

A CHANGING WORLD FOR WOMEN: PRENATAL DIAGNOSIS IN POINT-OF-CARE TECHNOLOGY

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Type of presentation: Oral session

Abstract:

Prenatal diagnosis to determine the outcome of pregnancies and to detect conditions that may affect future pregnancies has become a big issue in the public domain. Prenatal testing for genetic abnormalities is important as it helps parents and clinicians manage the remaining weeks of the pregnancy, plan for possible complications of the birth process and plan for problems that may occur in the newborn infant. The successful diagnosis of fetal abnormalities relies on the analysis of fetal genetic material obtained through invasive procedures such as amniocentesis and chorionic villus sampling (CVS). Amniocentesis is a relatively safe technique that produces reliable results but carries a small risk of fetal miscarriage (0.5 – 1%) and growth abnormalities. Therefore these procedures are not normally performed until the possibility of having a baby with an abnormality is calculated. Maternal age, previous abnormal pregnancies and abnormal ultrasound are some of the factors taken into consideration before performing invasive procedures. If the calculated risk is 1 in 250 or higher then genetic testing is recommended to the parents. Invasive procedures are also expensive and time consuming with an average reporting time of two weeks.

A long-sought ambition in prenatal diagnosis is to develop methods of obtaining fetal genetic material through a non-invasive means, which would not endanger the mother and fetus. Analysis of fetal genetic material extracted directly from maternal blood is therefore a smart alternative to invasive prenatal testing.

Over the last 10 years MEMS (Micro Electro Mechanical Systems) technologies, point-of-use microreactors or point-of-care diagnostic tools have reduced the need for intensive macro chemical plants or long diagnostic procedures. Many laboratory processes from a variety of scientific disciplines can now be performed on a micro chip, for example the Polymerase Chain Reaction (PCR) technique for the amplification of DNA. An integrated microsystem has many obvious advantages; reduced consumption of reagents and power, reduced costs, parallel processing and the smaller volume of sample fluid required for analysis.

A multi-disciplinary team in Heriot-Watt University, Scotland, has been set up to tackle the design and manufacturing of 3 Dimensional labs-on-a-chip for industries as a demonstrator of the EPSRC Grand Challenge project "3DMintegration". An integrated microsystem for prenatal screening is envisaged as a disposable cartridge with integrated modules for 1) cell separation, 2) sample preparation and 3) analysis of fetal genetic material from maternal whole blood.

The separation module is composed of preliminary and secondary separation. The aim of the preliminary separation is to extract blood cells from plasma. Blood plasma separation is achieved through the application of bio-physical laws in microchannels. The microchannels are manufactured in polymeric biocompatible materials using photolithographic methods. The plasma will then be analysed for the presence of fetal DNA. In the secondary separation module a magnetophoretic microseparator will be employed to separate fetal cells from the remaining blood cells. The separation method is based on the intrinsic magnetic properties of blood cells.

The presentation will cover the background of this study, an introduction to biological microsystems and their impact on a durable development of healthcare diagnostic tools throughout the world. The design, microfabrication and testing of the separation modules will be detailed and the latest results that have been obtained will be presented.

Key words: Woman & Child Health, Emerging technologies, Point-Of-Care, Microfluidics, Prenatal Diagnosis

CV:

Maiwenn is a PhD student in her third year at Heriot-Watt University, Edinburgh, Scotland. She holds an Electronics and MicroElectronics Engineering degree from the French Grande Ecole "ISEN". During her fifth year, before graduating she followed a Research MSc course at Lille Technical University in micro and nanotechnologies. She carried her MSc project at the laboratory IEMN, one of the five excellence center in microfabrication in France. Her research interest lies in emerging microtechnologies for biological applications. She has always belong to the female minority in Electronics and Microelectronics community, but strongly supports the interest of women in Sciences and Techniques.

PROTEOMICS FOR UNDERSTANDING THE SIGNALING PATHWAYS INVOLVED IN CANCER ANGIOGENESIS AND METASTASIS

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Type of presentation: Oral session

Abstract:

High throughput proteomics have been applied significantly to several fields of biomedical researches during recent several years. Proteomics, combined with separation technology and mass spectrometry, and bioinformatics make it possible to dissect and characterize the individual parts of various disease model systems by investigating the protein expression profiles, post-translational modifications and protein-protein interaction changes in various cellular systems. This can be applied for the early detection of disease as a biomarker and for the validation of target proteins for therapeutic drugs. Systemic analysis of proteomic changes in various disease states has been applied to understand the molecular changes of diseases. Availability will advance new technologies that improve sensitivity and peptide coverage. The progress of novel analytical technologies that are rapidly emerging, offer a great potential for determining the biomarker of diseases and drug targets. This presentation will focus on the strategies of proteome analysis using 2-dimensional gel electrophoresis, processing of protein spots and identification of proteins and posttranslational modifications and protein-protein interactions by amino acid sequencing with nanoLC-ESI-q-TOF tandem MS. In this work, we applied this technology for the determination of differentially expressed proteins, post-translational modifications (PTMs) and protein-protein interactions in various cancer models: angiogenesis and metastasis. [This work was supported by KOSEF through the Center for Cell Signaling & Drug Discovery Research (CCS & DDR, R15-2006-002) at Ewha Womans University, by KOSEF grant FPR05A2-480]

Keywords: Proteomics, Bioinformatics, Signaling processes, Cancer

CV:

From her graduate training in Chemistry at the Stanford University and post-doctoral fellow in Cancer Biology at Stanford Medical School, she has been devoted to the molecular investigation of biological processes. She is now opening a new dimension in the research of protein regulations in signaling processes combining the proteomic tools and biological processes, fully demonstrating her scientific leadership. She is one of the most active scientists, contributing heavily to the advancement of excellency in life science.

She has been actively involved in the social issues of gender equity. She spent a lot of energy to establish Korean Women Scientists and Engineers (KWSE) in 1994 and serves as a vice president KWSE (2004-2005) to support the woman scientists and engineers in their carrier development. She is an organizing chairperson of ICWES13 (13rd International Conference of Woman Engineers & Scientist), which held in Seoul, Korea (August 26-29, 2005). ICWES13 will support the woman scientists and engineers from 50 countries to the bridging between South and North, East and West. This will promote the Korean women scientists and engineers to play the important role in the world society.

CLONING AND EXPRESSION OF TRUNCATED FORM OF TISSUE PLASMINOGEN ACTIVATOR(K2S) IN LEISHMANIA TARENTOLAE AS A NEW EUKARYOTIC SYSTEM

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Type of presentation: Poster

Abstract:

Objective: Tissue plasminogen activator protein(t-PA) was found as superior thrombolytic agent for treatment of cardiovascular diseases such as acute myocardial infarction and efforts is currently focused to improve the t-PA molecule and thereby its pharmacokinetic properties. Reteplase (K2S) is a derivative t-PA that has a longer half-life and greater resistance to inhibitor than the natural t-PA molecule. The aim of this research is cloning and expression of K2S form of the t-PA cDNA in eukaryotic system leishmania tarentolae, which is recently has been introduced as a suitable host for expression of eukaryotic genes.

Methods: cDNA of t-PA was made by RT-PCR from human blood cells. PCR with specific primers for producing truncated form of t-PA (K2S) were used. For introducing the truncated form of t-PA in Leishmania tarentolae cells, we constructed two plasmid pFXm1sap1.4sat-K2S and pFXm1sap1.4hyg-K2S, that each of them contains one antibiotic selection marker (neomycin and hygromycin). After development of constructs electroporation was done on L.tarentolae cells for transfecting developed constructs.

Results: Both constructs (pFXm1sap1.4sat-K2S and pFXm1sap1.4hyg-K2S) were confirmed by restriction analysis and PCR. After electroporation, screening of cells was done by selecting resistance clones to antibiotic in media. At this stage we confirmed that our cells carry truncated form of t-PA in the respected site of ssurRNA (18s) and next step would be confirming the expression of t-PA.

Keywords: Thrombolytic agent, tissue plasminogen activator(t-PA), K2S

CV:

Dr.N.Davoudi Ph.D of Medical Biotechnology, Assistant prof , head of Leishmania research group

ACID-BASE AND CATION SORPTION PROPERTIES OF AQUEOUS MONTMORILLONITE SUSPENSION

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Department Environmental Science & Engineering, Ewha Womans University, Seoul, Korea.

Type of presentation: Poster

Abstract:

Surface properties of montmorillonite suspension, amongst which are point of zero charge (PZC) and point of zero net proton charge (PZNPC) have been studied using the convectional acid/basic potentiometric titration, mass titration and Lazarevic et al. (2007) techniques. At different ionic strengths, the proton adsorption vs. pH curves presents a common crossing point to determine the point of zero charge (PZC) of edges. The PZNPC of the edge sites were 3.4 ± 0.2 . Shift of the curves towards lower pH_{pzc} with increasing ionic strength for the KCl solutions may be attributed to formation of $\text{SO}^- \cdot \text{K}^+$ surface complexes because of coulombic interactions. The adsorption equilibrium of metal ions (Cu^{2+} and Ni^{2+}) on the studied montmorillonite, and the influence of pH_{pzc} on adsorption were investigated. Adsorptions for Cu^{2+} and Ni^{2+} are strongly dependent on pH and reached maximum at around pH 3.3 for both ions. Equilibrium data closely fitted the Langmuir model and observations showed that montmorillonitic smectite adsorption properties, results from surface complexation reactions and can be effective for cation (heavy metals) sorption in wastewater.

Introduction

Heavy metals of which Cu^{2+} and Ni^{2+} are major parts are being discharged to land from various industrial activities. Owing to availability, cost and crystal-chemical features, montmorillonites have been evaluated as an appropriate adsorbent for heavy metals.

Knowledge of surface properties of montmorillonite, such as the point of zero charge (PZC) and surface charge are very important for the determination of the acid–base characteristics of the surface functional groups and their interactions with ions from aqueous solutions in adsorption processes. Prominent among these characteristics are the density of surface charge created by isomorphic substitutions in a mineral structure (σ_o) and that created by proton adsorption and desorption reactions with a contiguous aqueous solution (σ_H). The sign of σ_H is always negative for montmorillonite and varies with aqueous solution pH, taking on a zero value at the PZNPC.

In this study, an attempt was made to evaluate some surface properties such as the point of zero charge (PZC), the point of zero net proton charge (PZNPC) and surface charge density of montmorillonite in KCl solution by using the potentiometric titration, mass titration and Lazarevic et al. (2007) technique. Sorption equilibrium of metal ions onto montmorillonite was studied to see the correlation of the investigated surface properties on heavy metal adsorption.

Methods

Analytical grade of montmorillonite from Aldrich Chemicals was used. Surface area as determined by the EGMA method was found to be $699 \text{ m}^2/\text{g}$. In the acid–base potentiometric titrations, 100 mL distilled water was initially adjusted to a high pH using 0.01 M NaOH and then titration began with small increments of 0.01 M HCl, until pH was 2.57. Titration was repeated with 20g of montmorillonite clay present in the same volume of distilled water. Experiments for charge determination were carried out under ambient temperature using 20g montmorillonite in 100 mL of KCl electrolyte concentration of 0.01 and 0.001 M. Suspension was then titrated with a standard NaOH solution, and for reversibility, the same suspension was titrated with a standard HCl solution. In all cases, pH was measured. With the potentiometric titration results, the surface charge density, σ_o , was calculated using;

$$\sigma_o = F(\Gamma_{\text{H}^+} - \Gamma_{\text{OH}^-})$$

where, the surface charge is in coulombs cm^{-2} , F is the Faraday constant. Γ_{H^+} and Γ_{OH^-} are the adsorbed amounts of H^+ and OH^- ions ($\text{mol}\cdot\text{cm}^{-2}$). In this manner, the dependence of the surface charge density on pH and electrolyte concentration was obtained. The mass titration experiments were performed by the following of the pH drift until a steady value. Each addition of 0.05g of dry montmorillonite sample were added to 30 mL of KCl solution at a given ionic strength, $I = 0.01 \text{ M}$, having a pH between 2.4 and 5.1. After each addition, the pH was recorded at equilibrium time, then a new amount of sample was introduced to change pH; this procedure was repeated until a pH was found where no pH change occurs with further addition of the sample.

A further verification was carried out using the technique of Lazarevic et al. (2007). Initial pH values (pH_i) of 20 mL of KCl solutions (concentrations 10^{-3} and 10^{-2} M) were adjusted in pH range of 3.1 to 10 using 0.01 M of HCl or NaOH. Then, 0.05g of montmorillonite was added to each sample. The point of zero charge was found from a plot of pH_f vs. pH_i . In order to substantiate the PZC of montmorillonite, adsorption studies on Cu^{2+} and Ni^{2+} with montmorillonite was carried out.

Results

It was observed that during titration with distilled water as electrolyte, PZC was around 3.4. The PZNPC, which in this case correspond to the pH where titration curves crossed with those of the corresponding blank solutions, shifted to lower pH values by increasing electrolyte concentrations. Maximum Cu^{2+} and Ni^{2+} adsorption with the montmorillonite was obtained at $\text{pH} > 3.3$. Sorption by montmorillonites may be explained to be controlled by two different mechanisms: (i) a pH-independent adsorption, usually attributed to cation exchange in the interlayers and resulting from electrostatic interaction between the ions and the permanent charge, and (ii) a pH-dependent adsorption, thought to result from surface complexation reactions similar to those on oxides. It can be described by Donnan equilibrium where the clay particle is conceptualized as a separate homogeneous phase bearing a negative charge (arising from isomorphic substitution) or as an accumulation of ions in the double layers that develops at the basal planes of the clay lamellae.

Conclusion

From the surface properties of montmorillonitic smectite studied, the proton adsorption vs pH curves presents a crossing point as the PZC value for experiments performed at different ionic strengths using the convectional acid/basic potentiometric titration technique. Observation from other methods of mass titration and Lazarevic et al. (2007) technique showed the values of PZC and PZNPC to be 3.3 and 3.4 ± 0.2 respectively.

Montmorillonitic smectite was found to be an effective adsorbent for removal of heavy metals like Cu^{2+} and Ni^{2+} in wastewater. It was also noticed that the adsorption of Cu^{2+} and Ni^{2+} was closely related with variation of the electrostatic potential of the Cu^{2+} and Ni^{2+} solutions - varying as a function of pH. The equilibrium data closely fitted the Langmuir model and showed the following affinity order; $\text{Ni}^{2+} > \text{Cu}^{2+}$. At pH above the point of zero charge (PZC) of montmorillonite, positive nature adsorbate adsorption enhances through coulombic attraction (ion exchange) and formation of complex with OH^- while at lower pH below (PZC), electrostatic repulsion may play a role to diminish the amount of Cu^{2+} and Ni^{2+} adsorption. Conclusively, the utilization of montmorillonite as adsorbent in adsorption processes of wastewater treatment can be an economically feasible technique for removal of heavy metals.

Keywords: Montmorillonite, Potentiometric titration, Point of zero charge, Adsorption, Copper

CV:

Ijagbemi Christianah is currently a PhD student in the Wastewater Treatment Laboratory of the Environmental Science and Engineering Department of Ewha Woman University, Seoul. She has to her credits, publications in both local and international journals on water and wastewater treatment technologies, contaminated soil treatment and gender issues.

LACTIC ACID FERMENTATION AND ANTIOXIDANT ACTIVITY OF *NABAK KIMCHI*

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Type of presentation: Poster

Abstract:

Kimchi is a representative fermented vegetable food in Korea, and is healthy containing bioactive substances. The present study examined the lactic acid fermentation and antioxidant activity of *nabak kimchi*, which is a kind of *kimchi* consumed mainly in summer. The counts of lactic acid bacteria and yeast involved in *nabak kimchi* were 2.5×10^3 CFU/mL and 5.2×10^4 CFU/mL, respectively, at the beginning, and both increased to around 10^7 CFU/mL in second day and then decreased with the progress of fermentation. The pH of *nabak kimchi* decreased and total acidity increased in the period of ripening. During the fermentation, *nabak kimchi* was extracted with the solvent (70% ethanol+30% water), and then compared the bioactive substances before and after fermentation. The total phenol content was $1.86.1 \pm 14.3$ mg/mL after fermentation, which was higher than that before fermentation, and the total flavonoid content was also 128.8 ± 2.0 mg/L after fermentation, which was significantly higher than 51.5 ± 6.1 mg/L before fermentation. Superoxide dismutase(SOD)-like activity, nitrite scavenging ability, DPPH(1,1-diphenyl-2-picrylhydrazyl) radical scavenging ability and antioxidant ability were significantly higher after fermentation ($P < 0.01$).

Key words: *Nabak Kimchi*, Antioxidant activity, Lactic acid fermentation, Radical scavenging activity

CV:

1974-1978: SongSim Women's University, Dept. of Food Science and Nutrition

1978-1981: Korea University Graduated School, Dept. of Food Technology (Food Chemistry)

1982-1986: Universite de Bordeaux II, Institut d'Oenologie (Oenologie)

1986-1994: Part-time Lecturer

1994-Present: Professor, The Catholic University of Korea

MODIFIED SILICAS IN ANALYSIS OF ENVIRONMENTAL OBJECTS

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Abstract:

The determination of trace metals in various samples usually requires their preconcentration and separation from matrix constituents. For this purpose, several techniques; i.e. solvent extraction, ion-exchange, co-precipitation and solid phase extraction (SPE) are used. The SPE is most suitable for trace analysis. In the sorption method, activated carbon, porous polymers, cellulose, silica gel are used. The latter materials are preferred to the other adsorbents due to their excellent kinetic characteristics.

In this work rapid and sensitive Flame Atomic Absorption Spectrometry method has been developed for the determination of trace amount of Cd(II), Zn(II), Pb(II), Cu(II), Ag(I), Pd(IV) and Au(III) in various samples after concentration on silica modified with propylthioethyleamine ligands (SiO₂-SN).

The modified silica gel was characterized by IR and C, H, N elemental analysis, and methods pH-potentiometric and conductometric titration. It was found, that two synthesized adsorbents contain 0,97 mmol g⁻¹ and 0,58mmol g⁻¹ of correspondingly attached groups.

The effects of various parameters such as pH (ranging from 0 to 8), time of shaking, volume solution (ranging 0.025l to 0.5l) and concentration of metals in solution (ranging from 50 mkmol to 1 mmol) were studied. The influence of types and least amount of eluent for elution of ions metals from phase of adsorbents were investigated. The result presented, that heavy metals could be quantitatively adsorbed by the SiO₂-SN from water solution at pH 6-7. The adsorption capacities of Cd(II), Zn(II), Pb(II), Cu(II) were 0.05 mmol g⁻¹, 0.14 mmol g⁻¹, 0.18 mmol g⁻¹, 0.22 mmol g⁻¹ of dry SiO₂-SN, respectively. Heavy metals eluted from SiO₂-SN easily and quantitative with a small volume of HCl solution. This became a basis of determination of the total concentration of heavy metals in natural objects.

In addition the SiO₂-SN is a very effective adsorbent for removal of noble metals. Their high sorption capacity (0.67 mmol g⁻¹ (pH≤2.5) – Au; 0.064mmol g⁻¹ (pH≤2.7) – Ag; 0.18mmol g⁻¹ (pH≤1.8) - Pd) and coefficients of distributions (10⁵mg g⁻¹) are evidence availability of their use for concentration and determination of these metals from various objects. The adsorbed metal ions can be readily desorbed with 10% thiourea in 0,1M HCl solution.

The analytical characteristics of the sorption-atomic-absorption methods developed have been checked up by the analysis of model solution (all metals), natural water (Cd, Zn, Pb, Cu, Hg), mineral water (Ag) and wastewaters (Pd, Au).

Keywords: enviromental objects, solid phase extaction, trace metals determination

CV:

Data of Birth: 01/27/58

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Degrees

PhD (1998) –Shevchenko Kyiv University, Ukraine, Analytical chemistry

MSc (1981) –Kyiv State University, Ukraine, Chemistry and analysis of rear elements

Education

1999-2000- UNICAMP, SP, Brazil – Postdoc

1985-1989- Kyiv State University, Ukraine, PhD student

1976-1981 - Kyiv State University, Ukraine, Full time student

Training

IWSE, 1998

A NATO Sponsored Workshop, France, 1996

Honors

ICWES 13, South Korea, 2005

FAPESP Postdoc. Brazil, 1999-2000

IWSE Fellow, USA, 1998

Communications

1. EURO analysis XIV – Antwerp, Belgium, 2007.
2. 9th ICFA. Giardini Naxos, Sicily-Italy. 2007.
3. ICAS. Moscow. Russia. 2006

Last Publications

1. Konoplińska O.P, Zaitsev V., Zaitseva G. Sorption-Atomic absorption determination of silver in water. Methods and objects of a chemical analysis (Ukraine), 2007, V.2, № 1, P.56-61.
2. Zaitseva G., Konoplińska O.P, B.A.Xanaφ, Zaitsev V. Sorption-Atomic absorption determination of Cu(II), Cd(II), Zn(II), and Pb(II) in drinking water with silica immobilized by propylthioethylamine Ukr.Chem.J., (Ukraine) 2006, V.72, №10-P. 108-113.
3. Zaitsev V., Khalaf V., Zaitseva G. Solid phase sorbent for phenol extraction based on silica modified by aryl diazonium salt Ukr.Chem.J., (Ukraine) 2006., V.72,-№ 1.- C. 24-31.

VENTRICULAR TACHYARRHYTHMIA DETECTION SYSTEM

Muazma Zahid

Research Student, National University Of Sciences and Technology (NUST)

Abstract:

Ventricular Tachyarrhythmia (VT) is responsible for 75% to 85% of sudden deaths in persons with heart problems. Due to high risk of sudden deaths by Ventricular Tachyarrhythmias, there is a need of an efficient, accurate, sensitive system in order to help the Cardiologists and Electro Physiologists for Detection of Ventricular Tachyarrhythmia. In this paper a new wavelet based algorithm for detection of Ventricular Tachyarrhythmia (VT) by analyzing ECG is presented. Wavelet transform has emerged over recent years as a powerful time–frequency analysis tool favoured for the interrogation of complex nonstationary signals. The proposed algorithm uses an efficient method for detecting VT in wavelet preprocessed ECG signals. The preprocessed signal is applied to the spectral algorithm (SPEC) which works in frequency domain and analyses the energy content. If the algorithm decides that the ECG part contains VT, the result is accepted as true and no further investigation is required. On the other hand a further investigation is carried out to confirm the result or to disprove it. The terminal parts of the ECG signal are processed with a continuous wavelet transform, which leads to a time-frequency representation of the signal. The diagnostic feature vectors are obtained by subdividing the representations into several regions and by processing the sum of the decomposition coefficients belonging to each region. Wavelet based efficient algorithm is used for detection of VT. With this method, underlying features within the VT waveform are made visible in the wavelet time-scale half space. The proposed algorithm overcomes the non-sensitivity of SPEC algorithm utilizing its highly specific nature to the fullest, enabling the cardiologists and electro physiologists to detect VT with accuracy of more than 85%. Such a system has broadened the horizons of research in the field of Biomedical Engineering. No such system in use can detect VT at this earliest stage and so the VT Detection System can save many lives.

Keywords: Ventricular Tachyarrhythmia, Wavelet Transform, Accuracy, Electro Physiologists, Cardiologists

CV:

I am a distinguished research student. I have done computer software engineering from National University of Sciences and Technology (NUST) Rawalpindi, Pakistan and I am a gold medalist of my university. My research work was selected in top 5 by European society of Cardiology in research work 2007. I have presented my work at several national and international forums. I have represented Women of Pakistan in International Festivals. I also won many renowned competitions.

REACTIVE OXYGEN SPECIES SIGNALING REGULATES T CELL DIFFERENTIATION AND APOPTOSIS BY COUNTER-REGULATING PROTEIN TYROSINE PHOSPHATASES AND JAK TYROSINE KINASES.

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Type of presentation: Poster

Abstract:

Reactive oxygen species (ROS) are known to modulate a variety of cellular and metabolic processes. In immune scenarios, ROS are produced by activated neutrophils and macrophages in the inflammation sites, and shown to affect T cell functions, including gene activation, proliferation, and apoptosis by affecting ROS-regulated proteins. Using exogenous hydrogen peroxide we have studied the role of ROS-mediated signals in T cell differentiation and apoptosis and associated mechanisms of signal transduction. Both in cytokine-producing human T cell lines and mouse primary splenocytes, the treatment of hydrogen peroxide at micromolar concentrations, induced an increase in intracellular ROS levels and stimulated the production of Th2 cytokine IL-4, but not Th1 cytokines. The ROS-mediated signal is accompanied by inactivation of protein tyrosine phosphatases (PTPs), which is potentiated by a PTP inhibitor sodium vanadate.. The combined treatment of hydrogen peroxide and vanadate then induced the activation of Jak1/3 and Stat6 and p38MAPK/ATFII, which in turn led to the upregulation of IL-4 promoter activities. On the other hand, anti-oxidants down-regulated the ROS-induced Jak and p38 MAPK activation as well as IL-4 production, while ROS-scavenging thioredoxin counter-regulated Th1/Th2 response by stimulating IFN- γ production. A very similar mechanism of ROS signaling pathways involving PTPs and Jaks was noted for the regulation of T cell apoptosis induced by hydrogen peroxide. A specific knock-down of CD45 / SHP-1 promoted hydrogen peroxide-induced T cell apoptosis, whereas the knock-down of Jak1/Jak2 resulted in a significant suppression of p38 MAPK and the subsequent apoptosis. Again antioxidants and thioredoxin introduction recovered the apoptosis by protection of PTPs. Thus ROS signal appears to regulate signaling pathways involving PTPs/Jaks/p38 MAPK common to Th2 differentiation and apoptosis. Our findings also suggest the role of ROS scavenging system in Th1 immunity and T cell survival for the maintenance of immune homeostasis.

Keywords: Reactive oxygen species, immune cell signaling, apoptosis, T cell differentiation

CV:

Ph. D in Biochemistry, Temple University (1985)

Post-doctoral associate, Harvard Medical School (1985-1988)

Professor in Immunology, Sungkyunkwan University, Korea (1994-present)

Visiting professor at University of Washington (2005-2006)

Vice president of association of Korean Women Scientists and Engineers (2006-present)

FROM COMMODITY PLASTICS TO SPECIALTY POLYMERS: ELABORATION OF POLYETHYLENE-BASED MULTIMATERIALS WITH MECHANICAL PROPERTY GRADIENT

C. Fréderix, R. Séguéla, J-M. Lefebvre, S. Elkoun & J-M. Gloaguen
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Polyethylene – blending – thermal sealability– cohesion – multi-materials

Polymer Industry has been increasingly focused on developing Commodity Plastics into High Performance or Specialty Polymers. Furthermore, one may expect that several high-tech innovations in Polymers (e.g. nano-composites, biomedical materials, plastic electronics, plastic for automotive) will find their way to the market via Commodity Polymers.

The extremely large variety of molecular architecture and crystal morphology of polyethylene result in a wide range of properties of these materials. Therefore, blending and sealing different types of polyethylenes can lead to a material with gradient of mechanical properties, such as viscoelastic and damping properties.

The goal of the present study is blending and sealing Linear Low (LLDPE) and Ultra Low Density Polyethylene (ULDPE) which are copolymers of ethylene and octene (metallocene catalysis). From a molecular standpoint, the presence of the co-monomer introduces short chain branching (SCB) on the polymer backbone which disrupts the crystallisation process and consequently reduces density and melting point. Unlike Low Density Polyethylene (LDPE), LLDPE contains very few long chain branches (LCB) which confers significant improvement of mechanical properties (higher young modulus, elongation at break, melting and crystallisation temperature...). The ULDPE owns good damping properties. LLDPE and ULDPE were chosen because they offer new opportunities of combining properties unexplored until now.

Blending of polyethylenes was widely studied but not well understood yet. Indeed, different situations are described in literature: depression of properties, common additivity (intermediate properties) or developpement of favourable interactions [1, 2, 3]. The blends and pure materials were characterised by thermal (DSC), mechanical (3 points flexion, uniaxial traction) and linear viscoelastic behaviors as well as rheology in the melt. The main result (e.g. *figures 1 and 2*) is that positive interactions exist between molecular chains of ULDPE and LLDPE for compositions with high content of LLDPE.

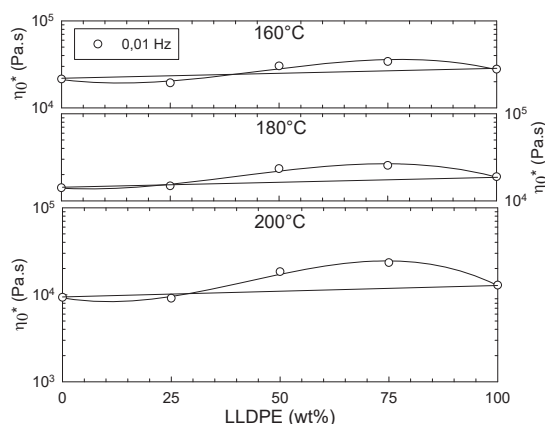


Figure 1. Newtonian viscosity vs %LLDPE at 0,01Hz and 160°C, 180°C or 200°C

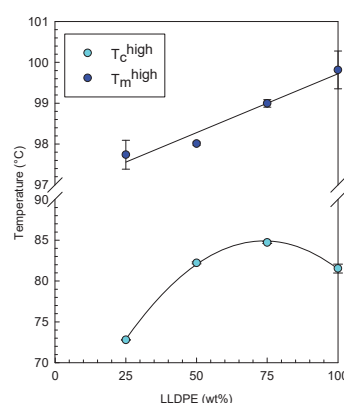


Figure 2. Crystallisation and melting temperatures of vs %LLDPE

The results of the blending study are promising regarding the sealability of these materials. Indeed, the blending study is a kind of pre-study of the sealing: during the sealing process, interdiffusion and co/trans-crystallisation at the interface occur while during the blending process the two phenomena occur in the whole sample.

The sealability of plates of ULDPE and LLDPE was investigated. This study contributes to a better understanding of diffusion and crystallisation phenomena that are involved in the adhesion of polyethylenes. An experimental welding device (*figure 3*) makes it possible to separate the process parameters such as time, temperature and pressure, and to explore their respective effects on the welding quality. This quality is mechanically evaluated by

means of shear (*figure 4*) and peeling tests (*figure 5*) [4]. Optical microscopy permitted observation of the interfacial zone and evaluate its width (*figure 6*).

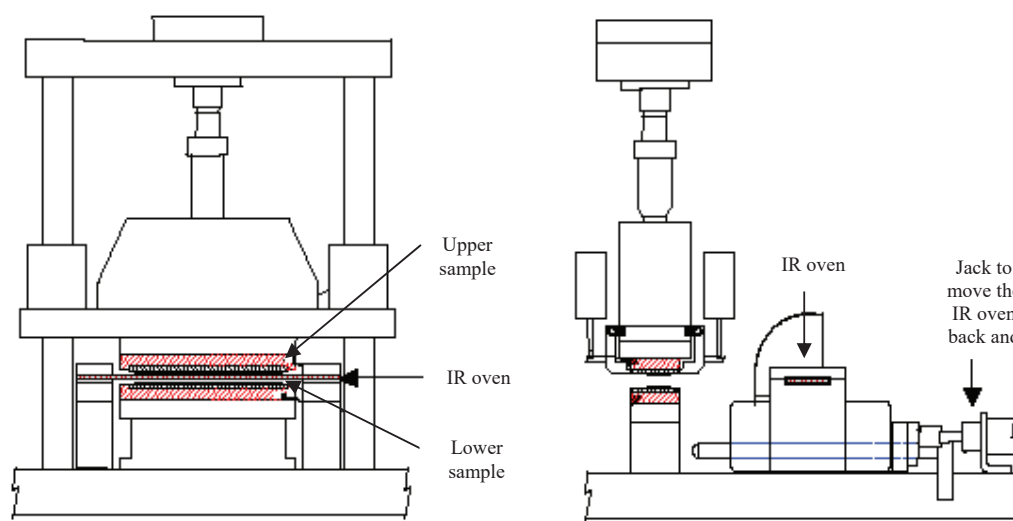


Figure 3. Sealing device

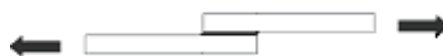


Figure 4. Sketch of shear test

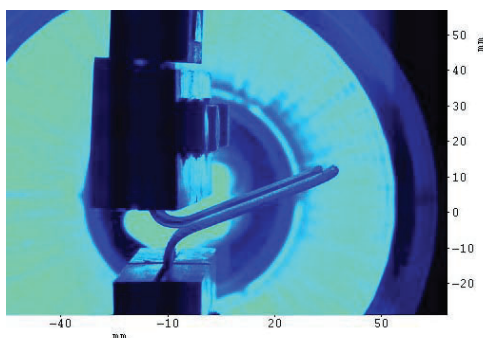


Figure 5. Peeling test

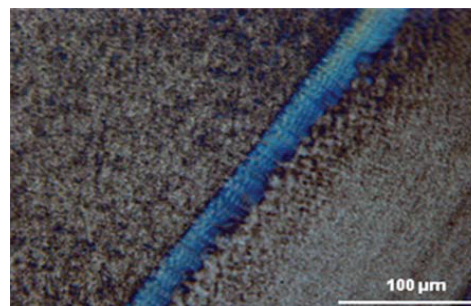


Figure 6. Interfacial zone observed by optical microscopy

Preliminary results of sealing show that it is quite easy to obtain a good cohesion between ULDPE and LLDPE and that varying parameters of the sealing device change a lot the quality of the resulting multilayer material. Investigations were also performed to seal common High Density Polyethylene (HDPE) with ULDPE or LLDPE. Compatibility between HDPE and LLDPE is rather good but less satisfying for HDPE and ULDPE. Indeed, these two last materials are too different from each other concerning the molecular architecture.

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Concentrating Solar Power – Technologies and Overview

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Outline

Recognizing the need for CO₂ reduction and the rising world energy demand renewable energy plays a major role in future energy production. Using the technology available today, at least half of the global energy demand in 2050 can be met by renewable energy sources. This has been proven by current scenarios in which a major role has also been ascribed to solar electricity generation [1]. In addition to photovoltaics, concentrated solar thermal power stations are central to solar electricity generation and provide a cost effective alternative for large scale power generation.

This article gives a general idea on Concentrating Solar Power (CSP) and recent developments in this field. We introduce the principles of CSP with particular attention to its different technologies and current innovations. Due to the recent market introduction an overview of current developments and first commercial systems will be given. Especially in countries with a high solar insolation, in the so called sun-belt regions, solar thermal power generation becomes commercially attractive. In Spain and the USA the first commercial systems since the 1990s were connected to the electricity grid in 2007.

Technologies

Solar energy is often associated with solar thermal heat production based on flat plate collectors to produce domestic water and space heating or with photovoltaic panels to produce electricity. Concentrating Solar Power plants in contrast means to produce electric power by converting the sun's energy into high-temperature heat using various mirror configurations for concentration.

For the generation of solar heat, different collector technologies are available: point-focusing collectors such as solar towers and solar dishes and line-focusing collectors such as parabolic trough collectors and linear Fresnel collectors. All CSP technologies rely on the four basic key elements: concentrator, receiver, transport-storage, and power conversion.

The concentrator captures and concentrates solar radiation, which is then delivered to the receiver. The receiver absorbs the concentrated sunlight, transferring its heat to a working fluid. The transport-storage system passes the fluid from the receiver to the power-conversion system; in some solar-thermal plants a portion of the thermal energy is stored for later use. As solar thermal power conversion systems, Rankine, Brayton, Combined or Stirling cycles have been successfully demonstrated. Four solar thermal power generation concepts will be presented here in more detail.

- The Solar Central Receiver or Power Tower is surrounded by an array of two-axis tracking mirrors, termed heliostats, reflecting direct solar radiation onto a fixed receiver located on the top of the tower (Fig. 1.1 and Fig. 1.2). Within the receiver, a heat transfer fluid (HTF) like water/steam, air, or molten salt transfers the absorbed solar heat to the power block.

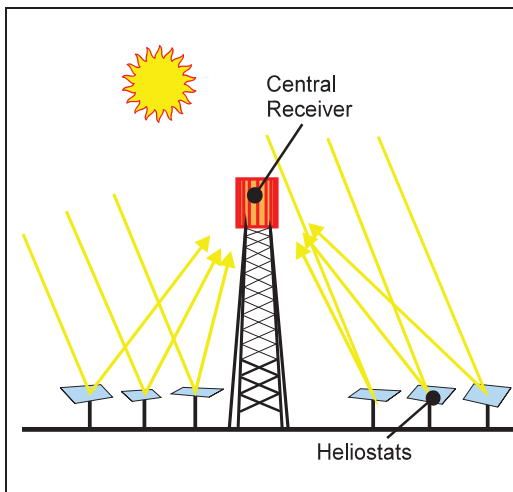
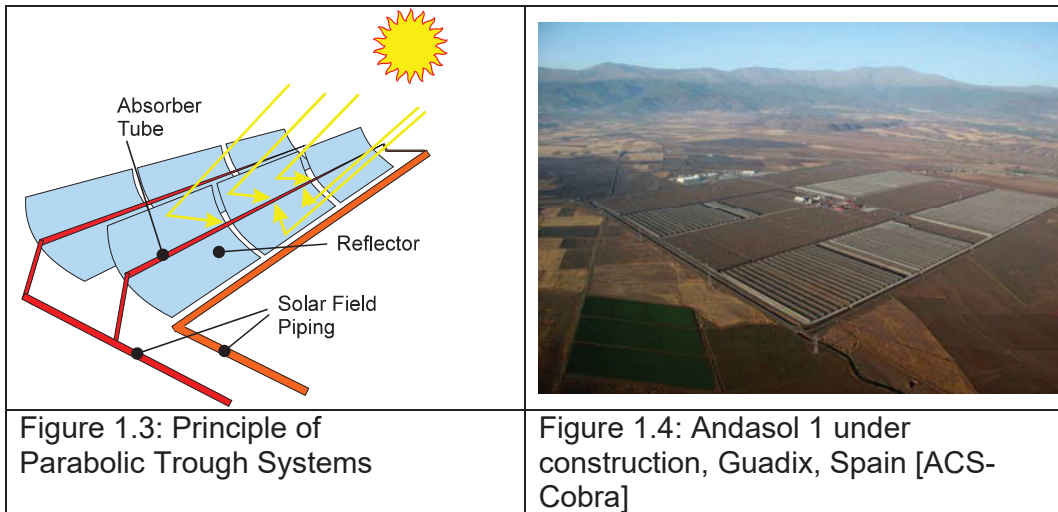


Figure 1.1: Principle of Solar Tower Systems

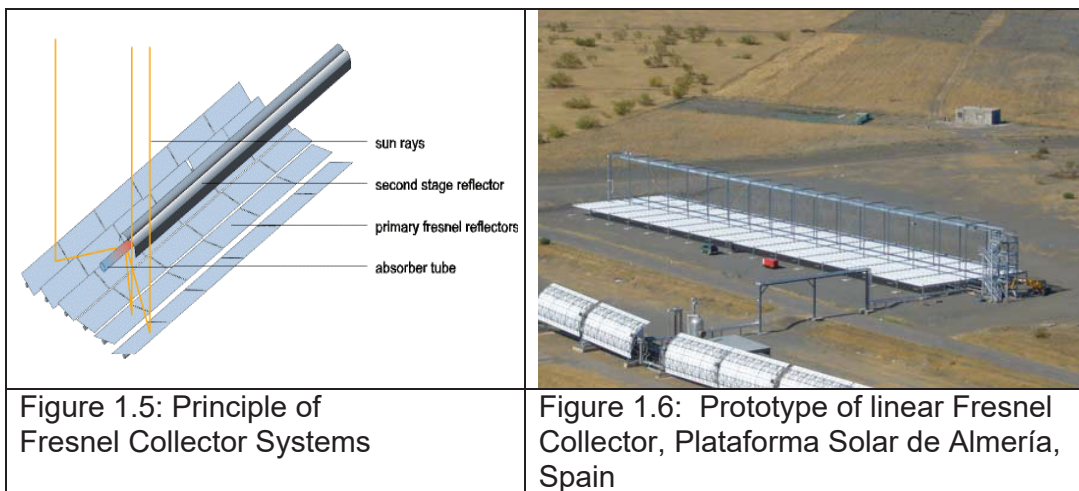


Figure 1.2: PS 10, Plataforma Sanlúcar la Mayor, Spain [Abengoa Solar]

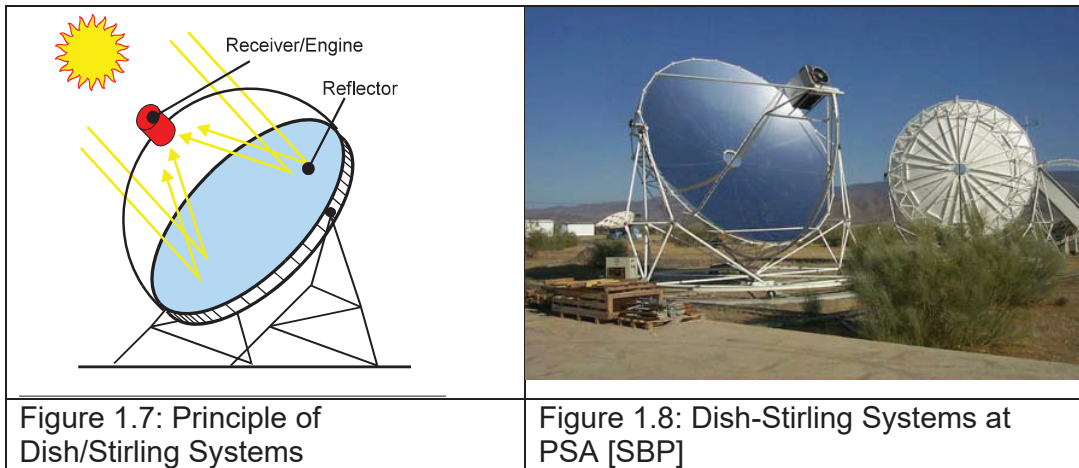
- The Parabolic Trough or Solar Farm consists of long parallel rows of trough-shaped glass mirrors. Tracking the sun by rotation on one axis, the collector concentrates the direct solar radiation onto an absorber pipe located along its focal line (Fig. 1.3 and 1.4). A heat transfer fluid, typically oil, is circulated through the pipes. The hot oil evaporates water and the generated steam drives the steam turbine generator of a conventional power block.



- Fresnel Collectors are also linear concentrating systems like parabolic troughs but with small segmented, almost flat parabolic mirror elements. Instead of tracking the whole collector, only the mirror segments are tracked focusing on a fixed absorber (Figs. 1.5 and 1.6). Compared to parabolic troughs Fresnel Collectors have a simpler technology and more economical flat mirrors but on the other hand a lower optical efficiency.



- The Parabolic Dish Systems consist of a parabolically shaped point focusing concentrator in the form of a dish that reflects solar radiation onto a receiver mounted at the focal point. These concentrators are mounted on a structure with a two-axis tracking system to follow the sun. The collected heat is typically utilized directly by a heat engine, mounted on the receiver (Figs. 1.7, 1.8).



The inherent advantage of CSP technologies (except Dish-Stirling Systems) is their unique integrability into conventional thermal power plants: All of them can be integrated as a “solar burner” in parallel to a fossil burner into conventional thermal cycles and provide with thermal storage or fossil fuel as backup firm capacity [2].

New developments and market introduction

Advanced concepts are under investigation to optimize the efficiency of the plants and to reduce costs. For example in power towers higher temperatures are aspired, using pressurized air up to over 1000°C in order to feed it into the gas turbines of modern combined cycles. Other projects showed the feasibility and cost reduction potential of Direct Steam Generation in parabolic troughs and linear fresnel collectors avoiding heat exchangers and expensive HTF. Other recent topics of investigations are the development of thermal heat storages and of absorber tubes with higher temperature stability of up to 500 °C.

Until lately, worldwide only one commercial solar thermal power plant was operating. The Solar Energy Generating Systems (SEGS) consists of nine solar power plants in California's Mojave Desert, which were commissioned between 1984 and 1991. The plants have a 354 MW_{el} installed capacity.

Due to feed-in tariffs passed in the last years, today new commercial solar thermal power plants were built or are under construction. Under the first commercial plants connected to the grid were the 64 MW_{el} parabolic trough plant in Nevada, USA and the 10 MW_{el} power tower in Seville. Several 1000 MW are planned to be erected in the next few years.

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MEASUREMENTS OF ENVIRONMENTAL DOSES OF COMPLEX RADIATION AT HIGH-ENERGY ACCELERATORS AND THERMONUCLEAR FUSSION FACILITIES

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Type of presentation: Oral session

Abstract:

Introduction: There are many kinds of technology impacts on environment. In last years facilities are being built which pose a challenge to radiation protection and dosimetry. These are high-energy accelerators developed for research and for hadron therapy of cancer (which number is rapidly growing) as well as thermonuclear fusion technology facilities which hopefully shall contribute to energy production in future that would help the climate change mitigation. The largest high-energy accelerator (the Large Hadron Collider (LHC) at CERN (Geneva)) will become operational in 2008. The ITER (International Thermonuclear Experimental Reactor) being under construction at Cadarache (France) is going to be crucial milestone in development and implementation of this technology. These technologies produce complex radiation fields in the vicinity of these installations. From radiation protection point of view all these facilities require measurements of the environmental doses caused by mixed radiation. These radiation fields typically consists of charged hadrons, neutrons as well as photons and electrons with energy spectra extending from fractions of eV to several hundreds of GeV. The intensity of this radiation may be very high (Bilski et al, 2007a). Monitoring the radiation field around such facilities may require several thousands dosimetric devices, because of its dimensions and complex distributions of radiation. Solution to this problem will require the application of a dosimetric system that consists of passive dosimeters, mainly alanine, RPL (Vincke et al, 2007) and TLDs (Obryk et al, 2007).

Method and Measurements: The use of thermoluminescent dosimeters (TLD) is a well developed technology in the field of passive radiation sensors, already widely used, nevertheless such sensors have not yet been applied in a radiation environment as it is presented by the mentioned technologies. The response of lithium fluoride thermoluminescent detectors is known quite well for typical types of radiation such as photons, neutrons and beta particles, but there is only limited knowledge about their response to complex mixed radiation fields, such as those expected around e.g. the LHC, especially in the high-energy range. By exposing TL detectors to a well-defined mixed high-energy radiation field it has been achieved a better knowledge and understanding of their response to these fields. The experiments in a known mixed radiation environment were conducted at the CERN-EU high energy reference field facility (CERF), which is providing radiation fields similar to those expected around LHC and behind the LHC shielding walls (Mitaroff and Silari, 2002). In this experiment over 600 TL detectors had been exposed to low (mGy range) as well as high (1-150 Gy) doses. For the latter range, in addition to the experiment, Monte Carlo simulations were performed giving good agreement for high energy mixed fields. The results of these experiments are very promising (Obryk et al, 2007).

In addition, recently has been discovered the new behaviour of high sensitive thermoluminescent detectors (LiF:Mg,Cu,P) at ultra-high doses (Bilski et al, 2007b, c) which enables to use these detectors for measurements of doses from mikrogreys up to several hundred kGy. So the dynamic range of these detectors is meant to cover very broad range of doses. Tests with gamma radiation were done so far up to 500 kGy. Some very significant changes of the characteristics of light emission during the heating of irradiated detectors have been revealed. The most important finding is the appearance of a new peak of light emission from detectors exposed above 50 kGy, the position of which shifts toward higher temperatures with increasing dose (from 405°C at 50 kGy to 470°C at 500 kGy) in contradiction to standard TL models (Bilski et al, 2007c).

Summary: Advances in thermoluminescent dosimetry technology due to recent investigations (Obryk et al, 2007) and discovery (Bilski et al, 2007c) offer attractive method for dosimetry of mixed radiation fields and at the same time a possibility to measure very wide range of doses with the same dosimeter. Our results indicate that TLDs can be successfully applied at the LHC to measure low and high doses. Such a dosimeter constitutes a universal passive device for dosimetry around considered facilities, being not only highly reliable but cheap at the same time. This technology is already considered to be applied for dosimetry around LHC and is going to be applied at hadron therapy facilities in Krakow. Our method is meant to yield valuable data on the LHC radiation environment that help spreading the technology among other hadron accelerators including those devoted to medical applications.

Acknowledgments: This work was partly supported by a research project from the Polish Ministry of Science over the years 2008-2009 (No. N404156434/22959).

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Keywords: Thermoluminescence; TL dosimetry; High-energy mixed radiation field; High-energy accelerator; Thermonuclear fusion facility

CV:

I was born in Andrychow, south of Poland. I graduated (with MSc) from University of Science and Technology, Krakow, in applied physics in 1978 and from Jagellonian University, Krakow in the field of astronomy (with MSc too) in 1980. From 1978 to 1980 I was research assistant in the field of reactor technology at the Institute of Nuclear Physics, Krakow. In 1980 I became an assistant and later senior assistant at the Jagellonian University in Krakow, performing research and teaching in the field of astrophysics. In 1990 I have returned to the Institute of Nuclear Physics and worked on High Temperature Reactor problems including research on high temperature metallic materials. These activities were terminated in year 2001, so I have moved to the Dosimetry Department. In 2002 I joined the Laboratory of Individual and Environmental Dosimetry where I performed measurements of radiation using thermoluminescent dosimeters. I was granted the fellowships of IAEA to stay at Health Physics Division of ARC Seibersdorf to perform the training in dosimetry and radiation metrology twice: two month in 2004 and three month in 2007. I've spent 9 month at CERN in 2006. In 2007 I was nominated deputy head of the Laboratory.

THE ROLE OF SCIENTIFIC KNOWLEDGE IN THE APPLICATION OF ENERGY MICROGENERATION TECHNOLOGIES IN EUROPE. THE CASE OF BIOGAS FROM BIOWASTE IN UK.

Maria Carmela Monteleone

Waste and Energy, Biogas from Biowaste Consultancy, Bedfordshire, UK.

Type of presentation: Oral session

Abstract:

The position of the European Community on Climate Change has brought in targets and priorities in the applied research activities supporting all the technologies that can replace the use of fossil fuels with renewable resources, generating lower CO₂ emissions (Ref. 1). European countries can count on specialised expertise in many of the technologies for the production of renewable energy from the studies developed in previous decades, but to different extents.

Looking at the target of achieving the introduction of each technology at all possible scales, the European Community supports the diffusion of knowledge and the progress in technologies that can be brought into the market effectively and in a short period of time.

Biofuels have been considered as an alternative to fossil fuels for the transport sector in the Biofuels Directive (Ref. 2, 3), for the production of electricity in the Co-generation directive (Ref. 4). Various studies have been funded in many European cities to assess the new fuelling options and all their practical implications.

The utilisation of biowaste is beneficial both as a source of biofuels and in achieving the waste management targets arising from the last EU waste Directive (Ref. 5).

Biowaste is now considered as a source of carbon that, diverted from landfill disposal and transformed into other forms of energy, contributes to meeting the obligations enforced by the Landfill Directive (Ref. 6).

Biowaste includes various materials containing carbon and having a putrescible nature. Anaerobic Digestion is a typical process that can use the natural tendency of biowaste to decompose in an oxygen free environment to produce methane gas. Since the 1980s, wastes such as sewage sludge, animal slurries, crops residues, various industrial process residues, households and catering waste have been used in various anaerobic digestion evaluation projects to assess optimum biogas yields, in various European countries such as Germany, the Netherlands, Italy, France, Spain and Sweden.

The knowledge of this technology in Europe has now improved at different levels. Nevertheless, the technical skills necessary to practically implement the process often remain within specialist design companies, waste managers, academic research centres and large environmental consultancies.

The United Kingdom has relied on landfill disposal until recent times, therefore studies on the applications of various technologies for waste treatment have been delayed, and the awareness of their potential, coming from many years of small scale trials and full scale applications, is still in a stage of development.

Scotland has invested for a long time in the anaerobic treatment of slurries; successful installations treating source selected waste exist in the south west of England. Municipal solid waste is processed in Leicester, and the new Biogen plant of Bedfordshire accepts source separated waste, farm and catering waste.

The design of these facilities was provided by German companies, showing a lack of confidence in UK professionals and in their practical knowledge of the application of anaerobic digestion technology.

Having studied the process at both a theoretical and practical level, and having visited and considered the operation of various sites, the author realises the simplicity of the biological process and of its application - therefore she started a series of studies on small scale anaerobic digesters to be installed on medium sized farms or commercial holdings processing food waste, for the purpose of producing heat from biogas to be used in the nearby buildings.

Larger sites for the treatment of waste require a considerable number of preliminary studies and the consideration of various financial, economical and environmental issues. On the other hand, small scale applications are more likely to be accepted by the local communities because of minimum requirements of waste transport, noise, smell, footprint of the site and potential of danger for the local inhabitants.

The convenience of installing a small anaerobic digestion plant depends on the amount of biogas that can be produced and its final utilisation. All these factors are related to local policies and economic issues on waste treatment and disposal, availability and costs of other technologies, the support given with the environmental- agricultural schemes in place for farmers or companies to pay back the costs, and the benefits that the company achieves in raising its public image as an environmentally friendly business.

The UK government has recently confirmed its commitment to support anaerobic digestion technologies as well as other commercial processes for the use of biomass and the production of biofuels. The government departments have produced useful guidance literature directed at the potential users, and financial help will be available soon.

Looking at the process of starting up a new biogas site, from the design to the planning applications to various environmental constraints, it is clear how specialised consultants with specific scientific and technical knowledge on all the various issues related to this process have a role, bridging the gap between the government proposals and the final users.

The availability of the best and most up to date knowledge on all the renewable energy technologies in Europe is the key factor to stimulating their diffusion in the European market and making their use a common feature of our everyday

life.

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Keywords: Biogas, Anaerobic Digestion, Biofuels, Biowaste, Microgeneration Technologies

CV:

Miss Monteleone has developed her studies on water and waste treatment in UK, at Cranfield University, after a period of study and work in Italy, where she is a qualified professional Civil Hydraulic Engineer. After completing in 2006 a research project on the anaerobic digestion of solid waste, for the production of biogas, she is now consulting in UK, Bedfordshire, on the treatment and disposal of biowaste, and in particular waste arising from farming activities. Having prepared a laboratory for the analysis of biowaste, she intends to participate further to the research on anaerobic digestion applications, with the discussions emerging from the various tests and applications. Miss Monteleone has already published many works in the field of Environmental Studies and Ancient Roman Hydraulics Studies.

THE CONTROL OF VELOCITY AND PRESSURE DROP IN A SEGMENT OF STRAIGHT PIPE AND ADJACENT BENDS, BY INDUCING A VORTEX FLOW

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Type of presentation: Oral session

Abstract:

Transport fluid flow velocity and pressure drop control

A convenient method of transporting solid material is by using air or water as the transport fluid. Pneumatic conveying, solid – air mixture, is a reliable and environmentally friendly transport method of bulk materials within a production process. The solid-water mixture is generally known under the name of slurry and is intensely used for the solid residue transport from power stations operating on coal.

One major problem of all pneumatic transport installations is the high wear resulting from abrasion at transition sections, especially bends, and the piping immediately downstream of bends. In the slurry transport installations due to the tendency of the solid part of the mixture to drag at the bottom part of the pipe the abrasion can be severe not only in bends but on the straight pipe sections as well, which can result in fluid loss due to holes in the pipe. A relatively often used method is to rotate all straight pipes by 90° in order to obtain a uniform abrasion. This method is labour intensive and time consuming and does not solve the abrasion in the adjacent bends. By deliberately creating a vortex flow sending the solid-air/water mixture in a swirling movement through the straight pipe and adjacent bend may reduce the heavy wear. In this study a virtual model was created using Computational Fluid Dynamics (CFD) software, where a wire spiral of different length, pitch and cross section was introduced at the beginning of the straight segment of pipe and just before the bend. The fluid flow in the pipe and bend was monitored with the aim of choosing the right length, pitch and cross section for the wire spiral used. As a start only the transport fluids, air and water behaviour was monitored. At a future stage the solid-air/water mixtures behaviour will be studied. For a spiral manufactured from round cross-section wire the initial CFD processing results were encouraging as the velocity vectors path diagram showed a clear vortex movement in the straight portion, but receding quickly in the bend. The next step was to try to enhance enough the vortex movement to continue in the up-stream bend. Changing the spiral cross section from round to a rectangular shape, increased the vortex movement but negatively impacted on the pressure drop. Several CFD models with variable spiral cross sections and lengths were created in order to achieve a reasonable balance between vortex flow induction and pressure drop.

Keywords: velocity, pressure drop, vortex flow

CV:

Mrs. Dorina Ionescu is the head of Mechanical Engineering Technology Department at University of Johannesburg. The department has a compliment of 19 permanent staff members and an average of 1400 students / year.

Mrs. Ionescu obtained a Ms.C in Mechanical Engineering in 1973 and is currently working on her doctorate

in computational fluid dynamics. She was among the first women engineers registered as a professional engineer with the Engineering Council of South Africa. Mrs. Ionescu is a member of South African Institute of Mechanical Engineers, South African Corrosion Institute and International Freight Pipe Society.

Mrs. Ionescu has over 25 years of tertiary education work experience and is an active member of the Technikon Accreditation Committee within Engineering Council of South Africa.

FUEL CELL POWER GENERATION: AN ALTERNATIVE TO FULFIL FUTURE ENERGY NEEDS

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Type of presentation: Oral session

Abstract:

Coal was the main source of energy during the 19th century and the booster of the industrial revolution in Europe. It was replaced by oil during the 20th century, followed by an increasing use of natural gas. The time for a single source of energy, dominating and conditioning the economical development, is over for two reasons. First, the forecast peak oil will lead to the drastic decreasing of its production and the increase of its price. No matter the actual time for this event, it will occur before the end of the 21st century. Natural gas will follow the same way as the stocks are located in the same area than crude oil. Coal is still abundant for many centuries but here comes the critical issue: the emission of carbon dioxide. Whatever is still pretended from time to time, there is no more doubt about the correlation between CO₂ emission level linked to the development of human activities and the climatic changes. The second reason is the increasing needs of energy at the level unknown since the beginnings of human being. In two hundreds years, the world population has been multiplied by six and, at the same time, the power needs per habitant increase two times quicker. Then, we are now facing a double challenge: fulfilling the energy requirements to go on with the technological development and protecting the natural balance of the planet. A clean and efficient power supply device based on a renewable energy source has to be available to take up the challenge. Among the different technological alternatives, fuel cell power generation becomes a more and more interesting and promising solution. Furthermore, two main application fields of fuel cell are transportation and stationary power plants. These two applications are responsible for the half of the greenhouse effect gas emissions in the developed countries [1].

As a battery, a fuel cell is an electrochemical converter; it converts the chemical energy of the fuel to produce electricity and heat. But, unlike batteries which electrodes are consumed during operation and have to be replaced or regenerated during a charge phase, a fuel cell is an open device and can operate as long fuel and oxidant are provided. Then, the stored energy and the autonomy are not related to the converter itself but to the capacity of reactant storage. The autonomy and the energy density issues are then set in a different way. A fuel cell is composed of two electrodes separated by an electrolyte. The anode is supplied by fuel, the best one being gaseous dihydrogen, which is oxidised. Electrons are collected and move towards the cathode through an external electrical load. Protons generated at the anode cross the electrolyte and reach the cathode, where the oxidant, the most common one being the oxygen, is reduced by the electrons. The reduction of oxygen being exothermic, heat is also produced. If pure dihydrogen and dioxygen are used, the only chemical subproduct is then water. The maximal thermodynamic limit of efficiency is around 80%, much higher than the Carnot cycle limit when rapid combustion is used. Furthermore, the operation is silent and pollutant emission free. Those three reasons explain the active research around this option all around the world. [2]

The voltage generated across a single cell is low (between 1 and 0.7V), so several cells are used in series for practical application in a so-called "stack". The current depends on the surface of the electrodes and the state of art is currently between 0.5 and 1Acm². The stack is the heart of a more complicated system composed of

- a fuel circuit and an oxidant circuit for the supplying and the conditioning of the reactants
- a thermal management circuit
- a water management circuit
- a power converter to link the stack output to the electrical load.

Operating a fuel cell generator reveals to be a difficult task because it involves the control of multiple actuators and auxiliaries.

Several fuel cell technologies have been developed. They present different characteristic, mainly driven by the electrolyte type and the operating temperature. Due to these differences, they address different market segments and applications. Because of their quick start-up potential, low-temperature fuel cells (Alkaline Fuel Cells, Polymer Electrolyte Fuel Cells - PEFC) are being considered for portable, residential power [3] and transportation applications [4]. Higher temperature fuel cells (Phosphoric Acid Fuel Cells, Molten Carbonate Fuel Cells, and

Solid Oxide Fuel Cells - SOFC) are often considered for stationary power generation [5]. Nevertheless, due to their solid electrolyte, SOFC are also considered for supplying the electrical net in embedded applications (car, bus, aircraft, yacht, ...).

However, many technological hurdles have still to be overcome before the development of industrial and competitive products in these fields. First of all, good performances have to be reached at a reasonable cost. Performances include high power density and fast dynamic response to load solicitations. Lifetime relevant to the customer expectation and reliability have also to be respected. This is far from being the case for the moment. Hydrogen storage and more generally the fuel storage has to be solved, the oxidant is generally extracted from the ambient air. Last but not least, the safety of the system itself and the users have to be carefully studied.

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Key words : fuel cell, hydrogen, renewable energy, power plant, transportation

CV:

Marie-Cécile Péra was born in 1968 in Paris, France. She graduated an electrical engineering degree from the Ecole Nationale Supérieure d'Ingénieurs Electriciens de Grenoble in 1990. She received a PhD in electrical engineering from the Institut National Polytechnique de Grenoble, in 1993, on magnetic material coating studies. From 1994 to 1999, she was associate professor at the University of Reims Champagne Ardennes, where she studied non-linear dynamics of electrical systems, based on chaos theory. Since 1999, she has joined the University of Franche Comte (UFC), and has worked on fuel cell systems in the Laboratory of Electrical engineering, Electronics and Systems. She has developed models for polymer electrolyte fuel cell (PEFC) and solid oxide fuel cell (SOFC) as well. She also studies system architecture for energy optimization. Since January 2008, she belongs to the FEMTO-ST Institute (UMR CNRS-UFC). She has contributed to more than 80 publications in international scientific journals and international conferences. She gives courses in electrical engineering at the Institut Universitaire de Technologie (IUT) de Belfort-Montbéliard for Bachelor Degree and at the UFC for Master Degree.

MODELING OF CONDENSATION SEPARATION OF SMALL FRACTION FROM GAS FLOW

O.V. Beliyeva

Joint Institute for Power and Nuclear Research – Sosny, National Academy of Sciences of Belarus, 99 Akademik Krasin Str, Minsk, Belarus, 220109

Type of presentation: Poster

Abstract:

A gas containing a small condensable fraction of admixtures is investigated. In the course of cooling the gas, the critical supersaturation of admixture fraction is achieved inside an expansion device and its homogenous condensation begins. The droplets growth rate is low and is controlled by intensity of diffusion vapor supply to surface of a droplet, in contrast to the case of high vapor content when condensation rate is determined by the heat release intensity into gaseous ambient. Due to the initially small content of admixture fraction, the role of the Stephan mass flow is rather low; so its effect may be neglected and common formulas of diffusion mass transfer can be used.

The separation of small fraction of condensable propane from its mixture with methane during expansion process in a reciprocating expander is being simulated. The variation of temperature and pressure of the fluid, as well as the propane liquefaction coefficient, droplet sizes growing while condensing has been calculated as a function of the piston stroke time. The calculations have been made with accounting for both the adiabatic expansion and the heat flow effect caused by mechanical friction and heat exchange with the outside ambient. The effect of initial temperature, pressure and content of condensable fraction has been analysed.

Key words: Condensation, Separation, Liquefaction, Droplet, Modeling

CV:

Beliyeva Volha V., PhD., Leading Researcher of the Joint Institute for Power and Nuclear Research – "Sosny", National Academy of Sciences of Belarus. Since 1966 after completion St. Petersburg State Polytechnic University, Russia I work in the Joint Institute for Power and Nuclear Research – "Sosny".

IMPROVING ROBOT EFFICIENCY TO REDUCE ENERGY CONSUMPTION

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Mechanical and Aerospace Engineering, Carleton University, Ottawa, Canada

Type of presentation: Poster

Abstract:

When an industrial robot at ambient temperature is powered up, a warm-up cycle may be required to bring the robot to a thermally stable working condition. Without such a warm-up cycle, temperature-induced dimensional distortion [1] may seriously affect the positioning and orientating capabilities of the robot. Similarly, if a robot workcell goes offline for any number of reasons such as unexpected maintenance, material or tool changes, a short warm-up period may be needed to restore a steady state condition.

Thermal instability, which causes the dimensional distortion, arises from losses in the robot motors and gearboxes. It has been reported [2] that in some applications where a precise trajectory must be followed, a warm-up of as much as two hours of continuous motion, at 100% motor speed, through the reachable workspace may be required to reach steady state. Such warm-up cycles represent a potential loss in productivity and an unnecessary consumption of energy.

Consider a modest assembly line of 15 small payload (15 kg) robots each with an installed motor capacity (maximum energy consumption) of 3 kW. The average power consumption at average power usage of each robot is 1.2 to 1.5 kW [3, 4]. If the robots work continuously for three, eight-hour shifts each day (45 robot shifts) with an overall efficiency of 98% [5]; then, roughly 1 robot will be out of service for one shift each day. During the unloaded warm-up cycle approximately 1 kW is consumed. If a one-hour warm-up period is required, there will be an un-necessary energy consumption of 1 kWh each day or 365 kWh each year. This corresponds to two weeks of energy consumption for a typical North American family [6], or that of a small village of 40 for a year in the developing world [7]. However, for a line of 15 large pay-load robots, the unloaded consumption per robot is approximately 10 kW and the warm-up cycle time may be 3 to 5 hours [2]. In this case there is an un-necessary energy consumption of 18,250 kWh per year.

According to the Ontario Energy Board [8], the cost for non-residential consumers is C\$0.05 /kWh (up to 750 kWh) and C\$0.059/kWh for consumption exceeding 750 kWh. Energy wasted in the warm-up cycle for the hypothetical large payload robot line is \$1070. If a plant has multiple assembly lines or multiple facilities, the total cost will be much larger. There is also the associated loss of production that occurs during the warm-up cycle. For high performance production lines the economic consequences may be significant.

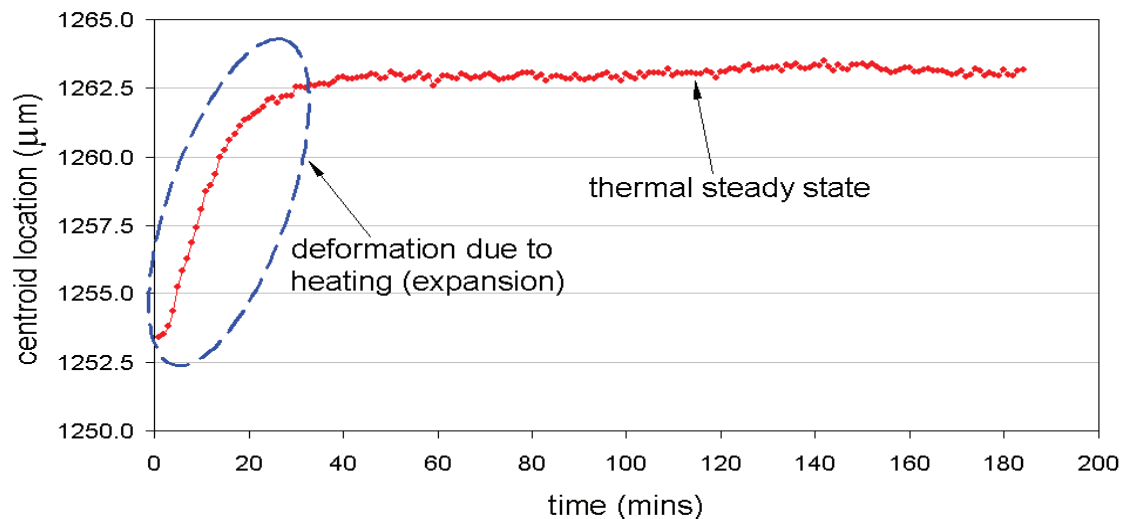
Objective

The goal of this work is to develop a model-based control algorithm to compensate for the temperature induced deformation associated with the warm-up period. For any assigned trajectory and load, the control algorithm will relate robot geometry to temperature changes, material behaviour, and the contribution of each motor and gearbox.

A single-link system comprised of one motor and one link (6061 Aluminium in the T6 condition) was attached to the shaft of a servo motor in a manner similar to that seen in small pay-load industrial robots. The motion of the apparatus was controlled by the wrist motion (sixth axis) of a Thermo CRS A465 robot.

The behaviour of the slender link, in which longitudinal deformation dominates, is determined as follows: experimentally with a charge-coupled device (CCD) camera [9] for measuring dimensional changes and an infrared camera [10] for measuring temperature; analytically using equations based on the coefficient of thermal expansion; and numerically with coupled thermo-mechanical FEA [11]. This three-pronged approach allows multiple cross-checking of behaviour and, for example, identified that the camera also requires a warm-up cycle to prevent spurious thermal-deformation results of the camera and its mount from being attributed to the link.

Figure 1 shows a typical result in which the location of the centroid of the laser spot in the longitudinal (xaxis) direction is plotted over the 190-minute period. Initially at room temperature, the linkage was heated indirectly from the output shaft, which was wrapped with and heated by an insulated flexible heating pad. The dashed oval shows the transient period, where the temperature-induced deformation occurred during the first 32 minutes. The linkage at steady-state is 9.5 μm longer than its original length. Clearly there is a need for a warm-up cycle in even this simple mechanical system.



Next Steps

The single-link experiment and its corresponding analytical and numerical predictions, suggest that it is possible to develop a simple predictive algorithm for industrial applications. A multi-link experiment is now under development. Further work is needed to understand the material properties and thermal boundary conditions in the experimental, analytical and numerical models.

With a sufficiently accurate controller algorithm, the repeatability of the robot can be improved along with the positioning accuracy of the robot. It is expected that greater positioning accuracy can be achieved in this way than can be achieved through calibration alone. This improvement in manufacturing efficiency will allow the robot to perform productive work during the warm-up cycles and in doing so, increase productivity and reduce unnecessary energy consumption.

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Figure 1: Experimental results from single-link system.

Keywords: industrial robot efficiency; energy consumption; warm-up time; temperature-induced deformation

CV:

I am a 4th year student in the Ph.D program in Mechanical Engineering at Carleton University. I completed my undergraduate degree in mechanical engineering from Chulalongkorn University in Thailand in my hometown. During the 4 years of my undergraduate degree, I continuously participated in engineering student voluntary camp, where engineering students built infrastructure in needy rural villages. Living and working as construction workers in the camp gave students both engineering and life experiences, and underscored the importance of community. I decided to come to Canada to pursue graduate studies in mechanical and aerospace engineering from Carleton University in Ottawa. Throughout I have been supported myself as a research assistant, teaching assistant, and sessional lecturer. Also I work part-time as a bartender at a graduate student pub on campus. In my spare time I recently participated in the Ontario Society of Professional Engineers activity day promoting outreach to girls. I play ice hockey, volleyball and ski. For the past 6 years, I have studied engineering technology in the developed world and have enjoyed my Canadian experience. I have a plan to one day return to my hometown and pass on my knowledge and experience to the future generations.

INVESTIGATION OF TURBULENT HYDROGEN FLAMES

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Motivation

Turbulent combustion of fossil fuels is still nowadays by far the most important process to cover the worldwide energy needs. Actually, more than 80% of our energy requirement is produced by combustion of fossil fuels, ranging from solids such as coal, over liquids such as hydrocarbon fuels to gases such as natural gas. Combustion systems are variously employed, for example for transport purposes in cars, ships, railway locomotives or airplanes, for power generation in stationary power plants, for heating of factories or residence homes. . . According to the International Energy Agency (IEA) we have to expect an explosive growth of energy consumption in the coming years at least till 2030 [2]. On the other hand fossil fuels are limited. In the future, fossil fuels and combustion of fossil fuels will have to be replaced by new energy sources and technologies to gain energy. One of the most important new sources will be hydrogen and, again for energy conversion, combustion will play the predominant role.

Investigation of turbulent reacting flows

In order to investigate turbulent combustion processes, two complementary ways are classically used: experimental investigations and numerical simulations. Both lead nowadays to a huge amount of raw data, which have to be post-processed carefully in order to gain useful information.

Due to different requirements associated with fundamental research and industrial needs there are different strategies to simulate turbulent combustion processes. The three main methods are:

Reynolds-averaged Navier-Stokes equations, RANS,

Large Eddy Simulations, LES and

Direct Numerical Simulations, DNS.

Information on modeling turbulent reacting flows can be found for example in [4] or [3]. In this work only DNS results are investigated. The DNS method consists in solving the fully-unaveraged Navier-Stokes equations. All spatial and time scales of turbulent motion are resolved. When the grids are fine enough DNS give us nearly exact results. On the other side DNS is time- and memory-intensive and produces a lot of numerical costs. For a 3D DNS we typically obtain around 500 MB of raw data per time step. Obviously DNS is not suitable for practical applications. But DNS is predetermined as a research tool [1].

Post-processing of experimental and numerical results

In order to extract all useful information from our experimental and numerical data, a library containing essential post-processing methods has been developed [5]. The library contains methods to investigate 2D as well as 3D results, premixed and non-premixed flames, hydrocarbon and hydrogen flames. The scripts are written in the MATLAB language. The name MATLAB stands for Matrix Laboratory. It is probably the most wide-spread basic computational tool for engineering sciences in research laboratories and in R&D industrial

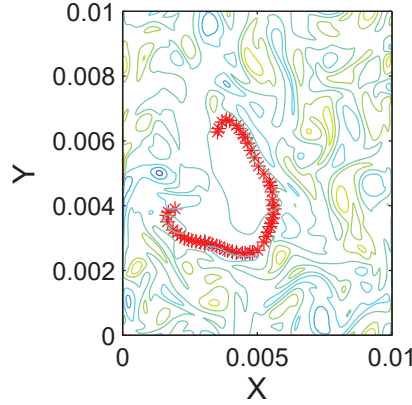


Figure 1: Flame-front defined as crestline of H_2O_2 and vorticity field

departments.

The toolbox developed in this work contains six different categories of complementary tools:

- tools for a direct *geometrical analysis* of flames,
- tools to investigate the *flame structure*,
- tools to investigate the *interaction* of flames and turbulent flow fields,
- tools allowing a *statistical investigation* of all variables of interest,
- tools to quantify the *properties of turbulent flow* fields,
- tools for a *spatial filtering* of the data.

Examples: Post-processing of a hydrogen/air flame

In the following only some selected tools are demonstrated due to lack of space. Much more will be demonstrated at the conference. We investigate a partially-premixed hydrogen/air flame in a turbulent velocity field, considering real chemistry involving 9 species and 37 chemical reactions. The domain is 1 cm large in each direction, discretized with 401 grid points. The first step of post-processing is to locate and define the flame-front. It is defined here as the crestline of the chemical radical H_2O_2 . Figure 1 shows this flame-front and the instantaneous vorticity field. In turbulent flows flames are strongly influenced by the velocity field, getting curved and strained. It is important to investigate these effects because they can lead to local or even global extinction of the flame. Figures (2) and (3) show curvature and strain-rate along the flame-front shown in fig. (1). The curvature has a minimum, mean and maximum value of 21230, 47940, 60280 m^{-1} respectively. The strain-rate has a minimum, mean and maximum value of -764, 2404, 4335 s^{-1} respectively. Such quantitative results can be used to refine, check or develop simplified models, suitable for industrial needs.

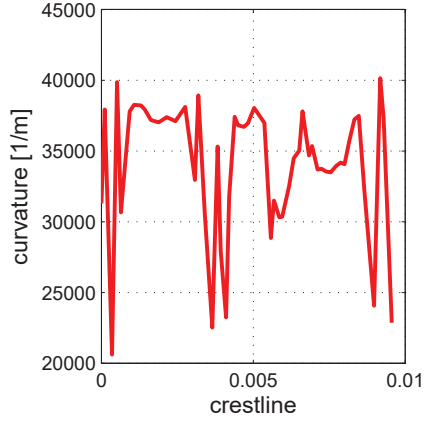


Figure 2: Curvature along flame front

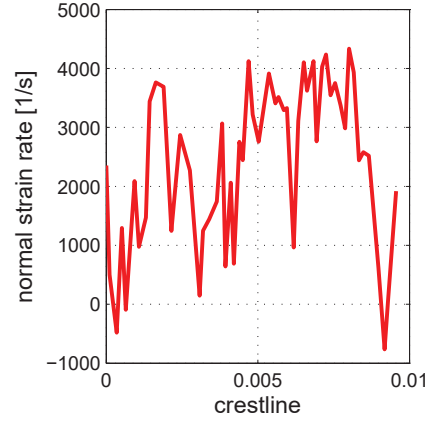


Figure 3: Strain-rate along flame front

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WOMEN IN SCIENCES AND HIGH TECHNOLOGY IN THREE BALTIC COUNTRIES

Erna Karule

Institute of Atomic Physics and Spectroscopy, University of Latvia

Type of presentation: Oral session

Abstract:

Three small Baltic states: Estonia, Latvia and Lithuania (with 7 million inhabitants in total) regained independence in 1992 and in 2004 joined European Union.

In 2006-2007 women physicists, sociologists and representatives of Ministries of Education and Science from all three countries worked together on a common FP6 project Baltic States network: „Women in sciences and high technology” (BASNET). In this network participated also Poland and Rumania. I was the BASNET coordinator for Latvia. Task of the project was to investigate the situation of women scientists and create the common strategy to improve the situation of women scientists in all three Baltic countries. Baltic countries are the former FSU countries. The most important are problems, which are common for all scientists – men and women: low financing of science and low salaries. But the salaries of women are lower than those of men. In Latvia the average salary of a women scientist is about 15% lower than that of a man. The average salary of a women in Latvia in 2007 was 19.5% lower than a salary of a man.

In Latvia on average every fifth student in engineering, manufacturing and construction is a woman (21% in 2005). Women constitute one third of the students in natural sciences, mathematics and information technologies. Number of girl students is growing. In 2005 only 54% of students in University of Latvia were girls, in 01.01.2007 76.28%. But how attract more girls to study natural sciences? In Latvia since 2006 so called „science nights” are organized in institutes to attract boys and girls to study natural sciences.

To attract more girls to study natural sciences, it is necessary to show women as the role models. Therefore we decided to follow USA where recently the book „Out of shadows” about women physicists is printed. In Latvia using the funding of our FP6 project a small book about the Latvian physicist Irena Plavina (1928-2003) and her laboratory, where most of researchers were women is in print now.

At present salaries and status of scientists is low in Latvia. After graduating physics only those who are really interested stay in physics. Physicists have a lot of job opportunities – much than those who had studied humanitarian sciences. One can see them in government (our Prime minister is a physicist), in banks. They are businesswomen and auditors.

Workbalance for women in STEM is very important. It is not easy to work and bring up children. Women with small children must have opportunity to have part time job in science. There is not enough childcare facilities in Latvia. Most of grandparents are working as many of them have pensions below the minimum, which is necessary for living.

Our sociological investigations show that so called „glass ceiling” is different in Baltic countries. In Latvia it is higher than in Lithuania and Estonia. „Glass ceiling” is moving up with time being but to remove it completely the strategy must be created. Lithuania wishes to remove it at least partly introducing quotas for women. In Latvia and Estonia quotas are strongly rejected by women scientists. I suppose instead of quotas one must teach girl students how to communicate, negotiate, and show how to become a leader.

Gender policy have to be different depending on the cultural differences. In Latvia women have many leading positions in government. In Latvia the Minister of Education and Science is a woman. From 1999 until 2007 the President of Latvia was a woman Vaira Vike-Freiberga. It has encouraged young woman a lot. Globalization also encourages young women in Latvia. They can travel, as students they each year have opportunity to participate in several scientific conferences abroad, which was completely impossible in FSU. Women become more self confident. In Latvia woman understand that struggling for a woman rights first of all one must be a good specialist in her field.

CV:

Date and place of birth: 22 March 1935, Latvia

Education:

1954-1959: University of Latvia, Faculty of Physics and Mathematics, Discipline: Physics

1966: USSR Candidate of Sciences in Physics and Mathematics, Latvian University, Riga.

1990: USSR Doctor of Sciences in Theoretical and Mathematical Physics, University of Leningrad (St.Petersburg), Thesis "Multiphoton ionisation of atomic Hydrogen"

1992 Nostrified degree in Latvia - Dr.Habil.phys.

Research fields:

Atomic physics, theory, electron atom collisions.

Atoms in strong electromagnetic fields: multiphoton ionization, harmonic generation, free-free transitions.

Languages: Latvian-native, English-fluent, Russian-fluent, French (read).

Scientific Projects

1) The principal investigator of the Latvian Science Council grant No: 05.1869 ?Quantum mechanical and semiclassical methods for the description of multiphoton processes.

2) The coordinator for Latvian University for the FP6 project 017017 Baltic States network ? ?Women in Sciences and High Technology?(BASNET), 2006-2007.

Participated with reports at all BASNET conferences. In 09-10.07.2007 in Jurmala, Lettonie organized the International BASNET conference on Strategy (how to improve women-scientist situation in Baltic states).

82 scientific publications.

Member of American Physical Society.

The member from Latvia to IUPAP Commission No13: ?Physics for development?,

The member of IUPAP(International Union for Pure and Applied Physics) ?Women Group?.

The team Leader from Latvia at the 1st. Int. conf. ?Women in Physics?(Paris, 7-9 March, 2002), The paper ? Surway of physics in Latvia? in Proceedings. of IUPAP 1st conference ?Women in Physics? (Paris, 2002).

Member of Int. Advisory committee for 3rd Int. conf. ?Women in Physics?, Seoul (Korea), October, 2008

THE PLACE OF WOMEN ENGINEERS IN KNOWLEDGE INTENSIVE FIRMS AND PERSISTENCE OF GENDER GAPS

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¹Professor, École supérieure de commerce de Lille

²Full professor, Labor relations, Téléuq - Université du Québec à Montréal

Type of presentation: Oral session

Abstract:

Many scholars assume that new organizational forms and managerial practices in knowledge intensive firms (KIF), in the so-called new economy, point to major changes (Barley et Kunda, 2004, p. 304; DeFillippi, 2003; Storey, Salaman et Platman, 2005). Compared to the traditional bureaucratic model, these new organizational forms are characterized by flexibility, lean structures, fast reactivity, high mobility, informal management practices, etc. If we count more and more organizational studies on KIF, few deal specifically with the gender gaps in these environments. In other words, do these organizational forms produce gender effects? There's scant attention to - and evidence of such matters.

However, in North America as in Europe, women are significantly underrepresented in the business-to-business technological services, part of the *new economy*, KIF which employed highly qualified professionals (Legault et Chasserio, 2005; Panteli et al., 1999; Valenduc et al., 2004, p. 14-20). Some authors don't hesitate to assume that new economy as a work environment is blind to the gender gap (Davies et Mathieu, 2005, p. 14; Perrons, 2003, Vendramin et Guffens, 2005).

This paper will concentrate on this issue. It is based on the results of a qualitative study on organizational practices regarding balancing work and private life in seven Canadian KIF (Montreal). These firms are product or service oriented with high intellectual added value and knowledge content. Five of them are loosely structured SME firms acting in multimedia, information technology (IT) services and optics-photonics; two other ones are big traditional bureaucracies (corporate real estate management services and insurance services) in which we studied the IT department, to compare conditions related to the same professions in different organizational settings. We surveyed 45 women and 43 men in order to assess the gender gap in these KIF.

Practices regarding balance between work and private life turned out to be a relevant way to reveal the importance of *management by project*, prevailing work organization form in these KIF, whose features characterize their human resources practices, career patterns set out in these settings and their gender effects.

In our paper, we stress that, as in bureaucracies, we can find gender gaps in KIFs. These gender gaps could be observed in several practices such as promotion, mobility lines, commitment appraisal or flexible time management practices (Legault et Chasserio, 2006). Many scholars link these gaps up with the professional culture of this sector (Evetts, 1998; Gale et Cartwright, 1995; Maddock, 1999; Maddock et Parkin, 1993; Robinson et McIlwee, 1991); our explanation focus on management by project as an organizational form, that can explain why this work environment is not women-friendly. Though its effects are general, they're particularly harsh on women, and we can assess requirements that imply discriminatory effects against women. Our results may curb the widespread enthusiasm concerning the assumed new opportunities of the new economy in general and for women in particular.

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Keywords: Women engineers, knowledge intensive firms, management by project, gender gaps, balancing work and family

CV :

Stephanie Chasserio est professeure à l'Ecole de commerce de Lille (ESC) au département Management des ressources humaines, organisation et communication. Elle travaille principalement sur les pratiques de gestion des ressources humaines, plus particulièrement sur les pratiques de conciliation entre la vie professionnelle et la vie privée, la place et les trajectoires professionnelles des femmes dans les entreprises de l'économie du savoir. Chasserio, Stephanie et Catherine Gosse. 2007. « De l'usage des techniques théâtrales pour développer le savoir-être relationnel des managers » dans *Arts et gestion : expériences vécues d'enseignement et d'apprentissage*, sous la dir. de Sacha Ghadiri, Sylvia Vergara et Eduardo Davel.

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OPPORTUNITIES FOR WOMEN ENGINEERS IN THE NIGERIAN ELECTRICITY INDUSTRY.

Nafisatu A. Ali

TCN, POWER HOLDING COMPANY OF NIGERIA (PHCN), MAITAMA, BUJA, NIGERIA

Type of presentation: Oral session

Abstract

Electricity plays a key role in sustainable development and also powers economic and social progress in every society around the world.

Electricity utilities create economic value through the technical and commercial processes involved in the generation, transmission and distribution of electricity and even its subsequent application in end uses. This value is redistributed at the community level and at the broader societal level.

From a social perspective, in addition to conventional economic value, electric utilities are providers of a commodity that is different from any other, yet has come to be regarded as an essential service to the public. Electricity supply is also a factor in maintaining national and global stability and peace.

The Nigerian Electricity industry is saddled with the responsibility of generating, transmitting, distribution and marketing of quality, reliable and safe energy to the Nigerian populace and beyond to Benin and Niger Republics.

With a population of about 150 Million people, the Nigerian power industry generates about 3,500 MegaWatts (MW) of electricity. This simply means that if every Nigerian is to have access to electricity at the same time, each person will only be entitled to about 23 Watts of electricity and therefore no one would be able to light a bulb.

However, the Nigerian President has a seven point agenda of which the number one on the list is focused on Power and Energy. The infrastructural reforms in this critical sector through the development of sufficient and adequate power supply will be to ensure Nigeria's ability to develop as a modern economy and an industrialized nation by the year 2015.

Now, how many women engineers are building careers in this interesting, exciting and promising field? What proportion of women compared to men are active participants in the power sector? And in which areas do they predominate? Are these women realizing their potentials? Are there opportunities for women engineers in the electricity industry?

Of particular interest, are specialist areas which include protection & maintenance of electrical equipment, metering, lines maintenance, transformers and reactors, distribution & marketing etc. There is high and steady demand for experienced professionals in these fields especially with the on-going unbundling and plans for privatization and crusade for the use of renewable energy for electricity generation.

These areas tend to be well-respected, very creative and rewarding, with excellent career opportunities for growth.

With more than 50% of its population being females and considering goal three of the Millennium Development Goals (MDGs) which is to "promote gender equality and empower women", Nigerian females can not but contribute to and be a part of the electricity industry.

The energy field in Nigeria and Africa at large is still very green, though male dominated; women also have very high chances of moving up the ladder and impacting / contributing positive changes in the industry and the society at large. The Nigerian electricity industry is yet to be scratched on the surface.

This paper discusses the low ratio of women to men engineers building a career in the Nigerian electricity industry, reasons for the low ratio, challenges faced by the women engineers and strategies of getting more women into the industry. New opportunities awaiting the women engineers in the industry are also revealed.

Keywords: Women Engineers, Electricity, Education, Opportunities, Strategies

CV:

Nafisatu Ali has been working with the Nigerian Electricity industry - Power Holding Company of Nigeria (PHCN) has an engineer for thirteen years. She is Manager (PC&M). She has undergone several trainings home and abroad and presented papers at local and international conferences.

GOING MY OWN WAY. THE SITUATION OF INDEPENDENT WOMEN ENGINEERS IN AUSTRIA

Bente Knoll and Elke Szalai

Knoll & Szalai oeg, Consulting Office for Landscape Planning and Management Consultancy

Type of presentation: Oral session

Abstract:

Whenever in experts' conversations, in publications or also in general in the "public opinion" there is the speech about women in technology / engineering, or about difficulties women are confronted with in men-dominated technical areas, then this topic is mostly discussed in combination with technological universities, with the academic occupational field or with the external-university research or in connection with research departments and developing departments of big (international) companies. Whenever in experts' conversations, publications or also in general in the "public opinion" there is the speech about independent women, the - very divergent - women's shares in the single sections of the Austrian Federal Economic Chamber are highlighted.

To light up research questions like

- How does the independence of women in technical or engineering area look like?
- What is the living and working situation of independent women working in the area of science, engineering, or technology?

and to spotlight these women who have set up their own businesses as engineers Knoll & Szalai oeg Consulting Office for Landscape Planning and Management Consultancy (Vienna, Austria) carried out the case study "Going my own way. The Situation of Independent Women Engineers in Austria" ["Meinen eigenen Weg gehen. Situation von selbstständigen Ingenieurinnen in Österreich."] in the year 2006.

The survey – financed by FFG - Austrian Research Promotion Agency - deals with the issue of independent work by women in the technical-engineering field and approaches the situation of independent women engineers in Austria from various angles: the engineers' specific areas of activity, their general workday, as well as their specific experiences in starting up businesses and motives for doing so.

The main aim of the study was to highlight – for the first time - the Austrian situation of women independent engineers and to develop customised recommendations for the Austrian situation. The authors define 'independent women engineers' as women with active or inactive authorizations for professional practice awarded by the Austrian Chamber of Architects and Consulting Engineers with the professional title "Ziviltechniker" ("technical consultant" means architects and consulting engineers with over forty authorizations for technical, scientific, mining and agricultural disciplines), women with active or inactive business registrations as "consulting engineers" ("Technisches Büro - Ingenieurbüros") at the Austrian Federal Economic Chamber, and women with active or inactive business registrations as "master builder" ("Baumeister") at the Austrian Federal Economic Chamber.

The research questions underlying this study include:

- How many independent women engineers are there in Austria?
- What is the living and working situation of independent women engineers in Austria?
- In what areas do independent women engineers work in Austria?
- How do independent women engineers experience their professional situation?
- What motives did they have for starting up their own firms?

A complete survey was conducted with a comprehensive questionnaire sent to all independent women engineers in Austria. Detailed interviews were carried out with selected self-employed women engineers. These women represent a range in terms of duration of professional experience, field of activity, and location. The survey thus provides a first quantitative and qualitative database on independent women engineers in Austria, making available information about independent business in general while paying special attention to the specific context of women forming business in engineering.

Based on the results of the quantitative questionnaires and the detailed qualitative interviews some concrete measures and suggestions were developed. The aim in this regard is to improve the basic conditions of women engineers startups and - in the long term – to lift the quota of independent women engineers in Austria. These suggestions are addressed to multipliers at schools and universities, decision makers within different interest groups, representatives of professional organisations, public management, or the media.

To gain access to the occupational field "independent engineer" in Austria graduation from an appropriate secondary school or university is not enough. Appropriate studies are almost all study programmes at the University of Technology in Vienna and Graz, the University of Natural Resources and Applied Life Sciences, Vienna, the University of Mining, Leoben, some selected study programmes, like geography, biology or ecology

and the engineering study programmes at the Universities of Applied Sciences ("Fachhochschulen") in Austria. In addition to the graduation the proof of appropriate work experience as an employee and an exam conducted by a commission at the Austrian Chamber of Architects and Consulting Engineers or at the Austrian Federal Economic Chamber is necessary.

As already shown by data and statistics of female and male students in Austria women are also a minority in terms of numbers within the domain of independent engineers. There are 10.9 percent (411 in absolute numbers) women architects, 2.5 percent (65 in absolute numbers) women consulting engineers, 5.7 percent (213 in absolute numbers) individual businesswomen with businesses registered as consulting engineers registered at the Austrian Federal Economic Chamber, 2.9 percent (45 in absolute numbers) legal subjects respectively joint-stock companies practicing the trade of consulting engineers with a female managing associate, and 2.9 percent (120 in absolute numbers) individual businesswomen authorized to practice the trade of master builder in Austria. These data include women with active or inactive authorizations or business registrations.

During the presentation I will summarize the survey's main findings:

- Within the domain of independent engineers, women are a minority in terms of numbers.
- Women engineers set up business with their private savings.
- Women Engineers mostly work as sole proprietors with offices located throughout Austria – even in peripheral zones.
- Women engineers do not have a 60 hour working week.
- Women engineers do not earn a lot.
- Women engineers want their names known.
- Independence is satisfactory for women engineers.

The study was published in June 2007 and is available as in PDF format on the website <http://www.w-fforte.at/> section "Knowledge base". Direct link: <http://www.w-fforte.at/de/knowledge-base/w-fforte-studien/meinen-eigenen-weggehen.Html>

Keywords: independent women engineers, selfemployment, entrepreneurship, leadership

CV :

Bente Knoll Dr. Dipl.-Ing.

Born June 16, 1974 in Bruck/Mur, Austria; 1 son, born May 24, 1994

since 2006	Lecturer at the University of Vienna, Austria, Institute of Geography
2006	Lecturer at the University of Salzburg, Austria, Institute of Geography
2006	Doctoral thesis at the Vienna University of Technology, Austria "Travel and Mobility Surveys. Introduction to Gender Planning"
since 2005	Lecturer at the Vienna University of Technology, Austria, in the field of Gender Studies
since 2004	Managing partner of Knoll & Szalai oeg Consulting Office for Landscape Planning and Management Consultancy
since 2001	Co-editor of the feminist magazine "Koryphaee. Medium fuer feministische Naturwissenschaft und Technik"
2001 - 2004	Project manager at "die umweltberatung", Verband Oesterreichischer Umweltberatungsstellen (Eco Counselling Austria)
since 2001	Lecturer at the University of Klagenfurt, Austria, in the field of Gender Studies
1999 - 2002	Co-organizer of the "27th Congress of Women in Science and Technology" , Co-editor of the publication of the congress, published by Milena, Vienna
1998 - 1999	Scientific employee at the Department of Landscape Planning at the University of Natural Resources and Applied Life Sciences, Vienna
1992 - 2000	Study of Landscape Planning at the University of Natural Resources and Applied Life Sciences, Vienna

THE TWO TRACK SYSTEM (TTS): A CAREER DEVELOPMENT COURSE ENCOMPASSING WOMEN IN SCIENCE AND ENGINEERING

Jung Sun Kim¹ & Eun Gyeong Yun²

¹Department of Biomedical Laboratory Science, Dongseo University, Busan, Korea

²Women's Career Development Center & Division of Social Welfare, Dongseo University, Busan, Korea

Type of presentation: Oral session

Abstract:

Since 2003, the Korean government has been actively funding university-run Women's Career Centers. Among their activities and programs is the career development course for female students. These classes usually cover general topics on career choice factors, career information and job seeking techniques pertaining to women. One of the shortcomings of these curricula is that they tend to be oriented to liberal arts or social science majors. Yet, opening a separate course for students in the sciences and engineering is difficult due to the relatively smaller number of female population in these fields. The Women's Career and Development Center (WCDC) at Dongseo University offers two courses entitled "Women and Career I & II." One is offered in the spring semester for freshmen and the other in the fall for juniors both of which are 2 credit courses. In 2007, the two track system (TTS) has been incorporated in these classes where students regardless of majors meet for common topics including MBTI testing or gender roles in career planning while for three weeks out of the 15 week curriculum, students are separated into the science and engineering group or the liberal arts and social science group. This allows students who are science and engineering majors to focus better on the job seeking techniques as well as career management topics. A field project is included in the courses where students visit their potential work places and report their findings. Volunteers among the female science and engineering faculty members offer guidance as well as discussions and mentoring. Evaluation of the first TTS trial in 2007 was quite encouraging. Female students seemed to develop greater self-awareness and be able to grasp the realities of the job market. In one of the science departments, the 10 female freshmen who took "Women and Career I" began to show a more positive attitude in their science classes and enthusiastically began their career planning. The TTS program at Dongseo University was possible because of the 10 female professors who willingly gave their time and energy for the students. In the long run, however, adequate funding needs to be acquired to assure that the program becomes well-established.

Keywords: two track system (TTS), career development, university women, credit-bearing course

CV:

Jung Sun Kim is a medicinal chemist and is currently associate professor at the Department of Biomedical Laboratory Science at Dongseo University located in Busan, Korea. She is member of the Association of Korean Woman Scientists and Engineers (KWSE) where she is a board of director and Secretary. She was one of the organizing committee members of ICWES13 and has accompanied Dr. Myung Hee Jung to INWES board meetings held in Korea and Kenya. Her research interest is in structure-activity relationship (SAR) studies of quorum sensing inhibitors and mosquito repellents. She is also actively involved in STEM education for girls in the Busan region as well as in career development of science and engineering female university students at Dongseo University.

THE NATIONAL REVIEW OF ENGINEERING CAREERS FOR WOMEN IN AUSTRALIA

J.E. Mills, E.J. Smith, V. Mehrtens, V. Adams

University of South Australia

Type of presentation: Oral session

Abstract:

In 1999, the Careers Review of Engineering Women (CREW) project was commenced by the National Women in Engineering Committee of Engineers Australia to investigate the issues surrounding women's retention, satisfaction and progression in the professional engineering workforce. The original CREW study provided data that showed that the cultures of many engineering workplaces were difficult for women, that they were more dissatisfied with workplace culture and conditions than their male counterparts and that discrimination, harassment and paternalism were rife in engineering organisations. Since that time both Engineers Australia and many engineering employers have taken significant steps to try to improve this situation. However, statistics still indicate that women are leaving the profession at an unacceptable rate. In addition, the numbers and percentage of women enrolling in engineering degrees in Australia has declined each year since 2002.

In 2007 the CREW survey was expanded and repeated to determine whether there had been an improvement in the retention and workplace satisfaction of women engineers in Australia. The study was carried out using an on-line questionnaire survey, which respondents accessed following an invitation by email which was sent to a total of 8214 members of Engineers Australia – 3214 to female members (representing all females at graduate or higher levels of membership at the time), and 5000 to male members, matched with the female sample in terms of age, college affiliation and geographical distribution by division. Responses were received from 1,187 female engineers (36.9% response rate) and 605 male engineers (12.1%), with the respondent profile being well matched between genders with respect to age.

The 2007 CREW study has indicated improvement in many areas, including overall workplace satisfaction, which has improved for both men and women. Relatively small percentages of both men and women described their workplace cultures as competitive, uncomfortable and/or hostile (17% of women and 14% of men), with the remainder describing their workplace culture as comfortable, supportive or team-centred. There were no significant differences in the nature of the work being undertaken by the different genders and male and female respondents also worked in similar industry sectors. Despite this women still received lower salaries than their male counterparts in the same age group, as they did in 1999, even when part-time workers were removed from the sample.

One of the most pleasing results was the significant increase in the availability of family-friendly working conditions between 1999 and 2007, although the utilisation of these provisions had not increased by the same proportion. This under-utilisation, and the text responses from female engineers indicating that they had experienced disadvantage in their workplace when they did utilise provisions such as part-time work or maternity leave, indicate that there is more work to be done by engineering organisations to make the use of these provisions an accepted norm.

The improved workplace satisfaction rates and descriptions of supportive workplace cultures provide a perplexing contrast to the fact that female engineers are still reporting unacceptably high rates of sexual harassment, discrimination and bullying. In the 2007 study 42.3% of women reported that they had experienced discrimination while working as engineers and 22.0% reported that they had been sexually harassed. While the percentage of women reporting sexual harassment had slightly decreased since 1999, the percentage reporting discrimination had risen by a similar amount, which was very disappointing. The basis of discrimination reported was overwhelmingly gender and was reported across all age groups, but particularly by those females under 40 years of age. The 2007 study also asked respondents whether they had experienced bullying in their workplace, and disturbingly 28% of women and 19% of men reported that they had. This adds another disturbing element to the nature of the workplace culture in engineering organisations.

Engineering managers and concerned members of the profession frequently ask "Why aren't more women attracted to engineering?" and "Why do women leave engineering?" There is no single or simple answer to either of these questions. Women leave the engineering profession for multiple reasons and the solution needs to be addressed in multiple ways, at multiple levels and by multiple people and organisations.

It is encouraging that there has been significant progress in increasing the availability of family-friendly work practices and some increase in the uptake of these provisions. However, only 22% of female respondents in the survey were responsible for dependent children, so it is a misconception to believe that family responsibilities are the only reason that female engineers leave the profession and therefore the only issue that needs to be addressed. When nearly half of all females experience sexual harassment and/or discrimination on the basis of gender in their engineering workplace, there is clearly significant work to be done by engineering organisations to

promote both workplace culture change and behavioural change at the individual level of engineering managers and engineers. The first requirement for changing organisational culture is for firm and visible leadership in making women's professional issues part of mainstream procedures and processes. There is evidence that this is starting to occur in at least some engineering organisations, including Engineers Australia, but clearly more needs to be done.

This paper will explore the background issues and current status of women in engineering in Australia and western countries. It will provide a detailed account of the quantitative survey findings as well as examine in more detail some of the messages from the qualitative, text responses to the survey. Finally the implications of these findings for both women engineers and their employers will be discussed along with some recommendations for future action.

Keywords: gender, women in engineering, discrimination, workplace culture

CV:

Julie Mills is an Associate Professor and Program Director in Civil Engineering at the University of South Australia. Prior to commencing at the University in 1996, she worked for fifteen years as a structural engineer in private industry on industrial, commercial and residential projects. She has a BE (Hons) from Adelaide University, a M. Tech. (Civil Engineering) from Deakin University and a PhD from Curtin University in the area of structural engineering education. Her primary research interests are in cold-formed steel structures, engineering education and women in engineering. Julie is Immediate Past Chair of the National Committee for Women in Engineering in Australia. Julie has received several university teaching awards and in 2006 was awarded a Carrick Australian Award for University Teaching Citation for Outstanding Contributions to Student Learning.

REQUISITE ATTRIBUTES OF FEMALE SCIENTISTS AND ENGINEERS FOR SUCCESSFUL CAREER DEVELOPMENT

Hae Ja Shin^{1*} and Hye-Young Park²

¹Environmental Engineering Major, Division of Applied Bioengineering, Dongseo University, Republic of Korea, ²Busan Ulsan Gyeongnam Institute for Supporting Women in Science and Technology, Dongseo University, Republic of Korea

Type of presentation: Oral session

Author notes: This work was supported by a grant from the Korea Ministry of Science and Technology and also by a grant from the Metropolitan City of Busan. Hae Ja Shin, who holds the position of Director General of the Busan Ulsan Gyeongnam Institute for Supporting Women in Science and Technology, would like to express her thanks on the behalf of authors to these two organizations.

Abstract

Here we examine requisite attributes of Korean female scientists and engineers (S&Es) for the development of successful career in industry. The results show that female Korean S&Es in industry face discrimination in placement, promotion, and salary. On the other hand, for their successful careers, personal characteristics such as work responsibility, expert knowledge, confidence, and office work ability were thought to be required, whereas leadership and foreign language skills were not. These findings suggest that female S&Es may not be expected to take leader positions. Even though female S&Es have proven successful in certain aspects in industry, they apparently exhibit docile behavior in biased and poor work environments for them. Role conflict is a dilemma that must be resolved by all of society in order to support the successful career development of female S&Es as future human resources.

Key words: Requisite attributes: Career development; Korean female scientists and engineers.

Cv:

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AVOIDING THE “LEAKY PIPELINE” BY UNDERSTANDING RETENTION ISSUES OF WOMEN IN THE U.S. ENGINEERING WORKFORCE

Betty Shanahan and Karen Horting.

Society of Women Engineers (SWE). Chicago, IL.

Type of presentation: Oral session

Abstract:

Introduction: In response to the “leaky pipeline” of women in STEM fields (loss of women in STEM), SWE partnered with Harris Interactive and 21 North American-based university alumni organizations to conduct a comprehensive study on the attitudes and experiences of engineering alumni to understand and quantify retention issues surrounding women in the engineering workforce. With only 20 percent of U.S. bachelor’s degrees in engineering and technology being awarded to women, retention of those women in the profession is crucial to maintaining a diverse work force. The corporate community’s understanding of retention issues has been largely anecdotal, thus hindering effective, proactive solutions. To better understand the issues, the goals of the retention study were 1) to identify the retention rates of women in engineering, 2) to benchmark those rates against men in engineering and study the rate of advancement of men compared to women, 3) to study the reasons for women leaving the engineering profession and 4) to study if and why women choose not to advance in the engineering profession.

Methods: A comprehensive online survey was sent to both women and men who had completed their engineering degree (undergraduate or graduate) within the past two to 20 years (“alumni”). Data was gathered from September-December 2005, resulting in 1,803 qualified female completed surveys and 4,490 qualified male completed surveys. Due to non-random methods of obtaining respondents, SWE thought it imperative to recognize how the survey may be biased and make the necessary adjustments. As a result, SWE utilized the National Science Foundation’s Scientists and Engineers Statistical Data System (SESAT) survey, which contains comparable data. In addition, this survey is a follow-up to a similar SWE survey conducted in the early 1990s, which allowed for valuable comparisons over time. The presentation will explore in-depth the survey methodology, limitations of the survey (including educational backgrounds and diversity of respondents), and show comparisons to SESAT data and the earlier SWE survey.

Results: Despite similar levels of satisfaction and education backgrounds among women and men engineering alumni, fewer women than men report staying in the engineering field. Moreover, women exhibit different reasons for leaving and returning to the engineering field and display different perspectives in regards to the workplace environment. As evidenced in the survey, not only are women less likely to be employed as engineers, 48 percent of women versus 58 percent of men, but women are more likely to indicate they are no longer in the work force, 12 percent of women versus three percent of men. In terms of motivation for leaving engineering, 47 percent of women cited a more family-friendly work environment and more interesting work as opposed to 33 percent of men. But, only 15 percent of women place emphasis on salary and advancement compared to 40 percent of men. Furthermore, women identify having a more convenient work location and more flexible work arrangements as encouragement to return to engineering as men identify more with opportunities for a managerial position. In terms of perceptions of career obstacles and inequities, and success in terms of advancement and compensation, gender differences are very apparent in the survey. Women are more likely to believe that, to some extent, work place inequities exist. Sixty-one percent of women believe there were either “consistent inequities” or that “sometimes” female and male employees were treated differently versus 28.7 percent of their male counterparts. In regards to advancement opportunities, women are less likely to hold management positions than men and a significant differentiation exists in respect to pay illustrated by the result that women are much less likely than men to be earning \$100K+ and much more likely to be earning less than \$50K. The presentation will explore more closely all major findings in the recent SWE survey.

Conclusion: The data illustrated in the survey indicates that women often move out of engineering as a result of changing career interests while men do so for better advancement or salary opportunism in other fields. While it may be difficult for employers to increase salaries or promotional opportunities in engineering, it may be possible for employers to determine ways to keep engineering interesting. That is, if women leave as a result of changing interests, companies may do well to determine how to work within their parameters to both retain women and to possibly improve the company’s competitive position. The results caution us all to be more aware of how engineering needs to be more inclusive and welcoming of diversity. Because engineers work in teams and we know that diversity can increase creative output, it is important for there to be open lines of communication amongst engineers to keep the profession an attractive and worthwhile pursuit for everyone regardless of gender and/or ethnicity. This dynamic and compelling presentation will also highlight best practices designed to impact the vital retention of women in the engineering field today and in the future.

Keywords: women, engineering, retention, gender, diversity

SURVEY OF OCCUPATION STATUS AND JOB SATISFACTION OF WOMEN IN THE BUSAN REGION SPECIALIZING IN STEM

CHUNG SOOKHYUN, PARK SUNGMI¹

Dept. of Food and Biotechnology & BIS-WIST, Dongseo University, 617-716 Busan, Korea, ¹Division of Social Welfare, Dongseo University, 617-716 Busan, Korea

Type of presentation: Oral session

Abstract:

A survey was conducted on 300 working women(one woman per company) who specialize in STEM(high school+2 or 4 years) in the Busan region (south of Korea) to determine their occupation status and job satisfaction.

The overall response of women working in the nontraditional sectors for females is relatively positive although they do experience a certain limit as female workers. The serious difficulties are working hours (long work hours) and restriction of behavior in consequence of being the minority. Respondents anticipate an increase in number of working women in the STEM field due to the enforcement of women resource policies in Korea because women are generally producing excellent achievements. However, respondents worry of their conflicting roles between family and career.

Survey results about career development show that some of the most important factors in professionalism are responsibility, gumption and cooperation. The expectation of promotion is very low, which represent a realistic meaning of the “ Glass ceiling”. Sexual discrimination is distinctly appearing in wages and promotions. If they decide to quit their job in the midstream, the key reason is in the difficulties of compatibility between home and occupation.

Survey results about job satisfaction to work in industry reveal that 31.0% of respondents are satisfied because their job is consistent with their specialty; 30.7% of respondents are working where they wanted. This result made us know that the choice of job is just to get an occupation not to realize their competentness. Among respondents who intend to change their job, only 20.7% of respondents wanted to keep their specialties. Two factors involved in the respondents's satisfaction during work are special technical achievement and practical application of their knowledge. But, they are unsatisfied in terms of implementing their leadership. In realizing their specialty for job, no difference between female and male was observed.

In conclusion, professional women in Busan expect a great potentiality as career women in the STEM field. They are content with applying their specialty in industry, but there are still some difficulties experienced because of sexual discrimination in the point of social structure and overall system.

Key words: Woman, STEM, Occupation status, Job satisfaction

CV:

After my ph D, at INRA(Dijon, France, Applied biochemistry), I worked 5 years in company(Korea) and 1 year post Doc. at MIT(USA). and 1 year research at lab ProBioGEM(Lille Univ. 2003). I'm professor since 1992 at Dongseo univ. in Busan. I have several scientific, social and educational activity: Secretary of Scientific Affairs in The Korean Society of Food Science and Nutrition, Chair of Student Life Research Center, Chair in University Committee of Women Students, a Board of Directors in Association of Busan Women Professor in Science and Technology... I'm enthusiastic educator and researcher to realize my job particularly for women career why I try to participate this occasion. And I have good experience ICWES13 in Seoul

GENDER AND SCIENCE ACADEMIC CAREERS:

Didion Catherine

National academies

Type of presentation: Oral session

Abstract

This session will focus on a 2008 report mandated by the U.S. Congress which presents new and surprising findings about career differences between female and male faculty in science, engineering, and mathematics. The report updates earlier analysis, identifies and assesses gender differences in the career patterns of men and women in academia, and recommends methods for further clarifying assumptions about gender and academic careers. Academic hiring, promotion, tenure, and the allocation of institutional resources are examined, based on the findings from two surveys of faculty and departments at major U.S. research universities in six fields: biology, chemistry, civil engineering, electrical engineering, mathematics and physics. One survey focused on departmental characteristics, tenure and promotion, and hiring practices in almost 500 departments during 2002-2004. The other survey gathered information from a stratified, random sample of 1,800 faculty on demographic characteristics, employment experiences, and types of institutional support received, including laboratory space. In addition to survey results, the presentation will explore how this new information advances our knowledge of women academics in science and engineering.

CV:

Catherine Didion is a **Senior Program Officer at the National Academy of Engineering (NAE)** which is one of the three U.S. National Academies. Her portfolio is the Diversity of the Engineering Workforce program with a charge to provide staff leadership to the NAE's efforts to enhance the diversity of the engineering workforce at all levels including the diversity of those being prepared to enter the future workforce. She is the project director of the Engineering Equity Extension Service \$2.5 million grant. In addition to these duties, in February 2007 Didion was appointed **the Director of the Committee on Women in Science, Engineering, and Medicine** of the National Academies.

Before joining NAE, Didion was **Vice President of the Didion Group**, a public affairs and communications firm. Her clients included the American Association for the Advancement of Science (AAAS), the W.K. Kellogg Foundation, the American Association of Medical Colleges, and the International Network for Women Engineers and Scientists (INWES).

Didion served as **Executive Director for the Association for Women in Science (AWIS)** for fourteen years (1990 to 2004). During tenure AWIS was awarded the U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring and she was the principle investigator for 17 government and foundation grants. Didion presented testimony before the United States Congress and U.S. federal agencies.

Didion is an **internationally recognized leader and expert on issues of equity and gender in science and engineering**. She has been an invited speaker on mentoring, networking, and women in science issues at over 200 scientific conferences and has authored over fifty publications on women in science. She was the editor for Women in Science Column for the *Journal of College Science Teaching* from 1993-2002.

Recent international activities include organizing a conference for women leaders in science, technology, and engineering in Kuwait; participation in a leadership training program for women scientists and engineers in Nairobi, Kenya; work with the Organization of American States (OAS); organizing the only event at the 2005 UN Conference on Women (Beijing+10) on women in science; and collaborations with the European Commission's Women in Science Unit and the U.S. Department of State.

Her **additional non-profit experience** includes service as the director of **American Community Services** in Riyadh, Saudi Arabia, the only non-profit affiliated with the U.S. government; Administrator of the **Arms Control Association**, and Program Assistant of the **Carnegie Endowment for International Peace**.

Didion has extensive experience on Capitol Hill including staff positions at the **U.S. Senate Commerce, Science, and Transportation Committee, Office of Senator Robert Packwood (R-Oregon), the Senate Computer Center, and the Senate Press Gallery.**

Her **professional affiliations** include Nominating Committee Member (elected position), Section X-Societal Impacts of Science, American Association for the Advancement of Science (AAAS) 2004-2006; Nominator, Lemelson Prize; Advisory Board Member, MentorNet; Organizer, National Science Foundation (NSF) Short Course for College Teachers and Faculty Development Program; International Member, South African Reference Group on Women in Science and Technology 2003-2006 (Appointed by the South African Minister of Science and Technology); Board of Advisors, National Post-Doc Association; Member, National Selection Committee, National Inventors Hall of Fame; Member, Progress Committee (Women in Science), American Chemical Society; Consultant, AAAS Minority Scientists Network; and Member, National Association of Science Writers.

Didion's **honors and awards** include AAAS Fellow (2005); AWIS Fellow (2001); Drucker Foundation Fellow (2000); Texaco Management Institute Fellow (1999); Secretary of the US Air Force Inaugural Environmental Civic Leaders Tour (1996); and Certificate of Commendation and Distinguished Service, Embassy of the United States of America (1989).

ADVANCING WOMEN SCIENTISTS AND ENGINEERS ON UNIVERSITY FACULTIES IN THE UNITED STATES

Peggy Layne

Virginia Tech

Type of presentation: Oral session

Abstract:

The number and percentage of women scientists and engineers in the United States have increased significantly over the past 30 years, but remain small in comparison to the general population and the work force as a whole. While women now earn half of the bachelor's degrees in science and engineering in the U.S., they constitute only 27% of the science and engineering workforce, and 29% of doctoral science and engineering faculty at four year colleges and universities. The participation of women also varies greatly among the various science and engineering disciplines. The U.S. National Science Foundation (NSF) created the ADVANCE program in 2000 to increase the representation and advancement of women in academic science and engineering careers. This paper presents some background on the participation of women in science and engineering in the U.S. and government efforts to increase the number of women scientists and engineers leading up to the ADVANCE program, then describes some of the innovative approaches developed by ADVANCE institutions to increase the success of women in faculty careers.

The NSF is the principle funding agency for non-medical basic research in the sciences and engineering in the U.S. With an annual budget of about \$6 billion, NSF funds about 20% of the federally supported basic research conducted at U.S. colleges and universities. The NSF also supports a variety of programs to strengthen the science and engineering workforce, including programs intended to increase the participation of women and minorities in science and engineering careers. Over the past 20 years, NSF awarded grants to female scientists and engineers to support their research and career development. In the late 1990s, NSF decided to take a different approach. The ADVANCE program, instead of providing grants to individual women, takes a systemic approach and focuses on the institutional barriers to the participation and success of women in academic science and engineering careers. Grants of up to \$3.5 million over five years have been awarded to 30 universities since 2001 to fund programs focused on institutional transformation.

The universities and colleges that have received ADVANCE Institutional Transformation grants include both state supported and private institutions, large and small, across the United States. The first ten institutions received their grants in 2001 and have now completed their programs, with the second round of grant recipients scheduled to complete their grant funded activities this year. Programs funded by the NSF ADVANCE program have focused on changing university policies, especially those policies that help faculty members to balance the demands of work and personal lives, educated faculty and administrators about gender equity and unconscious bias, developed a variety of mentoring programs for women and men faculty, and helped prepare women to take on leadership roles in academe. One of the requirements of the ADVANCE program is to collect and report a variety of data about the status of women scientists and engineers, including the numbers and percentage of women in various roles. At the conclusion of the five year grant funding period, institutions report on the results of their activities. This paper will highlight the accomplishments to date and ongoing activities of some of the ADVANCE grant recipients.

Keywords: academe, women, faculty, careers, transformation

CV:

Margaret E. (Peggy) Layne, P.E., joined Virginia Tech in 2003 after a year as a diversity consultant working with the American Association of Engineering Societies. She previously spent two years as a fellow at the National Academy of Engineering, where she directed the program on diversity in the engineering workforce. Ms. Layne also spent a year as an AAAS Congressional Fellow in the office of Senator Bob Graham (D-FL), where she was responsible for water, wastewater, and solid and hazardous waste policy issues. She has 17 years of environmental engineering experience, and was formerly a principal at Harding Lawson Associates in Tallahassee, FL, where she managed the office and directed hazardous waste site investigation and cleanup projects. Ms. Layne has degrees in environmental engineering from Vanderbilt University and the University of North Carolina School of Public Health. She served as president of the U.S. Society of Women Engineers in 1996-97, and is also an active member of the American Society of Civil Engineers. She is a registered professional engineer.

DE-GENDERING THE SCIENCE AND ENGINEERING ENTERPRISE

FRIZE Monique

University of Ottawa

Type of presentation : Oral session

Abstract:

Since millennia, societies constructed a patriarchal system which, until recently, barred women from higher education, academies, scientific bodies, and from public roles. This created a world without women and science evolved as an exclusively masculine enterprise. However, integrating a variety of perspectives encourages creativity and innovation. Looking at male and female attributes, the literature usually associates male attributes with objectivity and competitiveness, qualities highly valued in science; female attributes are associated with subjectivity, emotion and feeling, nurturing, receptivity, intuition, and cooperation, are considered as undesirable qualities in science.

Subjectivity: This is obviously far more present than suspected; grant agencies typically set research agendas. The military and industry also follow their priorities when funding projects. Funding decisions involve some politics and are not value-free. Shepherd [1] claims that "[t]hroughout history, science has often served the builders of empires—financial and political." Political, financial, and social considerations create potential biases in research projects. Subjectivity can become an asset if it raises the awareness of researchers on potential biases that can arise in the objectives, the methodology, and the variables to be measured.

Receptivity: This means listening patiently to nature, to observations, like Jane Goodall and Dian Fossey, who introduced new methods of observation of chimpanzees and silver-backed gorillas and this enabled scientists to record a different perspective about the behaviour of these primates, especially on the behaviour of females. It means reflecting on what the data and observations are showing instead of fitting the data to a pre-conceived model. This open-minded, receptive attitude can lead to new knowledge. Trying to fit the data to a pre-conceived model can lead to serious errors or to missing key points. This approach also avoids reductionism which is frequently mentioned as a negative aspect of a masculine science.

Nurturing: The retention of students could be much improved. There still are courses that eliminate students, 'separate the men from the boys' as some instructors say, and programs where you get weeded out; these are certainly not conducive to a positive environment and long-term success for students. There are times when students need support, whether in the form of additional tutoring, or mentoring, when facing particular difficulties. Encouraging students to develop self-confidence and to develop their own voice, as suggested by Belenky et al. [2] is another form of valuing diversity and will increase retention of students who may differ from the majority.

Cooperation: Science and engineering are fields where competition for grants, recognition, and visibility at conferences can be fierce. However it is desirable to foster collaboration among students and colleagues with whom one is sharing a grant or co-supervision of theses. The laboratory needs to get funding and to strive for greater visibility, but within its walls, students and colleagues can learn to help and support each other and to share information that helps the whole group to move forward. Secrecy may help one particular individual, but likely at the expense of the entire group. Open meetings where everyone feels free to ask for help or offer suggestions to others and even to the head creates an environment of trust.

Shepherd deplores the fact that most research places are organized in a hierarchical structure. Shepherd also cites the work of Broad and Wade who claim that: "Much of the fraud and deceit may be encouraged by its hierarchal structure and reward system. More publications lead to more grants, which lead to additional graduate and post doctoral students, and technicians, which in turn lead to more publications: "A research mill, a factory for the mass production of scientific articles". [3] This may encourage researchers to publish early results or even to fabricate data and/or results.

The 'publish or perish' culture needs to be replaced at all levels of evaluations, be it for a university promotion or tenure, awarding of grants, and acceptance of publications by editorial boards, by an assessment of 'quality' of the scholarly work instead of its 'quantity'. Criteria need to be revised to effect a change of culture. Assessments could focus on the best three papers or the best five papers depending on the recognition level being considered. How maternity or paternity leaves are counted is also of great importance. Some granting councils and universities do not count these career breaks for the measure of productivity unless the person asks for these periods to be included. This helps to measure productivity when it should count, that is, when the person is fully active. The culture in some of the granting councils is beginning to change. The Natural Sciences and Engineering Council (NSERC, Canada) has put in place maternity/paternity policies that allow researchers to use their grant for baby-caring services while attending

conferences; an attempt is made to appoint more women on grant selection committees and on the Council itself; allowing post-doctoral student applicants to remain at the same institution if they are not able to move because of a spouse's or partner's employment in the same city is another policy. Grant applications now contain a section where researchers can explain delays in publications. Moreover, NSERC has created special grants for women and Aboriginal applicants who meet high excellence criteria in order to help universities hire persons from under-represented groups. The grant provides a salary and research funding for a period of five years. In spite of these changes, many of the grant selection committee members have been around for a long time and they still think in the old way and apply the old rules.

Considering that feminine attributes discussed above have not been seen in a positive light since the beginning of time, it will take some time for the majority of scientists and engineers (including many of the women themselves) to understand their value and to see how they can add complementary and enriching approaches to such work. De-gendering the science and engineering enterprise will encourage diversity and take the best of women's and men's approaches to create a word of peace and prosperity for all.

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3. Linda Shepherd (1993) *Lifting the Veil: The feminine face of science*. Boston: Shambhala: pp 141.

Keywords: masculine, feminine attributes, science culture

CV:

DR. MONIQUE FRIZE is an Electrical Engineer with graduate degrees in biomedical engineering. Dr. Frize joined Carleton University, as a Professor in the Department of Systems and Computer Engineering and the University of Ottawa, as a Professor in the School of Information Technology and Engineering, in July 1997. Monique Frize held the Chair for women in engineering and science nationally between 1989 and 1997, and then the Ontario Chair between 1997 and 2002. She has published over 130 papers in journals and international conferences in the fields of medical instrumentation, clinical decision-support systems applied to obstetric and perinatal care, infrared image processing and analysis for medical applications, ethics for bioengineers, and women in engineering and science. Dr. Frize is a Senior Member of IEEE, inducted as a Member of the Canadian Academy of Engineering (1992), Officer of the Order of Canada (1993) and received five Honorary Degrees from Canadian Universities. Monique Frize is a founding member and president of INWES since 2002.

GENDER AND RETENTION IN ENGINEERING AFTER COLLEGE

Lisa M. Frehill

Commission on Professionals in Science and Technology

Type of presentation: Poster

Abstract:

Past research has described attrition of women from college engineering programs (Seymour and Hewitt 1996 and Frehill 1993) but to date there has been little systematic research on career outcomes for women in engineering after they earn their bachelor's degrees. McIlwee and Robinson's 1992 volume included data from a survey and interviews with women working in engineering jobs in California and concluded that most women experienced sexism. A national survey by the Society of Women Engineers (SWE) in 1991-1992 revealed that women were more likely than men to indicate that they felt that women had been overlooked for promotional opportunities (Eng 1993 and Frehill 1997). Eng noted that the pay of engineers reported in the SWE survey was near parity until about age 30, at which time, a gap between women and men grew and widened with age, a finding that she posited might disappear as more women entered engineering. Morgan's (1997) analysis of these data suggested that cohort effects were responsible for the gap in earnings.

The larger U.S. labor market in which engineers find themselves after completing a bachelor's degree has been undergoing rapid and accelerating changes. On the one hand, a technical education in science and engineering (S/E) has become even more important (National Academies 2006a). On the other hand, many young people are concerned about the "outsourcing" of S/E jobs and employers are increasingly concerned about the quality of the labor force (National Academies 2006a) and whether the U.S. labor force will be able to remain competitive in a global environment.

This paper presents findings from nationally-representative data on engineers in the U.S. labor force. The data are from the National Science Foundation's Scientists and Engineers Statistical Analysis System (SESTAT), which includes data from three surveys:

- National Survey of College Graduates (NSCG)
- National Survey of Recent College Graduates (NSRCG)
- Survey of Doctorate Recipients (SDR).

These data will show that there are some important similarities between women and men engineers once they are in the labor market. Significantly, though, these data provide some evidence for what many have known anecdotally all along: women are more likely to leave engineering post-graduation than are men.

Figure 1. Engineering Bachelor's Degree Holders Reporting an Engineering Job in 2003

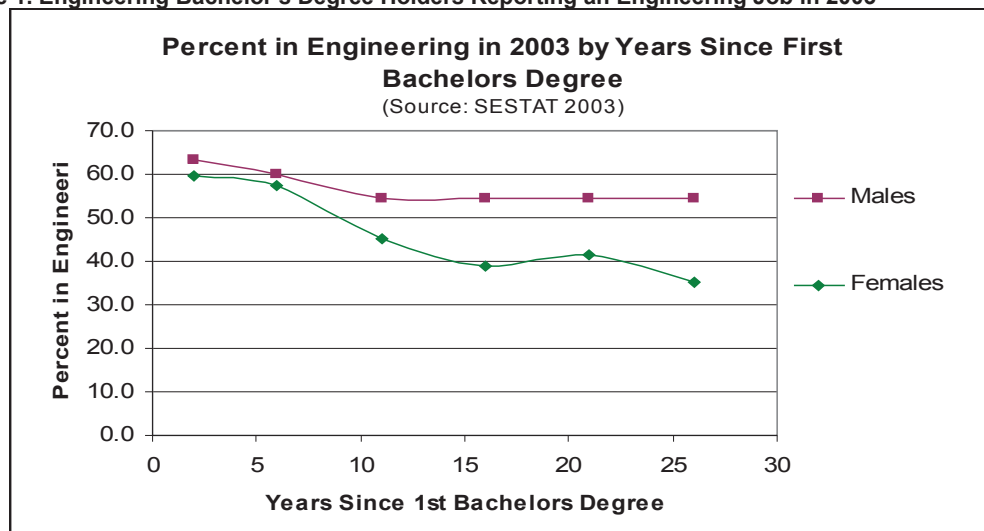


Table 1. Educational Outcomes (Percents), Graduates with Bachelors Degree Received in 1980 or Later

	Females	Males	Total
Bachelor's in Engineering w/no higher degree	55.8	56.1	56.1
Education beyond the BSE			
Master's, Engineering	42.5	37.6	38.6
Ph.D., Engineering	27.6	34.4	33.0
Master's, other S/E or related	10.0	7.6	8.1

Ph.D., other S/E or related	7.1	5.1	5.5
Business (Master's or 1st professional)	10.1	12.0	11.6
All other	2.7	3.4	3.2
Medicine	0.5	0.7	0.7
Law	0.6	0.7	0.7
Education (Master's and doctoral degrees)	0.4	0.2	0.3
N (with post-bachelor's degree)	1,394	5,296	6,690

Table 2. Percent Reporting Each Type of Primary Work Activity as Their “Top” Activity, 1980 and Later Bachelor’s Degree Recipients

	Engineers		Non-Engineers	
	Females	Males	Females	Males
Administrative and related	22.2	22.9	29.9	31.4
Engineering	69.4	69.8	49.1	54.5
Sales, purchasing, and marketing	2.1	2.5	9.4	8.0
Teaching	3.4	2.9	8.5	3.9
Other	2.8	1.8	3.1	2.3
n	1628	7808	1176	5282

The paper’s results indicate that women were less likely than their male peers with bachelor’s degrees in engineering to be working in engineering after receiving their bachelor’s degree and that the sex gap increased with older cohorts. Male and female engineers were quite similar in the types of work activities and workplaces in which they worked, with women a little more likely to be employed in government and educational settings than men. Bachelor’s degree holders of both sexes who were employed in Pre-K-12 education were likely to indicate that they were in non-engineering occupations. Interestingly, however, even among the respondents who did not say that they were in an engineering occupation, about half of the women and just over half of the men reported a primary work activity not entirely outside the kind of work performed by engineers.

While male and female engineering bachelor’s degree recipients were equally likely to pursue post-graduate studies, males were more likely than females to earn doctoral degrees in engineering while females were more likely to earn master’s degrees. Males and females were equally likely to report earning graduate credentials in engineering. Among those who indicated that they had earned graduate degrees, men were slightly more likely to pursue business (12%) than women (10%) but women were more likely than men to move into other S/E fields for either master’s or doctoral degrees (17.1% of women versus 12.7% of men). A small percentage of engineers (2.7% of women and 3.4% of men) pursued graduate studies in fields outside of S/E or business, in the professional fields of law, medicine or education.

In short, while there are some key differences in the career outcomes shown here for women and men with bachelor’s degrees in engineering, there were quite a few similarities between the sexes. The key divergences lay in the widening gap between women who are no longer engineers versus men who no longer say they are in engineering. These differences need greater attention. The ways in which family formation issues play a role in women’s engineering career outcomes also deserves closer attention than that which was given here. SESTAT provides a rich source of data for those interested in understanding what happens after people earn engineering degrees. This paper has merely scratched the surface of these important issues.

Keywords: engineering, careers, retention, women, gender

CV:

Dr. Lisa M. Frehill is the Executive Director of the Commission on Professionals in Science and Technology. She holds a BS in Industrial Engineering from General Motors Institute (now Kettering University) and an MA and Ph.D. in Sociology from the University of Arizona. After completion of her studies in 1993, she joined the New Mexico State University Department of Sociology and Anthropology. Now an adjunct professor of sociology, Frehill has been at CPST since 2006. Her research on gender and engineering has appeared in numerous journals and conference presentations.

Since 2002, Frehill has been working with many ADVANCE: Institutional Transformation programs, first as the Principal Investigator and Program Director of NMSU’s ADVANCE award (2002-2005), then as Program Director of the University of California at Irvine’s ADVANCE Program (2005-2006) and has provided technical support related to data collection and analysis to a number of others. Recent work at CPST has examined women’s participation in U.S., engineering as well as that of African Americans, American Indians/Alaska Natives, and Latinos/as (funded by NACME). She has completed a series of articles for SWE Magazine on experiences of U.S. engineers using a dataset commissioned by the Society of Women Engineers’ Corporate Partnership Council.

SCIENTIFIC CAREER DEVELOPMENT OF WOMEN IN MOSCOW UNIVERSITY

Ermolaeva Elena O., Belyaeva Galina F.

The Council of MSU Women, Moscow Lomonosov State University, RUSSIA

Type of presentation: Poster

Abstract:

Moscow Lomonosov State University (MSU) is the first and the largest classical university, scientific, instructional, and cultural educational center of Russia. In 2005 MSU has celebrated its 250-th anniversary. MSU includes 40 departments as well as 25 scientific research institutes and educational scientific centers, a number of social and non-profit organizations, including the Council of MSU Women. Educational process and scientific work are provided by the unique team of professors, tutors, and scientists about 9000 of them having candidate's (PhD) and doctor's (DSc) degrees. Currently, more than 40 thousand students, postgraduates and refreshers study at Moscow University.

The ratios of male to female students and postgraduates at Moscow State University are roughly fifty/ fifty. However, some natural sciences departments traditionally have fewer female students than male ones. For example, Department of Physics is the largest department of the MSU with annual admission about 450 students and only quarter of its graduates were women during the past few decades on the whole. In 2007 shares of female students (%) enrolled in Physics, Computational Mathematics & Cybernetics, Mechanics & Mathematics, Chemistry, Bioengineering & Bioinformatics departments of MSU were 23, 25, 29, 39 and 42% respectively. Female students are 50, 60 and 70% at departments of Geology, Biology and Basic Medicine.

As the result, fewer female students tend to join of Physics, Mathematics, and Chemistry departments for the postgraduate studies. Moscow State University has approximately 4.5 thousand postgraduate students. It should be noted that the ratios of female to male students and female to male postgraduates remains the same and more or less stable for each department. In 2007 percentage of female postgraduates by fields of sciences: technical, physics and mathematics, chemical, science on earth and biological are 18, 27, 40, 50 and 63% respectively. The percentage of female postgraduates in social sciences and humanities are higher than 50% and vary from one subject area to another. MSU provides more fundamental education and its gender statistics differs from Russian one as a whole (1). For example, percentage of female postgraduates by fields of sciences: technical, physics and mathematics, science on earth, chemical, biological were 20, 28, 36, 48 and 60% respectively. Percentage of female students and female postgraduates at Russia public higher education Institutions are 57% and 43% respectively.

Council of MSU Women has carried out sociological survey (of more than twenty questions) among the postgraduates of seven natural sciences departments at Moscow University (2). Majority of responding MSU postgraduates are satisfied fully (25%) and partly (62%) with their postgraduate studies. The responses of male and female postgraduates on some questions differ. For example, while choosing a job after obtaining a degree, the most important for male/female respondents are the following: salaries (81/74 %), career perspectives (63/48 %), job creativeness (63/39 %), psychological climate (31/36 %), working conditions (19/28 %), social pack (16/29 %). The respondents could choose more than one answer. Female respondents assume they need more time for dissertation, but collected statistics evidence the absence of gender imbalance. It should be noted than female percentage of diplomas with honors, winners of Lomonosov international conference of students, postgraduates and young scientists is even higher than among males.

Our studies have shown that the careers of University women are more difficult and long than those of men (3). There is vertical and horizontal imbalance between the genders. At research and teaching entry level positions for employees not over 35, gender inequality is negligible. The male/ female ratio at these positions is equal to male/ female ratio among graduates of corresponding specialties. Almost 6 thousand Candidates of Science (PhDs) work in MSU, half of whom are women, but the proportion of women differ for various faculties and field of sciences. The differences in the rate of professional development can be observed in the age group from 35 years to retirement age (for women - 55 years, for men - 60 years). On average, women tend to defend their doctoral dissertations much later than men. For most men receiving DSc degree is merely a step in their academic growth, while for most women it tends to be the last academic achievement. 425 MSU professors have received the title of Honorable Professor of Moscow University during the last 10 years, one-fifth of them are women: one-third - in social sciences and humanities and only 7% in natural sciences. The higher is the academic post, the lower the representation of women. A small number of women hold leading posts of the highest level at the University. Only two departments have female heads (Philology and Foreign Languages).

Some improvement in gender equality is observed over the last few years. Young, bright female DSc have appeared in all departments, including the departments of natural sciences, and the share of women among all Doctors of Science tends to increase. More than 300 DSc dissertations in the last 5 years were defended by MSU scientific/academic employees: more than quarter at natural sciences departments and half at social sciences and humanities departments were women. For comparison: 10 years ago 15% and 30% female DSc worked at these departments.

Council of MSU Women has carried out sociological survey of University women of highest qualification. A sociological questionnaire was developed containing twenty questions and more than four hundred female doctors of sciences and full professors were interviewed. Respondent's answers to some questions at various departments

were different. Our survey showed that the traditional values (such as family) are not alien to professionally successful university women. Less than 10% of respondents have no families of their own (i.e., are unmarried women with no children). About 80% of women have children. More than 80% of women of highest qualification expressed the opinion that the majority of women manage to reveal their creative potential at Moscow University fully or partially. According to our research professional activity of women in science proved to rise in the last decade.

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Keywords: Moscow State University, scientific career development, women statistics.

ACTIVITY OF AN ENGINEER NETWORK WITH SOUTHKOREA

Sumiko Hikami, Kazue Sakai, Yuki Hirose

NPO The women professional engineers society of Japan

Type of presentation: Poster

Abstract:

The Woman Professional Engineers Society of Japan was found in 1993 and has performed activity for 14 years.

This society is a network organization of the female professional engineers who belongs to various kinds of technical fields across boundaries, and the contents of activity are carrying out opinion exchange for the state of technology by a female viewpoint.

In November, 2007, this organization founded the NPO for the purpose of strengthening of an organization.

The missions of an organization are performing the social contribution to the technology field, We are offering support of the young technology person and student who build the future, We strengthen the international network which has so far continued exchange, And we are interchanging with Asian nations etc.

From now on, we will work by carrying out the network of domestic and South Korean P.E. to the female engineer of the Asian nations made into the start.

And I think that he wants to extend activity.

This time, we perform a report for the exchange with South Korea to a subject.

In September, 2007, we were able to hold the Japan-South Korea female professional engineers exchange meeting for the first time.

The Woman South Korean Professional Engineers Association committee invited about ten Japanese female professional engineers, and 11 female professional engineers participated.

We performed opinion exchange at this meeting about the present condition of the female professional engineers of both countries, and the state of female engineer training.

And we swore mutually that a Japan-South Korea female professional engineers consulting engineer cooperation together, and it will go from now on.

Keywords: Female network in Asia

CV:

Kazue Sakai works for a professional engineer's organization covering other kinds

NEW OPPORTUNITIES FOR WOMEN ENGINEERS AND SCIENTISTS IN BULGARIAN INDUSTRY IN THE PERIOD OF TRANSITION.

Prof. PhD. Eng. S. Grosdanova

Bulgarian Federation of Science and Technical Unions - President of the National Club "Women in Industry" at the Science-technical Union of Mechanical engineering.

Type of presentation: Poster

Abstract:

Industry is a sector with important place in the Bulgarian economy. The years after transition since 1989, however, had a negative impact on it - traditional international markets were lost, a numb of productions were lost, and others are in decline, scientific centers and development units were closed down, significant reduction of manpower was done. During the last 3 years revival of the sector can be noticed. The situation of women engineers and scientists has changed considerably, influenced by the decline of the industry. The Federation of Science and Technical Unions and the club "Women in Industry", along with other measures, tries to support the process of transition of the Bulgarian economy to a knowledge-based economy, providing a broad forum for all stakeholders in Bulgaria to exchange views and experiences; to facilitate the transition process, providing models of best practice that could possibly be used in the Bulgarian environment; to highlight measures that should be taken for the transition of the Bulgarian industrial economy to a knowledge-based economy.

There is an increasing digital, scientific and technological divide between women engineers and scientists that are exploiting knowledge, science, and technology for economic well being, compared to those women engineers and scientists (in the less developed regions within country) that are not adequately participating in this revolution.

New opportunities is focused on the development of a knowledge economy, that improved quality, reduced costs, better adaptation to consumer needs, as well as new, innovative products supporting the potential entrepreneurs interested in starting their own businesses. Part of the activities is focused on conducting entrepreneurship training courses, aimed to provide entrepreneurial and management skills. The innovation and entrepreneurship encouragement at local and regional level is the vital direction. Fostering the entrepreneurship, specially for women engineers and scientists, is one of the major task of Club "Women in Industry" at the Science-technical Union of Mechanical engineering.

The Federation of Science and Technology Unions in Bulgaria has capacity and experience in managing a number of projects – own and grants funded and projects under innovation and environment programs with legal entities of non-profit and training units. The professional qualification and training in the Houses of Science and Technology has a long standing tradition in the country and all project partners have their own material base and highly qualified and experienced lecturers, they enjoy high reputation among the local authorities – municipalities, labor offices and this reputation is the result of various forms of public beneficial activities supporting the development of science, technologies – conferences, seminars, discussions, business meetings of local science and technology experts, professional qualification and re-qualification and life-long learning for specialists, unemployed, students, military servicemen, and 198 licensed professions and specialties are a guarantee for successful activities aimed at responding to the needs of professional qualification on the local and the national market of labor.

The Vocational Training Centre of the Federation of Science and Technical Unions with its 28 training units located in all administrative regions of Bulgaria is the largest Adult Training Centre in the country.

The Club "Women in Industry" supports creation of the stable, bilateral connection between Federation and Small and Medium-sized Enterprises (SMEs). The most of the companies in Bulgaria are SMEs. The SMEs hasn't research departments but have a potential for development and implementation of innovative products and technologies. These companies are not leaders on the market in high technology, but they are followers which using technologies and innovations, developed abroad. One of the tools for improving SME' innovative actions are the technological transfer, which is one of the Federations' activities. It is important to have Institutions/Center for transfer of innovations and products as a main external infrastructure for company's development. The institutions like Federation have the important role in organizing and dissemination of the innovative services (individual and collective) for SMEs. The SMEs use consultancy services including of the women engineers and scientists in order to enhance their innovative activity and to create better image of the technical engineering of the country.

Key words: women in industry, knowledge-based economy, transition.

CV :

Prof. Dr. eng. Snejanka Grosdanova - President of the National Club "Women in Industry" at the Science-technical Union of Mechanical engineering in the Bulgarian Federation of Science and Technical Unions (FSTU). FSTU in Bulgaria is a non-government non-political, professional non-profit organization, whose members are more than 22 000 of specialists. It incorporates 19 independent national and 34 territorial associations, whose members are engineers, economists, scientists, agriculture specialists, inventors, students and other experts. The

Club "Women in Industry" supports creation of the stable, bilateral connection between Federation and Small and Medium-sized Enterprises (SMEs).

Prof. Dr. eng. Snejanka Grosdanova is leading consultant and manager of the company „BVB engineering” Ltd. The main activities is the consultation services with the objective to assist the development of industrial enterprises, technology transfer for SMEs, Managing of Human Resources Development (HRD), Business Planning for Enterprises, analysis of the technological, industrial, technical and scientific development on a national, regional and companies level.

Guest Prof. in Sofia University "Kliment Ohridski" – on "Management and Development of Human Resources" for MRS Program. Member of the Club "Academic body" of Bulgarian Human Resource Development Association.

CAREER-FORMATION SUPPORT TO THE FEMALE STUDENTS WHO STUDY IN THE JABEE COURSE BY WPETF

Maki Iwakuma, Yoshiko Ishida, Fudeko Kakuda, Kayako Sasao, Yukari Aoki

The Woman Professional Engineers Society of Japan (WPES)

Type of presentation: Poster

Abstract:

JABEE (The Japan Accreditation Board for Engineering Education) was organized to realize internationally-equivalent education and to guarantee the quality of engineering education and joined the Washington Accord in June, 2005. JABEE is managed by major organizations, such as 80 or more academic societies, IPEJ (The Institution of Professional Engineers, Japan), companies, etc., representing the field of science and technology.

The system of Professional Engineer of Japan (P.E.JP) has a history of more than 50 years and is authorized by the Professional Engineer Law, which is equivalent to the US PE and the UK CE. In 2002, the government revised in response to the above international agreement of collateralizing consistency with engineering education. JABEE graduates are exempted for the first examination.

In the technology field of Japan, activities of female engineers and scientists are relatively low, which are not so good in comparison with other countries. The Japanese government promotes the policy of a science and technology oriented nation, offering various supports to promote female activities in the field of science and technology.

WPES is co-steering a committee with INWES-Japan to plan meetings with the female students who study in JABEE course, showing them models of engineer's business career, including P.E., and supporting them so that they will be able to come out and play an active role in society. The purposes of the project team WPETF (Women Professional Engineers Task Force) organized in 2007 are:

1. To help female JABEE course students to understand P.E. system.
2. To help female JABEE course students to take an examination of P.E.
3. To provide information to female JABEE course students about the business in the field of science and technology and to counsel them.

In the first year, we could not have enough data for female student's enrollment-in-school, but there are few records of meeting. We plan to have meetings as many as possible from now on, and to make use of the result in a policy proposal etc. The present paper introduces the system of JABEE course that supports female students to become professional engineers and related activities of WPETF.

Keywords: JABEE, Professional Engineer, female student, business career, Women Professional

Engineers

CV:

I worked for construction-consultant company for long time. There were only a few women engineers in those days. I wanted to increase them, and then continued with my activity about woman engineer. I am attached to several associations now, showing the models of engineer's business career to young women.

WOMEN ENGINEERS IN SOUTH AFRICAN MINING INDUSTRY

Dorina Ionescu; Jane Buisson-Street¹

University of Johannesburg, Mechanical Engineering Technology;

¹University of Johannesburg, Electrical Engineering Technology;

Type of presentation: Oral session

Abstract:

The mining industry is one of the biggest revenue generators and job providers in Southern Africa. A significant percentage of the working force is made up from migrant miners originating from South Africa and its neighbouring countries. These workers were housed in notorious "men only" hostels which, until very recently, forbid female family members of these employees reside with them, let alone be employed in the industry. Similarly, until recently, women were specifically forbidden to work underground; and the range of jobs performed by women was limited to tea ladies, office cleaners and secretaries. Due to the courage and obstinacy of some female engineers pioneers, in the last decade, things started to change. Today this vast job opportunity market is now 'legally open' to female engineers, with some small mining ventures being staffed by women only. However nothing is easy for our sisters. Our study showed that there is a deeply entrenched mistrust of the male miners toward the ability of females to perform these "tough man" tasks, in some cases there has been instances of blatant gender discrimination. Unfortunately, even today, the female miner is still seen as "stealing" the male miners' jobs and as a distraction to male miners which affects their concentrate on their tasks which is indeed dangerous. Our study showed that the male miners are not even aware that their position toward the female miner is discriminatory. Invariably the opinion of the male miners is that the job is difficult and the women need to be protected from entering such dangerous profession, particularly as the traditional role of a woman is that of mother, carer and wife.

Keywords: Women engineers in mining

CV:

Jane Buisson-Street is a lecturer in the Department of Electronic and Computer Engineering Technology at the University of Johannesburg. She has been involved in tertiary education since 1993. She is a member of the South African Computer Society, the South African Institute of Directors and is a senior member of the South African Institute of Electrical Engineers. Her current main interest is in engineering education.

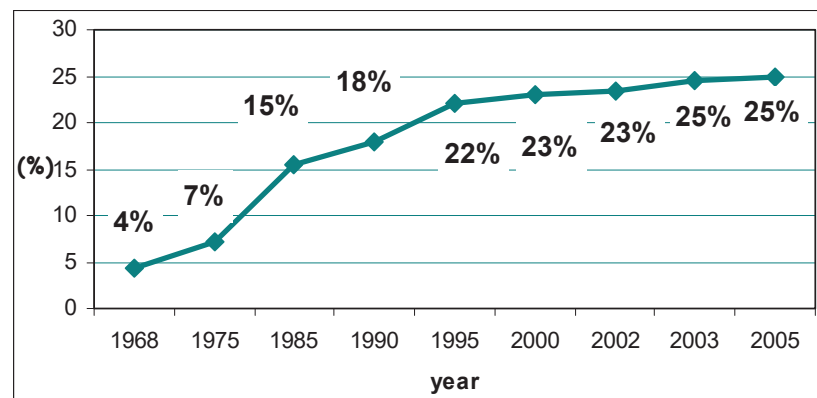
STATISTICS ON WOMEN ENGINEERS IN FRANCE IN 2006

Marianne Rodot

French Association of Women Engineers – Paris – France

Statistics – Women Engineers

This data provides the latest statistics on women engineers in France, taken from the 18th survey from CNISF (Conseil National des Ingénieurs et Scientifiques de France), completed in 2006. For further data, please contact the French Association of Women Engineers.

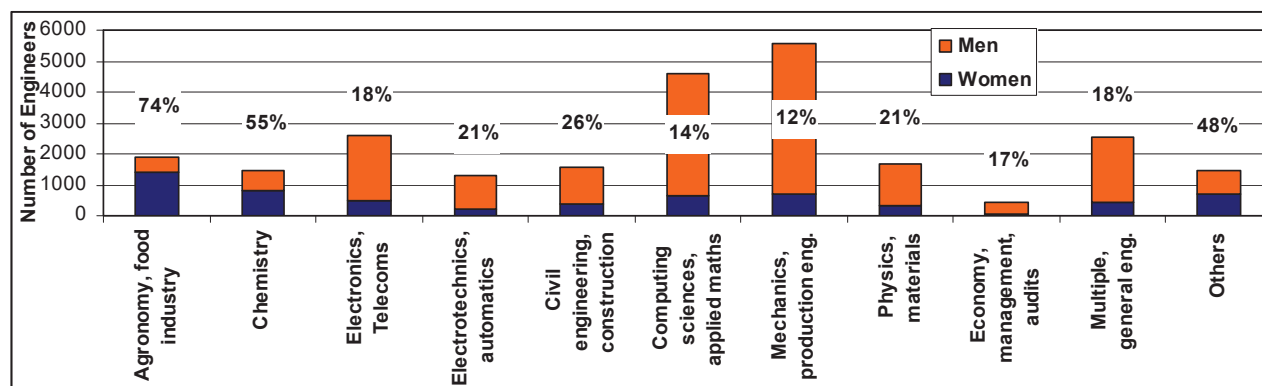


Girls are always more present in engineering schools: in 2005, they account for 25% of the students in engineering schools (Graph 1).

Nevertheless, girls are not choosing school specialities in similar proportions. They are in higher percentages in agronomy and chemistry. The speciality involving more women is computing and applied mathematics, due to the high number of engineers in this speciality; women represent though only 14% of the young beginning engineers in this speciality.

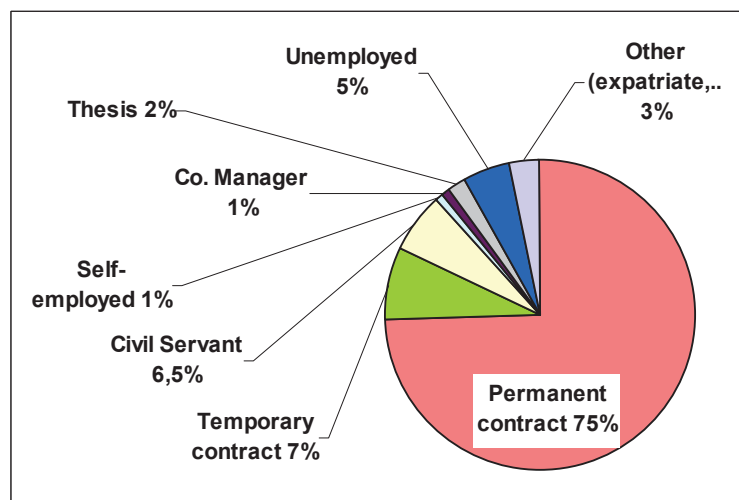
The following graph 2 addresses the school speciality of the whole population of engineers in activity in 2005.

Graph 1 – Ratio of women graduates in engineering schools



Graph 2 – Number and percentage of women graduates in each school speciality

The number of women engineers grows. In 2006, 16% of the 640,000 engineers were women, with an estimated population in excess of 100,000 women engineers. Women engineers is a young population: 42% of them are under 30 years of age.

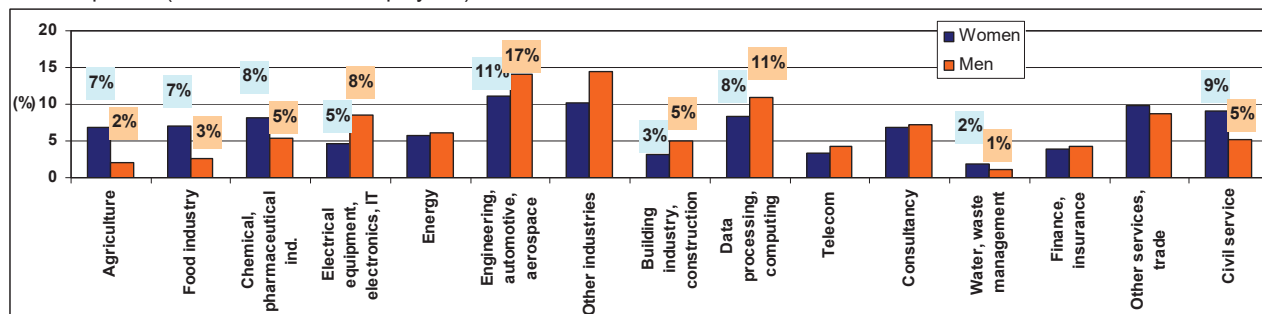


Professional situation of women engineers (graph 3): 75% hold the more stable permanent contract. They are always less often civil servants (3% of women under 30 years against 13% of those above 45 years). Alike men engineers, self-employment is significant only for those older than 45 years (more than 3%). The unemployment rate (5%) remains lower than for the general population (more than 9%). This is true for all ages. For women engineers aged 30 to 44 years old, it is limited to 3.7%.

Graph 3 – Professional situation of women engineers

Economic sectors (Graph 4)

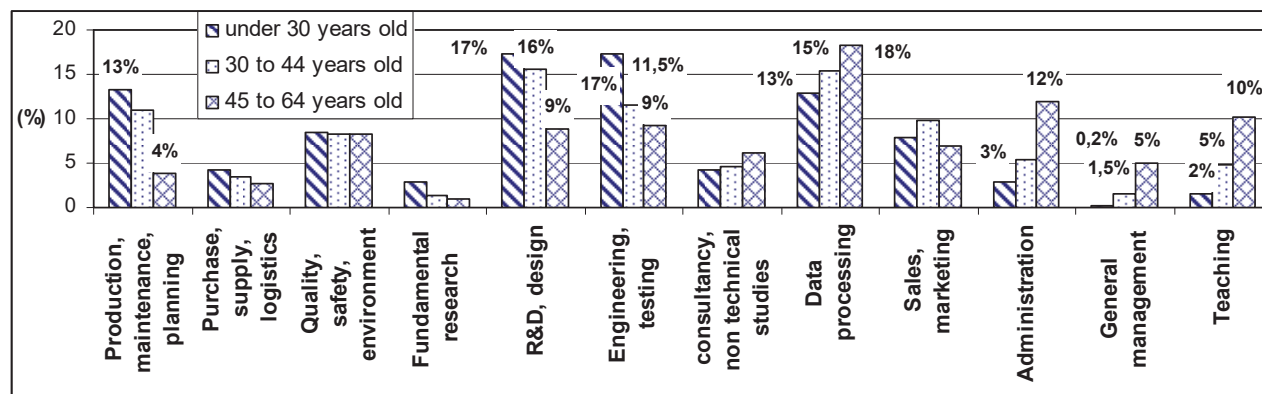
Women are present in all sectors of activity, in same numbers in the industry (47%) and in services (43%). They are in higher numbers in large industries, in the food industry, IT, engineering and civil service. They are more present than men in the food, chemical and pharmaceutical industries, which is implied by their initial speciality. On the other hand, they are less present than men in sectors such as mechanics, electrical and electronics equipment and IT. 46% of women engineers are working in large size companies (in excess of 2000 employees).



Graph 4 – Compared economic sectors of engineers

Type of activity (Graph 5)

Young women engineers are more often involved in projects, research, engineering and testing, but as well production and production planning compared to older women. But young women are less involved in administrative and computing activities. For years teaching used to be a top activity of women engineers. Nowadays, the ratio of young women engineers in teaching activities is at the same low level as for men (around 2%). Women engineers are less involved in production than men (but not in production planning) – respectively 11% for women and 16% for men. But they are much more in QSE activities (respectively 8% and 3% for men). The most significant difference is in general management of companies (1,3% for all women compared to 9% for men).

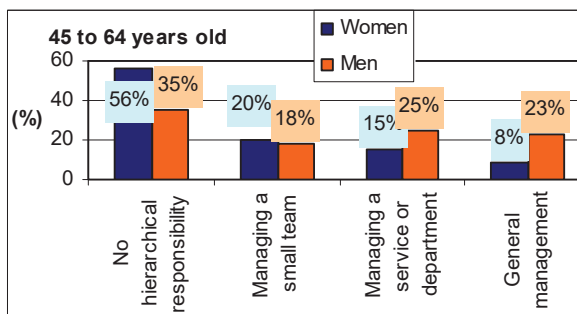
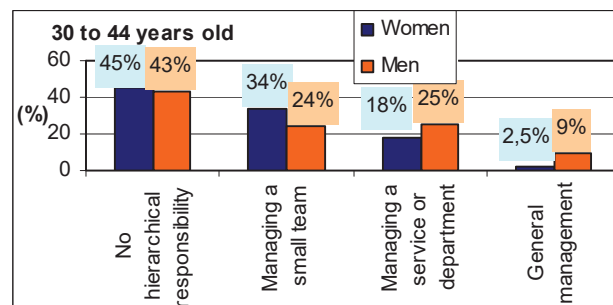


Graph 5 – Activities of women engineers versus age

Hierarchical position (Graphs 6 for two different age spans)

87% of women (against 94% of men) benefit from the specifically French managerial status of “cadre”.

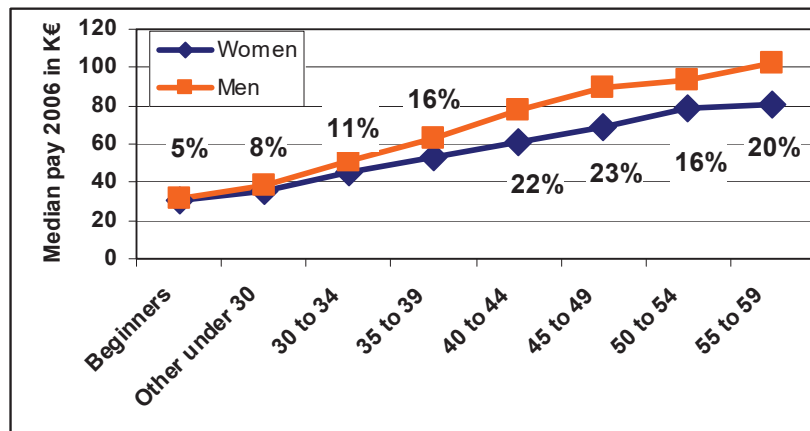
In their jobs as engineers, men and women are not equal in terms of hierarchical responsibilities. Women get them at a later stage and in lower proportion than men. For some years, large companies have launched programmes or actions aiming at providing equal opportunities, which should help reducing the differences.



Graphs 6 – Hierarchical position at different ages

Pays :

In 2006, the median pay of women engineers was 40,000 € per year (38,000 € for women managers “cadres” in 2007¹). It reached 51,550€ for all engineers (45,000 € for men managers “cadres” in 2007¹). This is partly due to the fact that women engineers are younger than men, and they have less experience. But a comparison with all equal factors shows that there is still a 9% gap against women. Women beginners are already at disadvantage compared to their fellow men, with a 5% lower median pay. The pay gap between men and women engineers is the highest after 45 years of age, and is related with the fact that women are less often managers compared to men.



Graph 7 – Median pay of engineers according to age and pay gap in percentage

Satisfaction and appreciation of the engineer's job

The biggest sources of satisfaction of women engineers in their job (more than 80% are satisfied) are the interest of the job, the autonomy, and the tasks diversity. Only quality of communication in the company implies an insatisfaction rate higher than 50% among women engineers. The style of management, the general company organisation, the readability of its strategy and level of stress are also quoted by more than 45% of the women as reasons for insatisfaction.

¹ Reference : APEC (National Agency for « Cadres » Employment) – 2007 figures on www.apec.fr

My thanks go to Chantal Darsch, Bernard Duquesnoy and Patrice Cacciuttolo who provided the figures of the CNISF enquiry to our French Association of Women Engineers.

Unless otherwise indicated, the figures are taken from the 18th enquiry lead by CNISF (Conseil National des Ingénieurs et Scientifique de France) in 2006. The questionnaire is available on the CNISF site : www.cnisf.org

For the detailed figures on women engineers : French Association of Women Engineers - Association Française des Femmes Ingénieurs – www.femmes-ingenieurs.org

WOMEN IN ENGINEERING EDUCATION IN EGYPT

Randa Abdel-Karim, Saad El-Raghy

Faculty of Engineering - Cairo University

Type of presentation: Oral session

Abstract

Egypt believes that comprehensive development can never be realized without the positive participation of women. The purpose of this study is to document advancement of Egyptian women in the field of Science and technology.

This paper will present a close look at the statistics of girls and their ratios between undergraduate and graduate students; also, their share in the teaching staff as well as college administration.

This study is based upon the raw data extracted from the faculty of Engineering, Cairo University and the supreme council of Egyptian universities. Statistical analysis shows the growth of both numbers and percentage of females at the engineering schools.

At Cairo University, the number of engineering students increased from 12654 in 2002 to 13086 in year 2006. The share of girls increased from 22% up to 29% for the same years. The same trend applies for graduate students and for the staff (faculty members).

Nationally, girls are gaining ground at all universities. However this trend differs from one province to another.

This study focuses on efforts done for closing the gender gap at decision-making levels including chairpersons, vices dean and deans at the engineering schools.

Keywords: Egyptian women, statistics, gender gap, governmental efforts

CV:

Professor, Cairo University - Faculty of Engineering, Dept. of Metallurgical engineering (MPM). Ph.D., Institute of ferrous metallurgy- Aachen Technical University- Germany. Currently, Co-Director of Engineering Centre for Archaeology and Environment (ECAE).

MEMBERSHIP IN PROFESSIONAL SOCIETIES

- National Association for Corrosion Engineering (NACE)- USA
- American Society of Metals (ASM)-USA.
- National Committee for Women in Science and Technology- ASRT- Egypt.
- National Committee for Advanced and New Materials- ASRT- Egypt.
- German-Egyptian Network for Young Scientists (GENYS) - Egypt.
- Egyptian Committee for Synchrotron Radiations and its Applications.

CULTURES OF MASCULINITIES IN ENGINEERING

Dr. Brigitte Ratzer

Centre for the Promotion of Women and Gender Studies, TU Vienna, Austria

Type of presentation: oral session

Abstract:

The content of this paper is based on a series of interviews conducted at the faculty for electrical engineering and information technology (ET&IT) at TU Vienna in February 2007. Like in many other industrial countries the university engineering courses in Austria show a heavy excess of men on the students level as well as on the university teachers level. As important background information we have to consider that the situation in Austria is special insofar as a majority of the beginners in engineering courses (nearly 45 % in electrical engineering) come from specialized technical secondary schools, called *HTL*, starting at age of 15, where the percentage of women is even smaller than at university. Only about 30 % of first year students are recruited from general secondary schools and another 25% possess a foreign school leaving examination.

When regarding the alumnae of the faculty the percentage of HTL graduates rises to nearly 65%, whereas the percentage of secondary school graduates amounts to 27% and the foreign school graduates decline to 13%. It is hardly amazing, that in such an environment the proportion of women drops from 10% at the beginners' level to only 2% of the alumnae.

When conducting the interviews one of our goals was to frame a picture of the specialised culture of engineers in order to understand the processes of displacement and exclusion that we observe in ET&IT faculty. With the material provided by the interviews we were finally able to draw a very detailed and sophisticated picture of ET&IT faculty. The main findings may be concluded as follows:

- * ET&IT faculty has passed through a two decades lasting period of transition. The shift from an "old", machine-oriented training and research towards the "new" information-oriented main focus is highly visible and extensive.
- * There is a hegemonic form of masculinity that is very well described by the concepts of the "Scientific Warrior" and "Mathematical Men". Besides we find a hierarchy of masculinities that is framed by multiple factors.
- * The content and direction of research is one key factor for hierarchisation. While large and risk technologies – such as military and weapon technology or nuclear technology, automation of industry production, construction of fully autonomous robots, automation of every day life, observation and monitoring technologies and artificial intelligence research – are seen as eminently masculine, eco-technology or clean technologies and political counselling as well as social sciences or humanities are associated with softness and femininity.
- * Another key factor is the amount of money the researchers can acquire from industry. As a result of decreasing public funding of the Universities researchers see themselves confronted with an increasingly hard competition and the science system is subjected to output indicators and cost-benefit-analysis on various levels. This has a huge impact on the relative importance of applied research compared to basic research. Applied researchers tend to develop a self-understanding quite different from basic researchers esp. with regard to the conception of university, university teaching and research-programs. This development is mainly powered by the cash flow from industry.
- * The myth of the engineer as an autonomous hero of a long-lasting initiation rite is another important element in the shaping of hierarchies. All our interview partners shared the idea of engineering studies as being a special ritual to eliminate the dishonourable and unworthy and find out the right and dignified ones. As a result the curricula give a strong emphasis to highly theoretical fundamentals and advanced knowledge of programming within the first year of studies. Again this refers to a self understanding where strongly mathematically based sciences are seen as hard (which is more masculine) and essential for the training of future engineers while at the same time a different approach – e.g. problem based learning – is strongly opposed.
- * Lasts but not least we could observe that research questions very often emerge from individual motivations. Generally spoken: we found the "knowledge" of what society or individuals would need very often linked to personal desires for technologies that make easier every day live or facilitate the needs of individuals akin to the interview-partners. Again autonomy of the individual is a central category there, so the interests of a specific group of men dominate the range of research questions.

Keywords: Men Studies, Gender Studies, Technology Studies, Feminist Science Studies, Electrical Engineering

CV:

Dr. Brigitte Ratzer, born 1966. My educational background is a Dipl. Ing. in Chemical Engineering and a Doctorate in the Field of Social Science Studies. For about ten years I have been working as a scientific assistant and assistant lecturer at TU Vienna and TU Graz. The main fields of my research have been Social Studies of Technology, Feminist Technology Studies and Technology Assessment of Biomedical Technologies. Since 2005 I am the Head of the Centre for the Promotion of Women and Gender Studies at TU Vienna.

A SURVEY REPORT ON THE GENDER-RESPONSIVE IN S&T FIELD : THE CASE OF KOREA

EUN-KYUNG SONG, Coordinator/ Policy Development, National Institute for Supporting Women in Science and Technology (NISWIST)

KONG-JU-BOCK LEE, Director General, NISWIST

JEEHYE KWEON, Director / Policy Development, NISWIST

MOON-YONG CHOI, Coordinator/ Policy Development, NISWIST

Abstract:

In this knowledge-based society, utilizing human resource in S&T is becoming one of the key factors to improve national competitiveness and economic growth. Especially, women in S&T are recognized as core human resources on the next-generation of high technologies such as IT, BT and NT. Relevant systems and policies for fostering and supporting women in the S&T field have already been enforced in several major countries. So It's essential to build the proper evaluation system and statistical information system for supporting policies.

The Korean government enacted "An Act on Fostering and Supporting Women in S&T" in 2002. According to the act, the annual survey(A) on women in S&T was carried out to figure out the actual employment status and define the effects of the policy since 2005, even though there is another statistical survey(B) in S&T over all. The numbers from this survey(A) show more valuable standards that are very useful to establish the gender specific policy in S&T due to the scales of the gender-responsive and so on.

According to the survey(A) the employment rate of the women in S&T was 16.1% (9.4% of the permanent position, 31.% of the non-permanent position) in 2006, but 13.1% from the survey(B) because it is not enough to specify gender even on the basic questions for employment conditions and treatments. It implies that this kind of survey ought to be followed with new-born policy's implementation and revision.

In Korea the policy for the female human resources in S&T has been developed, based on this survey(A). By the survey analysis, various policies have suggested for the women in S&T, such as affirmative actions : "Recruitment Target System", "Promotion Target System", "Promote Appropriate Ratio of Female Students in S&E University". In the nationwide policy development for women in S&T, the gender-responsive survey on the human resources in S&T should be in more systematic approach with general legislative basis and implementation of DB system. Also, the government should encourage the related service to support the survey.

Keywords : gender-responsive survey, affirmative actions, "An Act on Fostering and Supporting Women in S&T", statistical information system.

Cv:

As a Coordinator of NIS-WIST(National Institute for Supporting Women in Science and Technology commissioned by MOST of Korea), EUN KYUNG SONG is working for supporting of women in S&T, especially in a field of policy development and policy-making.

Her research interest is in the Advancement of Women in S&T. With the enacting "An Act on Fostering and Supporting Women in S&T" in 2002 she, in charge of "Research on the Actual Status of Women in S&T", has worked at NIS-WIST for 4 years and has constantly researched and analyzed status of women in S&T.

In 2008, she intends to activate the survey through making up for the questions and contents. Therefore applying the results to the policy making and execution, and utilizing implication for lots of proximity field, she'll endeavor to advance women in S&T.

ENGINEERING A FUTURE FOR WOMEN?

Dr. Rihana Ishaq, Jill Collins, Denise Eaton and Pat Morton;

Sheffield Hallam University, Telephone 0114 225 4695, Fax 0114 225 4676

email address: p.m.morton@shu.ac.uk

Type of presentation: Oral session

Abstract:

A longstanding continuing theme of engineering education, particularly in Western Europe and America is to explore ways to break the cycle of under representation of women in education and industry. There have been many interventions in the past that have been targeted mainly at recruitment, and whilst many have not made significant progress on numbers, they have made some difference to individuals who may not have chosen engineering as a career. The challenges of climate change could offer engineering a significant opportunity to draw in more women if engineering can adapt to meet need. This paper will draw on current gender based interventions in the UK that seek to address demand and supply chains to try and ensure a sustainable and incremental increase in participation by women in engineering for the future. The paper will outline the interventions at different life stages of girls and women.

1. Work with school girls to promote engineering as a career by delivering work experience programmes and allied work as university outreach and widening participation.
2. The building of networks to support female students at university and to support progression to engineering careers beyond university.
3. Work with employers to assist women who have taken a career break and wish to update their skills and return to engineering.

The paper will explore the challenges and the successes of interventions to date as well as lessons learned for others seeking to bring about change.

This paper is situated within the Gender in STEM strand. The paper crosses over a number of the sub themes within the strand. The paper's key theme is in Strategies to attract girls in STEM. Our philosophy is that any strategy must look holistically to women's career paths throughout education to the workplace. Strategies should work with all the influencers as well as girls and women if sustained success is to be achieved.

GENDER SITUATION ANALYSIS OF A STEM BASED KENYAN UNIVERSITY

Maranga Rosebella

Gender office, Jomo Kenyatta University of Agriculture and Technology

Type of presentation: Oral session

Abstract:

The Government of Kenya has put in place a comprehensive national gender and development policy supported by an equally good gender responsive policy in education. Although these documents have been in place since 2000, not much has been done in institutions of higher learning to understand the position of gender equality and equity in these institutions. Information on sex disaggregated data is not well documented in many institutions of higher learning. This paper shades some light on the gender situation analysis of a STEM based Kenyan University. The objectives were to; a) assess the enrollment of female and male students in various STEM based courses, b) their retention up to the time of graduation c) as well as their performance in those courses. These courses included those leading to B.SC in science, engineering, agriculture, architecture, computer science and computer technology. Another objective was to assess and document the gender situation of both academic and non-academic staff. Sex disaggregated data was collected for both students and staff in their respective courses and areas of work respectively. The results of this analysis indicated that there was gross gender imbalance in terms of student enrolment and performance with male students doing better than female students in all courses that they had registered for. Male students dominated as follows; science, about 70% ,engineering 87%, computer science 78%, architecture 86% and agriculture 73%. The situation of staff was similar to that of students where majority were men in especially in the academic staff where 81% were men. In lower cadre, there are more women but still men dominated being 57%.

With these revelation, it is clear that there is gender inequality in this STEM based university and other workers have reported the same in other institutions of higher learning in Kenya.

The results of these study have been documented in the newly created gender office and they will be a reference for future enrollment of students and staff recruitment to ensure gender equality in student enrollment and staff recruitment.

Key words: situation analysis, responsive, equality, equity, university, gender

CV:

She is an associate professor of medical and veterinary entomology at Jomo Kenyatta University of Agriculture and Technology where she has worked since 1992 when she was first employed as an assistant lecturer. She was the head of the department of Zoology in the same University between 2002-2005 and has also acted as Dean of faculty of science in the same University. She has supervised several postgraduate students and serves as an external examiner of theses for other universities. She has published scientific papers in international and local peer reviewed journals and is credited for the invention of a biological trap for the control of ticks. Currently she is the Director of Gender at Jomo Kenyatta University where her major role is to ensure the engendering of all academic programmes as well as staff in all sections of the University. She is also active in research in both her area of specialization and gender issues.

GENDER KNOWLEDGE OF ROLE MODELS: LINKING STRUCTURAL AND SYMBOLIC ASPECTS OF STRATEGIES TO ATTRACT GIRLS INTO STEM

Dr. Christiane Erlemann

Technische Universität Berlin

Zentrum für Interdisziplinäre Frauen- und Geschlechterforschung (ZIFG)

Type of presentation: Oral session

Abstract:

My aim as both engineer and social scientist is to empower women engineers. Communication between the different generations of women engineers should not be guided by entrepreneurial profit aims or changing national politics. Scientific analysis should ensure the quality of self-defined activities.

Despite increased promotion measures, career obstacles for highly qualified women persist in science and engineering. Decreasing enrolment of women in engineering reflects the inefficiency of measures to attract girls into STEM. My research project focuses on how ambivalent requirements of single sex interventions are seen and dealt with by the women concerned. The activity of role models, a central instrument used to attract women students to engineering, will be examined.

An application for funding has been submitted to DFG (Deutsche Forschungsgemeinschaft).

Theoretical Basis

The project links two fields of research which so far have been separate: occupational sociology - analysing structural factors impairing gender equality in leading positions - and gender studies in the field of science and engineering, envisaging the symbolic markers of the topic.

In German speaking countries, linking gender studies and studies about science and engineering has just started (exempl. WIE 2002, LUC 2004, PAU 2006). By synthesizing formerly separate scientific fields the study provides a new and extended contribution to gender studies in engineering.

Studies in occupational sociology show that gender segregation is a basic structure of the labour market, and devaluation happens regardless of the field of activity (GIL/ WET 1992). Assigning gendered positions proves to be "a constant factor despite the supposedly equalizing factor of qualification" (TEU 1992, 46; translation of quotations C.E.); areas in between "will eventually be integrated in this pattern of appointment, sooner or later" (WET 1993, 53).

Gender studies about science and engineering deal with the specific notion of "nature" as a fundamental concept for the modern, technical use of nature. Ever since the 17th century modern science has been characterized by a hierarchical and dichotomous basic structure, marked according to gender. The central concept of "rationality" is based on a split-off emotionality; the concept of "objectivity" excludes subjectivity, "spirit" is opposed to matter, attributing the separate principles to a naturalized "femininity" (exempl. PAL 2001; OSI 1996).

"Technology" is – not only on the level of application, but also on the level of epistemology – not gender neutral, but symbolically marked: this status of research is valid.

Attracting the upcoming generation: which theory is it based on?

Governmental departments, universities, research institutes and enterprises ignore the fact that "technology" is marked as "masculine". Young women are made to believe that their career – provided they have majored in the "right" field – will be as certain as that of their male colleagues, since "technology" is gender neutral. Addressing girls interested in engineering by talking from "woman to woman" can therefore fail as long as this dichotomous basic structure still exists.

Why is this so?

The principle of equality is conceived as a collective title. It is established as an autonomous requisite for justice since the biological sex is determined by birth and is generally unchangeable. This is why individual advancement – so to say from dishwasher to millionaire – is not possible (SLU 1988).

However, promotion measures do promise individual advancement to young women interested in engineering. Interest in technology - and adequate formal training based on this interest - is presented as key to well-paid jobs with high chances for development and advancement. This is what a highly qualified man's job is like, but women will be less likely to achieve it.

As long as "interest in technology" is considered to be gender neutral, promotion measures to attract young women into male dominated fields of activity cannot keep their promise to provide equal opportunities.

Case study

Employed women engineers acting as role models in encounters with school girls are interviewed all over Germany. Being part of the standard instruments in programs aiming at school girls, these encounters motivate young women for (or against) engineering studies. The role-model engineers' self-presentations - given in biographical interviews - are analysed regarding which gender knowledge is passed on and how ambivalences are reflected.

The theoretical concept of single sex interventions can be described as "paradoxical intervention" (LOR 1999) since – in order to obtain gender equality and thereby de-dramatizing gender differences - gender division is applied which at first causes re-dramatization of the "gender" category. Consequently my main research interest is to ask which attitude the protagonists adopt in this tensional field.

The oral presentation will introduce the field study: sample; the concept of theoretical sampling; the interpretative paradigm, biographical-narrative interviews, interpretative text analysis according to Rosenthal (ROS 2005).

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Key words: gender knowledge, symbolic markers, individual advancement, paradoxical intervention, interpretative text analysis

CV:

Christiane Erlemann graduated in Architecture/ Urban Planning at RWTH Aachen University (Dipl.-Ing.) and holds a degree in Spatial Planning from the University of Dortmund (Dr. rer. pol.).

For the past fifteen years she has been working in projects dealing with equal opportunities at different universities, including projects like "Advancement of Undergraduate Women Engineering Students"; "Women Friendly Reformatory Measures of Curricula in Engineering"; "Gender/Innovation Professorships and Internationalisation"; "Evaluation of and Recommendations for Cooperation with Schools". As an expert, she advised institutions including the Federal Assembly, the Ministry for Science and Culture of Lower Saxony and VDI (Association of German Engineers).

Her activities as architect and urban planner include ecological construction, gender aspects of traffic planning, site supervision, reconditioning and modernization of old buildings. She teaches in departments of Architecture, Environmental Technology and Gender Studies.

She co-founded the annual "Congress of Women in Science and Engineering - FiNuT" which has been taking place in German speaking countries since 1977 and "NUT - Women in Science and Technology (Registered Association)" in 1988.

Thesis on dropout women engineers: „Ich trauer' meinem Ingenieurdasein nicht mehr nach“. Warum Ingenieurinnen den Beruf wechseln – eine qualitative empirische Studie. Bielefeld: Kleine Verlag 2002.

STRATEGIES TO ATTRACT GIRLS INTO STEM: SCIENCE AND TECHNOLOGY (S&T) OUTREACH SURVEY FOR NIGERIAN GIRLS

¹Mrs. Uduakobong Aniebiat Okon, ²Dr. Mrs. Eno Etim Ituen, ³Dr. Mrs. ³Emem Paul Udofia and ⁴Dr. Mrs. Udeme Chigozirim Nwabuko

¹Department of Vocational Education

² Department of Physics

³Department of Library Science, University of Uyo, Akwa Ibom State, Nigeria.

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Type of presentation: Oral session

Abstract:

The Association for Promoting African Girls in Engineering, Science and Technology Education (APAGESTE), constituted by women in (STEM) Disciplines in Nigeria, organized a unique Science and Technology Outreach for Nigerian girls, in Lutheran High School, Akwa Ibom State of Nigeria in 2006 school session. It was supported by the state Ministry of Women Affairs, Youth and social Welfare, Ministry of Science and Technology, The Ministry of Education and the University of Uyo, Nigeria. The event girl students centered aimed at application of multidimensional approaches to build the status of African girls and women and to enhance their full participation in STEM disciplines and careers. On the 1st and second days of the programme, a survey was conducted round selected secondary schools in the state by APAGESTE executive members, on "Nigerian Girls' Experiences and Impressions on Science and Technology" (Details indicated below). On the third and forth day, members of APAGESTE, including University girls in STEM went on S&T campaign in primary and secondary Schools. There was mentorship session on the fifth day for interaction between the girl child and their mentors. The 6th day was the grand finale which featured essay competition on 'Why I Want to be a Female Scientists, Engineer or Technologist', exhibitions of S&T hands-on activities by girl students and award of prizes for winners and participants. In attendance were representatives of all the supporting organizations. A keynote address was delivered by the APAGESTE president on "Catch Them Young for STEM, a medical director, delivered a talk on Sexuality and Academic Performance of Girls in Science and Technology. The vice president of APAGESTE, appreciated the students for their participation, scientific projects presentations and essay renditions in the outreach. The purpose of the outreach survey was to investigate the experiences and impressions of Nigerian secondary school girls and their teachers in STEM with a view to obtain an overview of their progress and sensitize the girls on Science and Technology outreach programmes in the country. The research questions was "what are Nigerian secondary girls and their teachers' experiences and impression in STEM with regards to; teachers experiences with girls in STEM, girls' competence as compared with boys in STEM, girls' reaction to gender trends in STEM and girls career prospects in STEM.?" The study was conducted in Akwa Ibom State of Nigeria and the population consisted senior secondary school girls and their teachers in electrical/electronics, textile technology, building technology and computer science. Stratified random sampling technique was used to draw 1000 senior secondary school girls and 265 teachers in STEM based on subjects offered in each school for a fair representation of all the indicated subject areas in the sample. Validated instruments were used for data collection which included open ended questionnaire and structured interactive scheduled sessions. The instruments were administered to respondents in groups. Descriptive and independent t-test statistics were employed to analyze the data and summaries of the interactive sessions were provided; In the findings on girls impressions about STEM, 68% of the respondents indicated in quote "I am satisfied being in science and technology areas of study". 20% indicated "My parents want me in sciences or technology" and 12% indicated "STEM subjects takes too much of my time" The responses obtained on teachers experiences in STEM revealed that teachers work comfortably with girls and that girls are as enthusiastic as the boys in STEM. On teachers views on girls competences in STEM as compared to their male counterparts 37% of the teachers agreed that girls are as competent as their male counterparts, 20% indicated boys are more competent as than girls while 21% agreed that are more competent than boys and 13% had no option. There was no significant difference between male and female teachers' mean rating of responses, on girls competence in STEM at 95% probability level. Findings on peers' impressions about girls in STEM revealed that some peers discourage girls from offering S&T subjects, the reason being that, women engineers and technologist are hardly employed. Some others give girls the impression that STEM is mainly for boys as an explanations for the current prevalent dominance of males in STEM professions in Nigeria. A few others encourage them to stay on with S&T. In girls' reaction to gender influences and trends in STEM, some girls

indicated that they feel challenged to observe the trends of gender imbalance in STEM careers and encourage themselves and others in STEM. Some felt discouraged at peers wrong attitude towards them and some were encouraged at the positive attitudes of some a few peers. to assess of girls prospect in STEM, they were made to respond to the issue of wiliness to continue in STEM and to finally pick up a career in any of its area. The following options in quote were obtained, 65% for "Yes I do" 20 % for "I am not sure" 15% for "No I do not". In some other study, girls were seen to compete favorably with boys in sciences and technology subjects at the junior secondary schools in Nigeria .This paper calls for a search for explanation of the under representation of women in science and technology. Based on the diverse responses of Nigerian girls in STEM, the APAGESTE team encouraged the girls to stay on in STEM and countered the false impressions with specific examples. The president used the opportunity to sensitize the girls in STEM on science and technology outreach programmes for girls in the nation. The gender trends in STEM and some impressions of girls about STEM stress the need to encourage and attract more girls into STEM.

Keywords: strategies, Attraction, Outreach, Science, Technology

CV:

The presenting author is lady lecturer in the University of Uyo in Nigeria, in a specialty area of Agricultural Science Education. with more than 10 publications including, International papers, Journal aricles, books of reading, etc.Her research interest is in Gender studies in STEM, Agriculture,Education, Policy and Developmental studies. she is the President of the association for Promoting African Girls in Engineering, Science and Technology (APAGESTE) memeber of several professional bodies, including,Third World Organization of Women in Science, , Educational Rserach Network for West and Central Africa(ERNWACA),Gender and Science and Technolpgy International Association, Science teachers Association, etc. Participatees in selected INWES board meeting as invited guest. Won national and international awards for outstanding research presentaion. ENRWACA,INWES, CIDA, TTTP etc. She is awaiting her final PhD defence scheduled for in MAY 2008 programme.

INITIATIVES BY THE QUEENSLAND GOVERNMENT AND UNIVERSITIES IN AUSTRALIA TO INCREASE THE REPRESENTATION OF WOMEN IN ENGINEERING

Bouchra Senadji

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Type of presentation: Oral session

Abstract:

Australia is currently facing an acute need for skilled labor, particularly in the field of engineering. This has sparked various initiatives from state governments and universities to increase the representation of females in engineering. The proportion of women in engineering in Queensland is around 7% and some disciplines, such as electrical or mechanical engineering, attract less than 5% of women [1]. This paper describes the strategies currently used by the QLD government and some QLD universities for compensating for this extreme under representation of women in engineering.

The various strategies and initiatives can be categorized into 3 levels. The first level relates to increasing the awareness and knowledge of engineering amongst female students at primary and high school level, i.e. prior to university years. The second level of strategies is concerned with reducing attrition rates amongst female engineering students once they reach university. The third level of strategies aims at encouraging female engineering graduates to remain in the profession. The next sections are a summary of the strategies used within each level.

- 1- Increasing awareness and knowledge of engineering amongst female students at primary and high school level

As a result of financial initiatives and rewards by the QLD government, an increasing number of high schools, amongst them girls-only schools, are introducing engineering programs in their curriculum. Some universities, such as Queensland University of Technology (QUT), are collaborating with these schools, and specifically targeting girls-only schools, to educate students in various aspects of engineering. A survey conducted by the author in 2002 in a girls-only school, showed that girls carry a very narrow idea about the field of engineering, often restricting it to "building bridges" [Ref]. As a result, a QUT equity grant was awarded to develop engineering kits in fields that are generally more appealing to girls, such as forensics, environmental, or medical engineering.

Other strategies targeting primary and high schools, involve various talks, focus groups, and workshops run by female engineering students or professionals in the schools. This aims at increasing the level of role model exposure to female engineers, which girls significantly lack.

Finally, universities are now initiating faculty days whereby high school girls come to university to experience engineering first hand. Programs involving tours, demos and workshops for girls only, are now run.

- 2- Reducing attrition rates amongst female engineering students

Research shows that attrition rates are the highest amongst first year engineering students. As a result, a series of initiatives have been undertaken by the QLD government, in collaboration with universities in very recent years since 2005.

The main initiative involved the 2007 organization by the QLD Office for Women, in collaboration with all QLD universities, of a workshop for first year female engineering students. First year female students representing all QLD universities gathered in a one day event to network, interact with female professional engineers from all disciplines, and attend workshops designed to enhance skills particularly required by females in the workforce. The event was such a success that it was decided that the workshop should continue running every year.

Other initiatives involve the introduction of women in engineering scholarships, as well as the creation of Female Engineering Clubs at university, whereby female engineering students feel a sense of belonging

and nurturing. Female engineering clubs are also responsible for organizing mentoring schemes with both peer students and female professionals if the need arises.

3- Encouraging female engineering graduates to remain in the profession

There are various initiatives undertaken by both the QLD government and universities to reward achievements of female professional engineers.

The most important initiative of the QLD government in this area, was the creation, in 2005, of the Smart Women, Smart State program. The program is designed to increase the visibility and recognize achievements amongst women in Science, Engineering and Technology. It is also designed to encourage women to undertake leadership roles, as well as help women return to the workforce after career interruptions [1].

Similarly, most universities have an alumni rewards program to recognize and reward achievements of former graduates. 2007 being the year of Women in Engineering, the awards went to a former high achieving female engineering graduate.

This is, however, the level where more sustained effort is required. Indeed, after the time and effort involved in producing female engineering graduates, it is disappointing that a strong proportion of female engineering graduates still choose not to work as engineers, either straight after graduation or within a few years of graduating.

REFERENCES

[1] <http://www.women.qld.gov.au/Work+and+life/Smart+Women+-+Smart+State+Strategy>

[2] B. Senadji, "On the Popularity of Engineering among Brisbane High School Girls", Australasian Association for Engineering Education Conference, Melbourne, Sept 2003.

Keywords: women in engineering, initiatives, strategy

CV:

Bouchra Senadji has graduated from ENSEEIHT, France as an Electronics Engineer, and subsequently undertook a PhD in Signal Processing from ENST, Paris. She has been working as an academic at Queensland University of Technology for the last 12 years and is passionate about Women in Engineering issues.

MESSAGES THAT ENCOURAGE GIRLS (AGES 14-18) TO CONSIDER ENGINEERING CAREERS

Didion Catherine
National academies

Type of presentation: Oral session

Abstract:

More than 50 engineering associations, corporations, and universities formed a coalition to develop and implement the Engineer Your Life project. The goal of the project is to encourage academically prepared girls ages 14-18 in secondary school to consider engineering as an attractive option for post-secondary (university) education and subsequent careers in order to increase the number of women who make up the engineering workforce.

The project's objectives are:

- 1) to mobilize engineers to reach out to educators, and high school girls with tested messages tailored to encourage participation in engineering education and careers;
- 2) provide compelling role models of young women (age 35 or less) actively engaged in engineering education programs and fulfilling engineering careers;
- 3) help high school science, math, and technology teachers to better understand the nature of engineering, the academic background needed to pursue engineering, and the career paths available in engineering; and equip teachers to share this information with students, especially girls; and reach out to girls directly with messages that accurately reflect the field of engineering and will inspire girls to choose engineering.

This session will share the results of surveys of secondary students (male and female) attitudes towards engineering and sources of career advice that these students rely upon. In addition, the session will explore what kinds of messages about engineering careers resonate with young women and how the engineering community can successfully encourage more young women to study engineering.

CV:

Catherine Didion is a **Senior Program Officer at the National Academy of Engineering (NAE)** which is one of the three U.S. National Academies. Her portfolio is the Diversity of the Engineering Workforce program with a charge to provide staff leadership to the NAE's efforts to enhance the diversity of the engineering workforce at all levels including the diversity of those being prepared to enter the future workforce. She is the project director of the Engineering Equity Extension Service \$2.5 million grant. In addition to these duties, in February 2007 Didion was appointed **the Director of the Committee on Women in Science, Engineering, and Medicine** of the National Academies.

Before joining NAE, Didion was **Vice President of the Didion Group**, a public affairs and communications firm. Her clients included the American Association for the Advancement of Science (AAAS), the W.K. Kellogg Foundation, the American Association of Medical Colleges, and the International Network for Women Engineers and Scientists (INWES).

Didion served as **Executive Director for the Association for Women in Science (AWIS)** for fourteen years (1990 to 2004). During tenure AWIS was awarded the U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring and she was the principle investigator for 17 government and foundation grants. Didion presented testimony before the United States Congress and U.S. federal agencies.

Didion is an **internationally recognized leader and expert on issues of equity and gender in science and engineering**. She has been an invited speaker on mentoring, networking, and women in science issues at over 200 scientific conferences and has authored over fifty publications on women in science. She was the editor for Women in Science Column for the *Journal of College Science Teaching* from 1993-2002.

Recent international activities include organizing a conference for women leaders in science, technology, and engineering in Kuwait; participation in a leadership training program for women scientists and engineers in Nairobi, Kenya; work with the Organization of American States (OAS); organizing the only event at the

2005 UN Conference on Women (Beijing+10) on women in science; and collaborations with the European Commission's Women in Science Unit and the U.S. Department of State.

Her **additional non-profit experience** includes service as the director of **American Community Services** in Riyadh, Saudi Arabia, the only non-profit affiliated with the U.S. government; Administrator of the **Arms Control Association**, and Program Assistant of the **Carnegie Endowment for International Peace**.

Didion has extensive experience on Capitol Hill including staff positions at the **U.S. Senate Commerce, Science, and Transportation Committee, Office of Senator Robert Packwood (R-Oregon), the Senate Computer Center, and the Senate Press Gallery**.

Her **professional affiliations** include Nominating Committee Member (elected position), Section X-Societal Impacts of Science, American Association for the Advancement of Science (AAAS) 2004-2006; Nominator, Lemelson Prize; Advisory Board Member, MentorNet; Organizer, National Science Foundation (NSF) Short Course for College Teachers and Faculty Development Program; International Member, South African Reference Group on Women in Science and Technology 2003-2006 (Appointed by the South African Minister of Science and Technology); Board of Advisors, National Post-Doc Association; Member, National Selection Committee, National Inventors Hall of Fame; Member, Progress Committee (Women in Science), American Chemical Society; Consultant, AAAS Minority Scientists Network; and Member, National Association of Science Writers.

Didion's **honors and awards** include AAAS Fellow (2005); AWIS Fellow (2001); Drucker Foundation Fellow (2000); Texaco Management Institute Fellow (1999); Secretary of the US Air Force Inaugural Environmental Civic Leaders Tour (1996); and Certificate of Commendation and Distinguished Service, Embassy of the United States of America (1989).

STRATEGIES TO ATTRACT GIRLS INTO SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM): THE CASE OF KENYA

Dr. Genevieve A. Mwayuli

Catholic University of Eastern Africa

Type of presentation: oral session

Abstract:

Like the rest of Sub-Saharan Africa Kenya has low enrollment of females in schools, higher training institutions and universities. According to the Association for Development of Education in Africa and the Forum for African Women Educationists, of the 22% of girls attending secondary school, only 10% study science-related subjects. At present women form only 15% of the scientific field in Africa and only 1% of them are in leadership positions. In fact Sub-Saharan Africa only trains 83 engineers per million of the population annually. There is a higher female representation in social and behavioral sciences compared to STEM.

In Kenya in the 1990/1991 academic year, 18.7% of girls enrolled for undergraduate courses in medicine, 23% in Pharmacy, 36% in dental surgery, 21% in agriculture and 16% in Science. The enrolment in engineering and architecture was only 5%. Presently there is only a slight improvement in the situation. Female students constitute 32% of the total enrolment in public universities and 54% in private universities. This does not improve the situation of female enrolment in STEM as there are only 3 private universities offering science courses. Most women are automatically excluded from science related high status and highly specialized occupations. This is a vicious cycle as young girls lack mentors and role models and don't perform well in science. Strategies are thus needed to attract girls into STEM.

Kenya women professionals in STEM should form stronger networks to promote education of girls especially from marginalized communities: provide role models for girls and career guidance in science and engineering; have a protocol to mentor girls in primary and secondary schools throughout the country. Such an association could provide scholarships for girls who are unable to access university education due to poverty and patriarchal, cultural practices. Engineering courses take a long time and families give male children preference for university education. The association could also help girls who qualify to access not just university courses taking the shortest time possible, but engineering courses. In addition the association could establish a fund to sponsor girls who score B grade and above at the Kenya Certificate of Secondary Examination I to take STEM courses at university. The association once formed should also put in place mechanisms to ensure girls not only enroll but participate actively and complete the courses. Kenya women in STEM should be at the fore front in peer coaching as well as up-bottom coaching of other females.

Kenyan women scientists and engineers should be involved in the training of teachers and pedagogy. Those who are educationists should volunteer services while the engineers should fabricate equipment, materials and kits to be used in the teaching of science. These can then be donated to girls' schools or sold and money accrued given as scholarships to girls. Kenya women scientists and engineers should be involved in Curricula reforms, Science and Mathematics textbooks writing. The Kenya women scientists and engineers should also be involved in constant review and upgrading of teaching methods making sure they are gender responsive and encourage girl participation. There should be inclusion of gender studies in curriculum at all levels of education.

Great effort should be put in the selection and training of teachers to give them capacity to handle girls' learning effectively. Generalized impersonal teaching approaches should be avoided and teachers empowered to provide an enabling environment for learning of female students. Conducive working environment for women in STEM should be provided to avoid brain drain of nurses, doctors, science teachers, engineers so that they remain in Kenya and act as role models and mentor the youth.

Women scientists and engineers should be involved in organizing science club for girls; running science competitions and support the science congress held annually by the Ministry of Education. They should initiate diverse activities such as science camps and clinics to motivate, encourage and attract girls into STEM. The ultimate goal is to raise the number of girls and women in STEM.

Policy makers and education authorities as well as civil society organizations and parents need to demystify STEM and to provide science communication role models for girls and young women. A vigorous career education for girls should be introduced in schools to enlighten them on career options that exist in STEM and their attendant academic requirements. Women in STEM need to expose themselves amply to girls to act as role models and be involved in advocacy. Sensitization should start with young children in lower primary school. Science should be demystified, made fun and mentoring offered. Indeed there is need for a lobby group to lobby for awards/scholarships to encourage young scientists and engineers study in Kenyan universities.

Adequate research should be undertaken focusing specifically on girl-student needs to enhance their understanding of Science/Mathematics. This would be in relation to what methods and materials would be effective. Research should continuously be carried out in schools, institutions of higher learning and employment institutions and in communities in order to establish the relative importance of the factors that impinge on the full participation of girls in STEM. Results of such research should be published widely, disseminated to stakeholders and put into practice and not just undertaken as an academic endeavour.

Women engineers and scientists also need to leave their laboratories, offices and workshops and participate in politics so as to be part of policy makers. Promoting policy change takes time and means changing entrenched attitudes in both government and males and even women themselves. It requires concerted information and persuasion campaigns and advocacy work at all levels of society beginning with formal education and continuing with business communities, public institutions and civil society

Through affirmative action girls and women should be given the opportunities that culture and traditions have deprived them. Institutions should require that women are represented at all levels, especially in the key decision making committees responsible for establishing promotion criteria, selecting conference representatives, allocation of funds and support facilities with institutions, ministries, universities. Consequently girls will have role models and mentors to find STEM attractive.

Key words: mentoring, gender responsiveness, science camps/clinics, coaching, curriculum reforms, career guidance

CV:

DR. GENEVIEVE A. MWAYULI

Educationist and science researcher, Senior Lecturer in Biology, Chairs the Department of Natural Sciences. Teaches and supervises students at both undergraduate and graduate level. Research areas engaged in for improving livelihoods and environmental sustainability include Ethnobotany and use of plant products, Integrated aquaculture-agriculture, seaweed; science and mathematics education and environmental education. PhD in Environmental studies (Biology) obtained from School of Environmental Studies, Moi University.

An active participant in national and international seminars, workshops and conferences addressing challenges of contemporary significance e.g science and technology policy issues, environment, poverty, HIV-AIDS, Gender. Has strengths in skills and knowledge in collaborative process, brainstorming, Community-Based Instruction, Mentoring/Apprenticeship, Participatory research, Project assessment and appraisal. Able to cope with wide range of subject matter in environmental science research and pedagogy but particularly interested in evaluation of marine aquatic ecosystems.

Involved in four professional bodies, The Western Indian Ocean Marine Science Association; the African Women in Science and Engineering; the International Network of Women Engineers and Scientists; the Association for the Conservation of Environment and Nature. Also involved in the SIDA-Sarec funded Inter-University Council of East Africa Lake Victoria Research Project and Commission of Higher Education Research Project in researching in integrated aquaculture.

QUESTIONNAIRE RESULT OF EACH ASIAN COUNTRY, WHAT PROCEDURE IS NECESSARY FOR THE CREATION OF WOMAN'S JOB TO THE PHYSICAL SCIENCE FIELD.

Eng. Aguri Nakano

Lecturer of the Okinawa Polytechnic College, Director of INWES Japan

Type of presentation: Oral session

Abstract:

Recently we, INWES Japan, obtained the information through a questionnaire regarding rate of school attendance by girls and employment rate by woman, national empowerment policy and the rate for woman's social position in the scientific field through the activities of INWES Asian Network.

Based on the result through the above mentioned questionnaire, we examine what kind of measures to be taken to improve the woman's employment opportunities and furthermore how to enhance job creation for the scientific field by woman.

It depends on each country and area that enrolment ratio and employment ratio of each country. And also it is different between boys and girls.

We are now asking to people who work the ministry of education for each East Asian country, what is exactly happening exactly in their nation? We are also using data of the state of the world's children 2007 of UNICEF to ask these questions.

The contents of questionnaire are:

1. How many percentages of Adult literacy rate?
2. How many percentages of the primary school enrolment ratio?
3. How many percentages of the secondary school enrolment ratio?
4. How many percentages of the High school enrolment ratio?
5. How many percentages of national population attend university (according to area type)?
6. How many percentages are the woman students at the university (according to each program type)?
7. How many percentages are the woman students at the university who have registered in science and engineering courses (according to each program type)?
8. How many percentages are woman researchers in the entire country (according to area type)?
9. What is the general thinking in regard to employment?
10. Especially, what is the general thinking in regard to the woman employment?
11. Are there any programs by governmental agency or other entities that promote jobs to woman?
12. What are the expectations of the parents for their daughter's future?
13. Please list up the five most typical occupations for women.
14. What are the most preferred occupations by female students of compulsory and upper secondary

school? Please list the five most typical ones.

15. Why are there any differences in the questions between No.13 and No.14?

16. Are there any programs by governmental agency or other entities that promote jobs to woman in the science and engineering area?

17. If you answered "Yes". Please name what entities are and explain a brief description of the offered job(s).

18. Is there any expectations that women's participation in science and engineering come to in the future?

19. What is your opinion about the women's future in these areas (opinion)?

20. What is your desire in the women's future for science and engineering (desire)?

According to the UNICEF Data, the average of the Adult literacy rate among 22 Asian countries is Male 88%, Female 78%.

The average of the primary school enrolment ratio is Male 92%, Female 90%.

The average of the secondary school enrolment ratio is Male 67%, Female 67%.

But the attendance ratio of the primary school and secondary school are decreased.

The attendance ratio of the primary school is Male 79%, Female 76%, and of the secondary school is Male 32%, Female 28%.

Now the life expectancy of female is higher than male in most countries, and the attendance ratio of the school of female is higher than male.

So the object of this questionnaire is to search for the cause based on the data, and why the gender problem still occurs.

It is because of their culture, habit, religion or something else?

We think that having a good grasp of this reason is very important to start big first step for woman social advance.

Moreover, it is not only for woman social advance, but also grasp woman advance to science and engineering area.

So now we are waiting for the data of each country, so when we have all the data, we will examine how it keeps changing in the future. We will also search the way to improve the enrollment ratio, employment ratio and advance ratio to science and engineering area.

In Japan, woman's position of improvement is still developing.

To go to primary school and secondary school is compulsory education, so adult literacy rate and enrollment ratio is high. But there are some parents who don't think it is good way for the daughter future to go to the high school, university, and so on, and also to work.

Their daughter wants to go higher schools and to work, but they insist her to not to go that way.

It is one of the problems of the culture, habit, and religion.

In this report, we inform just in 22 East Asian countries, but in the future, we are thinking that we will search not only Asia, but also each area and the whole world.

Depending on the data, we will be focused in the things that obstruct the woman social advance and life improvement. Furthermore we will show the way to choose their desire future.

We also plan to participate to the panel discussion "Winds from Asia to promote Women Engineers and Scientists".

In this Panel discussion, we are convinced that this report will be very useful.

And through the discussion which will be hold by persons who confront the situation, we can find the way to go.

Keywords: women, school attendance, employment opportunities, scientific field

CV:

Engineer in the electronics area of the Polytechnic University.

Master's degree in the electronics.

Instructor of the electronics technology of the Okinawa Polytechnic College.

Coordinator of the JICA(Japan International Cooperation Agency) interchange program for electronic technology area.

She worked in Paraguay for 2 years and half, as JICA expert in Electronic technology area under the Japan-Paraguay Professional Human Development Center Project.

Director of INWES Japan.

MENTORSHIP TO PROMOTE ENGINEERING AS A CAREER CHOICE FOR WOMEN: THE MARIANNE-MARESCHAL CHAIR PROPOSAL

Suzanne Lacroix, Nathalie de Marcellis-Warin, Diane Riopel, Annie Ross, Maya Farhat
Chaire Marianne-Mareschal, École Polytechnique de Montréal C.P. 6079, Succ., Centre-ville,
Montréal, Québec, Canada, H3C 3A7 <http://www.chairemm.polymtl.ca>

Type of presentation: Oral session

Abstract

Since its foundation in October 1998, the Marianne-Mareschal Chair at École Polytechnique de Montréal is involved in the promotion of engineering for women. Four women professors – Suzanne Lacroix, Nathalie de Marcellis-Warin, Diane Riopel and Annie Ross – assisted by four women students presently manage the Chair. They interact with the scientific and technological community in the Province of Quebec to present engineering as an accessible, stimulating, dynamic and socially significant career choice for young women.

More precisely, the Chair objectives are the following:

- To give information, to motivate girls and young women to consider engineering as a rewarding career;
- To encourage women students in engineering to complete their degrees, and to maintain the motivation of professional women engineers;
- To participate in the process of abolishing prejudicial thinking or facts that can inhibit the recruitment of young women as engineers, and that slow down their promotion in the industrial and business worlds.

The Chair aims at giving women an attractive image of science, and more particularly engineering, whatever their social background or ethnic origin. To achieve these goals, the Marianne-Mareschal Chair has established a strategic program to influence the career choice process of young women and to consolidate these choices. Part of this programme, mentoring has early been identified by the Chair as an excellent means to influence this process. The Chair's mentoring activity covers several levels of education and the corresponding programmes were progressively set up as the Chair involvement increased, in importance and number, over the years.

1. **The “Internal programme”:** Since 1999, the Chair proposed mentorship to the undergraduate women students at Polytechnique. On a voluntary basis, women students in their 2nd, 3rd or senior year guide women students in their first year in university. The former provide the latter advice regarding the academic curriculum, the extra-curricular activities, and more generally the resources available inside and possibly outside of École Polytechnique. As much as possible, mentors are recruited within the same academic programme as the mentee. The programme, after a few years of its existence, was so successful that male students complained that such a programme should be offered to every student, whether female or male. As a result, it is presently offered to all students. Care is however taken to pair a new female student with a female mentor. As for many of its initiatives, the Chair transferred the activity responsibility, once the activity is operational. A student committee (the ComMent for *Comité de Mentorat*, i.e., *Mentoring Committee*) manages this particular mentoring activity; the Chair now supervises the programme. More information, including the on-line registration process may be found at the following address: <http://www.etudiants.polymtl.ca/comment/>.
2. **The “External programme”:** Since September 2000, the Chair proposed a new programme, which pairs women about to graduate (possibly mentors in the first programme) with professional women engineers. The latter provide the former invaluable counselling and advice regarding the transition from university to the labour life, the career path, and possible networking activities. The practicing engineer mentors are recruited on a voluntary basis. Most of the exchanges between the adviser and the mentee are done by e-mail, but events are also organised twice a year so that all mentors and mentees can meet each other. For this programme, registration is available on-line at the following address:

<http://www.chairemm.polymtl.ca/marrainage/index.html>

This “external programme” is also available to Masters and PhD female students.

1. **The “College programme”:** This programme, made available in the recent years, is also an external version of our mentoring programme as it pairs college (pre-university) women students with university undergraduate students. College students may enrol at Polytechnique during the *Open Doors* activities, which take place once a year in November. They can also be informed through another Chair programme specifically dedicated to CEGEP women students: “Future engineer?”. The latter allows students to visit a professional engineer at his/her

work premises and participate in his/her routine activities for a whole day. As for all the above-described programmes, mentors are recruited on a voluntary basis, often among the mentees of the first two programmes.

2. **The “Professor programme”:** The Chair is now in the process of implementing a new programme inside Polytechnique, intended to help the women professors in their career path. The percentage of female professors at Ecole Polytechnique is even lower than that of female students. Many of the Polytechnique women professors have been recruited in the last ten years, when the competition to have a successful career happens to be fiercer than ever. Most of them are also mothers of young children, and, as such, must face both the professional as well as the familial obligations. They were brilliant students and postdoctoral fellows but are not all well prepared to face the reality of this double and overwhelming burden. It thus appeared to the Chair members that their young women colleagues could benefit from their own experience, if needed. The first step of this programme has been recently implemented. It consists in adding, in the newly recruited women professor hiring letter, an invitation to meet the Chair holders.

Mentoring activities are not the only ones that the Chair proposes to girls and women. The Chair also organises conferences, workshops, and industrial visits. These are opportunities for female students to benefit from the experience of women engaged in a practice, thus getting valuable information regarding integration to the job market. Other Chair events and activities are devoted to younger girls, such as the popular event “Girls and science, an electrifying duo!” organised for high school students and “The brilliant tour” to introduce high school students to the engineering practice. Whatever the activity, it appears that presenting role models to the girls, to whom they can identify in a way or another, makes a difference: this is the key of a popular activity. Mentorship, in this regard, is no exception. It gives the engineering practice a human face, and this is, in our opinion, a determining factor when girls are confronted to their studies and career choices.

Acknowledgement: The Chair holders would like to take this opportunity to thank all the students and engineers who generously participate in its activities.

ASSOCIATION FOR WOMEN IN SCIENCE SCHOLARSHIP AND OUTREACH PROGRAMS: SUCCESSFUL STRATEGIES TO ATTRACT AND RETAIN GIRLS AND WOMEN IN STEM FIELDS

Frances Solomon, Ph.D., Adjunct Professor, Norman B. Keevil Institute of Mining Engineering, University of British Columbia, Vancouver, British Columbia, Canada; and Scholarship Program Chair, Association for Women in Science Seattle chapter, Seattle, Washington, U.S.A.

Abstract:

The Association for Women in Science (AWIS) was founded in 1971 to serve as a network, a resource, and a voice for women working in all fields of science, technology, engineering, and math (STEM). AWIS (www.awis.org) envisions a day when women will participate fully in STEM through equal opportunity, pay equity, and recognition commensurate with their accomplishments. The Seattle chapter (www.seattleawis.org), which was founded in 1985, is one of the largest and most active of the 49 chapters. Our successful strategies for attracting and retaining girls and women in STEM fields include a scholarship program for undergraduate women and a science outreach program for middle school girls (ages 12-14).

The goals of the scholarship program are to reduce educational expenses of women who are majoring in STEM fields at universities in Washington State, and to encourage women to finish their degrees and pursue STEM careers. Scholarship winners are selected on the basis of academic achievement, financial need, demonstrated passion for science, and motivation to pursue a STEM career. Five to eight scholarships of \$1000 to \$1500 each are typically awarded in the fall of each year. During the past 18 years, 115 women have received a total of over \$115,000 in scholarships.

Scholarship money is raised from technical companies in the Seattle area, other professional organizations, and Seattle AWIS members. Those who contribute at least \$1000 to the scholarship fund have scholarships named after them. All contributors are recognized in the monthly chapter newsletter, on the chapter website, and in Seattle newspapers. Many technical companies and Seattle AWIS members renew their contributions annually. The scholarship program is publicized and applications are distributed via the Internet as well as at local women in science conferences and undergraduate scholarship fairs.

Scholarship applications request information on each student's educational expenses, career goals, and how she became interested in science. Transcripts of course grades and two letters of recommendation from professors or employers need to be included. Applications are due on April 1 of each year. Three to four people review the applications and select and interview finalists in May. Scholarship winners are selected and notified in June. They receive their scholarships at the chapter meeting in September; their families, friends, professors, and other mentors are invited to attend. In 2007, we invited past scholarship winners to speak about their career paths at the September meeting. The new scholarship winners were inspired by these presentations. We will continue to invite past scholarship winners to speak at future September meetings.

Many scholarship winners have sent heartfelt thank you letters, indicating that their AWIS scholarships have provided both financial and emotional support. Even though the amount covers only a small part of the cost of a U.S. university education, the vote of confidence can be major. Knowing that an organization of women in STEM fields believes in them helps them to believe in themselves and to realize that their dreams are attainable. Some past scholarship winners have volunteered for the scholarship program, contributed to the scholarship fund, or mentored current students. We plan to follow up with future scholarship winners to track their graduation from university and their career paths.

In order for undergraduate women to major in STEM fields, interest in science must be nourished earlier. The Seattle AWIS Girls in Engineering, Math and Science (GEMS) program is a science outreach program for girls in Seattle public schools. Started in 2002, the goal of the GEMS Program is to encourage girls to maintain and broaden their interest in science by providing mentoring, hands-on activities, field trips, and information pertaining to a variety of scientific fields. The middle school age group was targeted because this is a critical age for retaining girls' interest in science.

Every year, GEMS program volunteers contact middle school science and math teachers and parent-teacher associations to recruit 20 girls who have shown an interest in science but could benefit from additional encouragement. Girls and their mentors meet monthly from October through June; the final meeting is an awards ceremony in which each girl presents a poster on what she has learned and receives a certificate of completion. The Seattle AWIS budget provides funding for the program. The Fred Hutchinson Cancer Research Center's Science Education Partnership provides equipment and a place to hold meetings.

Past field trips have included hiking along the shorelines of local rivers and streams to view spawning salmon and visits to the University of Washington planetarium, biotechnology companies, and the Seattle Museum of Flight. Past hands-on activities have included experiments and demonstrations related to topics as diverse as the properties of yeast and its relationship to carbon dioxide, catapult construction and design, how earthquakes cause tsunamis; and the use of computer graphics to display comet orbits.

Feedback from the girls and their parents indicates that the GEMS Program is successful. The girls appreciate knowing that other girls share their interests in science. The parents say that their daughters enjoy the opportunity to have fun with science and are inspired by the mentors. The GEMS Program is effective in providing a peer group so that girls who are interested in science do not feel isolated. Instead they receive the message that they can do science and it is socially acceptable to do science.

Key Words: Association for Women in Science, field trips, mentors, scholarships, science outreach

CV:

Dr. Frances Solomon is an environmental biologist with a bachelor's degree in biology from the University of Rochester (Rochester, New York), and a master's degree in environmental health and Ph.D. in fisheries from the University of Washington (Seattle). She has over 25 years of professional experience in environmental agencies and university laboratories, addressing biological impacts of water pollutants, pollution prevention and control, and salmon habitat protection and restoration. Dr. Solomon enjoys bringing her work experience to the classroom. She teaches "Impacts of Metals on Aquatic Ecosystems and Human Health" at the University of British Columbia and has developed an online version of this course (www.edumine.com). She has taught environmental science courses at Northwest University in Xi'an, China and at the University of Washington. Dr. Solomon is passionate about encouraging girls and women to enter STEM fields. She serves on the National Board and the Seattle chapter Board of the Association for Women in Science (AWIS). She started and continues to chair a scholarship program for undergraduate women in STEM fields. In 2005, National AWIS selected her as a Fellow for "significant contributions to the mission of AWIS by promoting women in science through scholarship, leadership, education, mentoring, advocacy, or service."

GENDER INCLUSIVE CURRICULUM IN ENGINEERING: A CASE STUDY OF ITS IMPLEMENTATION AND SUSTAINABILITY

J.E. Mills¹, M. E. Ayre², J. Gill¹

1. University of South Australia

2. University of Glamorgan

Type of presentation: Oral session

Abstract:

Despite many years of effort by some institutions and organizations to increase the number of women attracted to the study of engineering and to improve their experience and success in both university and their subsequent professional careers, both the percentage and number in real terms of women in engineering, particularly in western countries such as Australia, the UK, USA and Canada has plateaued and is now declining. Whilst this does not mean that we should give up the attempt, it does indicate that a lasting solution will require systemic change at all levels of influence, from the commencement of schooling, through university study and in the workplace. In recent years a major focus of researchers and women in engineering groups has been on changing the culture of university engineering departments and engineering workplaces to make them more inclusive for women, and it is important that these efforts continue. However, the focus of this paper is on another element of the system, namely making changes at the university level to develop curriculum that is also consciously inclusive of women.

The concept of inclusive curriculum has developed over time. Early advice was to organize classroom activities so that minorities, such as women in an engineering class, were 'included' and not 'excluded': that is receiving the same amount of teacher attention as the dominant group, and ensuring that they were not the targets of sexual harassment. The next stage of thinking involved the recognition of variation in preferred learning styles which, while not necessarily gender linked, led to the suggestion that teachers use a range of approaches to cater for the range of learning styles likely to be present in every classroom. Thus there needed to be a focus on working cooperatively as well as competitively. Thirdly, recognizing that knowledge is a social construct, students are encouraged to challenge assumptions that scientific knowledge is wholly external and objective. A comprehensive commitment to an inclusive curriculum requires that its aims, content and processes be based on inclusive principles. However work towards the inclusive ideal often begins by addressing any one of the curriculum components. The concept of inclusive curriculum that is adopted in this paper is an all-encompassing one at both program and course level, involving the consideration of the assumptions made about the students, the aims and objectives, the content, the teaching and learning arrangements and environment and the assessment. The paper considers a case study of the implementation of inclusive curriculum in a university wide project at the University of South Australia, with a particular focus on the implementation in the engineering programs at the university, as well as a reflection on its sustainability and success since that time. In 1997-8 the University of South Australia conducted an eighteen-month inclusive curriculum project across all programs in the university.

The project aimed to develop inclusive curricula by improving the understanding and practice of faculty and developing guidelines to assist them in restructuring their courses to become more inclusive. The project was intended to raise awareness of the issues and influence institutional and departmental policy. Its objectives were to produce guidelines, to provide staff development and to develop and collect resources to assist the growth and extension of inclusive curricula after the formal project ended. Whilst guidelines are valuable for implementing curriculum transformation, there must first be faculty and departmental commitment to making the changes. The support of departmental heads in engineering was particularly strong and the authors were asked to provide additional assistance in developing inclusive curricula within those departments.

Within the engineering departments the implementation of the inclusive curriculum project commenced with an audit to assess the extent of inclusive curriculum practice amongst faculty. This involved both interviews with course co-ordinators and heads of schools as well as an examination of existing course materials, documentation and departmental policies. Based on the outcomes of the audit, workshops for staff were developed and delivered. As well as conducting workshops, a manual was developed that gave faculty practical suggestions for developing inclusive curricula within their courses, and incorporating suggestions and examples from the audit and workshops. In addition, the authors participated in individual discussions with faculty about developments within their courses.

The intention of the inclusive curriculum project within both the university as a whole as well as the engineering departments was one of staff and resource development. At the conclusion of the project the principles of developing inclusive curriculum were mainstreamed by being formally incorporated into the university's policy for program and course development and approval and their code of practice for teaching. It is now required when planning the development or amendment of programs that faculty should:

“...indicate in what way advice has been sought on issues of inclusivity, how that advice is acted upon in the planning and delivery of the program, and what mechanisms will be adopted to evaluate the level of success of such program components.”

The paper examines the extent to which the introduction of inclusive curriculum practices in engineering was successful and the ways in which this commitment has been sustained in the subsequent years. A follow-up study as undertaken in 2007 to evaluate staff and student perceptions of inclusive curriculum in engineering departments, programs and courses. The results of this study are discussed and the statistics for attraction and retention of women in engineering at the university are examined, within the context of national statistics. The implications of these findings are then discussed with respect to the introduction of inclusive curriculum more widely in engineering programs in Australia and other areas of the world.

Keywords: curriculum, gender, engineering, inclusivity

CV:

Julie Mills is an Associate Professor and Program Director in Civil Engineering at the University of South Australia. Prior to commencing at the University in 1996, she worked for fifteen years as a structural engineer in private industry on industrial, commercial and residential projects. She has a BE (Hons) from Adelaide University, a M. Tech. (Civil Engineering) from Deakin University and a PhD from Curtin University in the area of structural engineering education. Her primary research interests are in cold-formed steel structures, engineering education and women in engineering. Julie is Immediate Past Chair of the National Committee for Women in Engineering in Australia. Julie has received several university teaching awards and in 2006 was awarded a Carrick Australian Award for University Teaching Citation for Outstanding Contributions to Student Learning.

BRINGING MORE WOMEN INTO APPLIED RESEARCH

Katharina Sauter

Fraunhofer-Gesellschaft, (Munich, Germany)

Type of presentation: Oral session

Abstract;

Introduction

Attracting the younger generation

Positive work experience at Fraunhofer Institutes

Career advancement

The Fraunhofer-Gesellschaft's staff development plan

International networking

The concept of work-life balance as practiced by the Fraunhofer-Gesellschaft

Research projects with gender implications

Introduction:

The Fraunhofer-Gesellschaft aims to be one of the leaders in efforts to actively promote gender equality and a greater compatibility between the demands of professional work, family commitments and leisure time. "Bringing more women into applied research" is a leitmotif for the organization. The Fraunhofer-Gesellschaft wishes to augment the number of women employed in all areas in which they are currently underrepresented. This means catering for the different life patterns and interests of men and women in every project and research program, both at the outset and throughout its duration. An approach of this type has implications both for staff recruitment and as a basis for improving career opportunities for men and women throughout their term of employment.

Examples of best practice – Attracting the younger generation:

The Girls' Day event, which was born out of a nationwide initiative by the German ministries of education and research and for family affairs, senior citizens, women and youth, entered its fifth year in 2005. More than 20 Fraunhofer Institutes all over the country opened their doors to groups of school students.

Girls and engineering: Positive work experience at Fraunhofer Institutes:

Even outside the context of the nationwide Girls' Day events, more and more institutes are attempting to capture the interest of the rising generation of young women for a career in an engineering or scientific field.

Examples of best practice – Career advancement:

Since 1999, the Fraunhofer-Gesellschaft has been implementing a mentor program conceived to help its institutes to increase the proportion of female postgraduates on their payroll, thereby motivating the institutes to pursue an active policy of gender equality and rewarding those who do so. Each year, twelve institutes selected by a panel of experts are granted financial support for one or two women doctoral candidates. The applied selection criteria include the evolution of the ratio of women scientists, activities undertaken to promote equal opportunities, and the number of women employed in management functions by the various institutes. The jury also accords priority to hitherto male-dominated specialist fields.

The mentoring program also helps female postgraduates to plan their future career development. Participants are invited to take part in a two-day seminar during which they are taught to deal with the obstacles that they are likely to meet and how best to overcome them.

The Fraunhofer-Gesellschaft's staff development plan:

Naturally, the Fraunhofer staff development plan is available freely to all employees of the Fraunhofer-Gesellschaft. The specific requirements of women staff are catered for in appropriate, practice-oriented training courses designed to develop the social, interpersonal and business skills of research staff as a complement to their specialized skills as scientists. The Fraunhofer-Gesellschaft offers its employees a systematically graduated series of training opportunities. The staff development plan is accompanied by other measures such as regular staff surveys, which have produced remarkably good results with regard to issues concerning gender equality.

International networking:

Fraunhofer joined the European Women's Management Development International Network EWMD as a corporate member in April 2005. EWMD serves as a discussion forum and collaborative working resource at a global level, providing a platform for professional knowledge sharing and the dissemination of current management trends, across all sectors of industry, at all levels of the hierarchy, and on an international basis.

The concept of work-life balance as practiced by the Fraunhofer-Gesellschaft:

Numerous examples of best practice can be cited to illustrate the Fraunhofer-Gesellschaft's varied provision of childcare facilities at various of its institutes. The number of men applying for paternity leave has almost tripled since German employment laws were amended in 2001.

Research projects with gender implications:

By establishing a project on "Gender aspects in research", the Fraunhofer-Gesellschaft has set itself the task of drawing up the first-ever set of fundamental principles and methods of incorporating gender aspects in the research and development process and applying them to applied research.

The project "Roberta" is an initiative to awaken an early interest by young girls in technical fields of work and study, the Roberta project reaches out to schoolgirls aged 10 and upward by introducing them to the fascinating world of robots. Autonomous robots serve as the medium for transmitting a knowledge of physical science, engineering, and computing in an exciting way, through real applications.

Conclusion:

The Fraunhofer-Gesellschaft is to a certain extent successful with his great effort to bring more women into applied research. The quota for female researchers and managers increase. But there is only a slow improvement because Fraunhofer is dependent from the social development. In German society still exists the prejudice that women and technology don't fit together. One may conclude from that, that only few girls are enthusiastic in taking up a technical profession like mechanical or electrical engineer. In addition these gender attributions exist nearly all over the world. Only an alliance of states and companies making sensitive for a chance in choosing a career by women and men will increase the amount of women in applied research in a faster and lasting way.

Key Words: Fraunhofer strategy, Attracting the younger generation, Career advancement, Staff development plan, Work-life-balance

CV:

apprenticeship as a clerk, foreign language secretary, student assistant at Deutsches Jugendinstitut München, student assistant at Psychologisches Institut der Universität München, diploma of sociology at the Ludwigs-Maximilians-Universität München, dissertation "women and sports", teacher at the Berufliche Fortbildungszentren der Bayerischen Arbeitgeberverbände München. HR-Manager at the Fraunhofer-Gesellschaft in Munich with the focus gender and diversity. (The Fraunhofer-Gesellschaft promotes and undertakes applied research in an international context, of direct utility to private and public enterprise and of wide benefit to society as a whole. The Fraunhofer-Gesellschaft maintains 56 institutes. The majority of the roughly 12500 staff are qualified scientists and engineers. As an employer, the Fraunhofer-Gesellschaft offers a platform that enables its staff to develop the necessary professional and personal skills that will enable them to assume positions of responsibility within their institute, in industry and in other scientific domains)

YOUTH OUTREACH MODELS FOR ATTRACTING GIRLS INTO STEM: A COMPARATIVE PERSPECTIVE

Dr. Valerie Davidson¹, Jennifer Fender², Dr. Christine Moresoli³, Lesley James⁴

¹ NSERC Chair for Women in Science and Engineering – Ontario/Professor of Biological Engineering, University of Guelph

² Program Manager, NSERC Chair for Women in Science and Engineering, University of Guelph

³ Associate Professor of Chemical Engineering, University of Waterloo

⁴ PhD Candidate, Chemical Engineering, University of Waterloo

Type of presentation: Oral session

Abstract:

Strategies to attract girls into STEM face varied and multi-dimensional challenges in achieving and measuring positive results. The NSERC Chair for Women in Science and Engineering - Ontario program employs a range of models with the goal of addressing the underrepresentation of girls and women in STEM fields. While each has achieved a degree of success, each also faces different challenges and limitations.

This presentation will consider two youth outreach models, used by the NSERC Chair for Women in Science and Engineering – Ontario, in a comparative perspective.

- Go Eng Girl! (Genlaes, les filles)
- Ready, SET, Go

By examining the comparative strengths and challenges of each model, including practical experiences and 'lessons-learned', this presentation will help participants to avoid 'pitfalls' and to assess the appropriateness of different models based on their goals, resources and organizational capacity.

The comparison will centre on three points of analysis:

- Outreach approach: Including activity structure, issues of mixed or single gender activities, networks and collaboration, location, affiliation, breadth of focus and goals.
- Resource requirements: Including both human and financial resource needs and the issue of sustainability.
- Evaluation and impact: Including evaluation methods, results and limitations

Go ENG Girl

The Ontario Network of Women in Engineering (ONWIE) includes representatives from each of the fifteen Schools or Faculties in Engineering in Ontario. The network was formed in 2005 to work together on five action areas: recruitment, role models, image, classroom and corporate partnerships. Under the action area of "recruitment", ONWIE members agreed to coordinate an annual, one-day event that would happen concurrently at multiple locations across the province.

This free event is called "Go ENG Girl!" (English version) or "*GENlaes, les filles*" and it has been running for three successive years at 12 venues. The program is designed for women in Grades 7 to 10 and their parents and includes activities to show the wide range of undergraduate programs and careers in engineering. At each local venue, there are opportunities to meet role models, to participate in "hands on" activities in small groups, and to learn about student activities outside the classroom such as design projects and student organizations (e.g. Engineers Without Borders, Women in Science and Engineering). While the young women are working on the design activities, parents engage with a panel that includes faculty, students and engineering professionals.

READY, SET, GO

Ready, SET, Go is a program which provides free high school workshops that aim to reduce the gender imbalance in post-secondary education in science, engineering and technology (SET). These workshops endeavour to improve awareness, particularly among female students, of the range of opportunities in SET fields and, ultimately, to increase female participation in SET careers. Led by female role models with a SET background, workshops:

- encourage students to stay in school and to maintain studies in science, technology and mathematics;
- work to eliminate gender role and SET stereotypes;
- offer information about and help students to explore the diverse study and career options in these fields, before they decide on a university or college program; and
- engage students in a fun team design challenge that teaches communication, team work and problem-solving skills.

Ready, SET, Go workshops are presented in mixed gender classes.

Acknowledgements: We would like to acknowledge the contributions of the following people to Ready, SET, Go and Go ENG Girl: Marta Escedi, Frankie Stewart, Lisa Anderson, Kim Gilbride and the Go ENG Girl committee of ONWIE.

Keywords: Youth outreach, engineering, STEM, girls

CV:

Jennifer Fender is the Program Manager for the NSERC Chair for Women in Science and Engineering at the University of Guelph. In this role, she manages the diverse activities of the Chair program, ranging from youth outreach to applied evaluation and research. The Chair program engages girls and women of all ages, as well as other stakeholders, to encourage greater female participation and retention in STEM studies and careers. Jennifer completed her Masters in Political Science and Collaborative International Development Studies at the University of Guelph. Her research interests relate to structural inequality.

STRATEGIES FOR ATTRACTING AND RETAINING WOMEN IN ENGINEERING IN AUSTRALIA

AUTHOR: Dr. Marlene Kanga FIEAust CPEng

AFFILIATION: Chair, National Committee Women in Engineering and National Vice President, Communications and Marketing, Engineers Australia

KEY WORDS: women engineering strategies attract support

Women engineers currently represent less than 7% of the engineering workforce in Australia - one of the lowest participation rates of women across all professions. Ensuring more women join the profession and remain is vital from a social equity viewpoint and also provides a means to increase excellence and address the shortage of engineering skills.

In recognition of the need to attract and retain women to the engineering profession, Engineers Australia declared 2007 the **Year of Women in Engineering**. The objective of the Year was to increase awareness amongst the profession, industry and wider community of the role and contribution of women to engineering and to celebrate their achievements. The vision was to demonstrate that engineering is a sought after profession that offers a sustainable and fulfilling career for women.

The objectives of the Year of Women in Engineering were:

- To increase awareness and understanding amongst the profession and wider community of the diversity, competence, influence and passion women have for engineering.
- To promote Engineers Australia as a champion of women's issues by acknowledging the valuable and significant contribution women make across all engineering disciplines.
- To promote to girls in high schools the opportunities and long-term career and lifestyle rewards that engineering offers women.

The focus on women in engineering by a professional engineering association is unique and increased awareness of the achievements of women engineers within the membership of the professional institution. It provided an opportunity to educate the profession and others about issues of concern to women engineers that may be limiting their career progression and preventing other women from entering the profession.

The **key messages** for the Year were:

Engineering needs women - Attracting women to engineering will have benefits to the profession and the wider community

Women are good for engineering - The profession and community will benefit from an inclusive team as diversity results in better use of talent, increased workplace understanding, enhanced creativity and increased quality of team problem-solving.

Engineering is good for women - Women complete the picture of engineering. However, for the profession to be a lifelong career for women, support frameworks and policies for work-life balance and flexible arrangements are needed.

The world needs women to be Engineers - Women engineers bring health, wealth and safety to the community and to society.

Strategies for attracting and retaining women in engineering need to cover the entire career life cycle – from attracting girls to engineering, encouraging and supporting these students at University and further support as they enter the profession. In Australia, women engineers tend to leave the profession after about 10 years, using their skills in other careers. It is crucial to develop policies to retain these women especially as they start to have families and raise children.

The National Committee for Women in Engineering has developed a program ***GirlTalk*** which is designed to be delivered to school students to inform them about engineering as a career. A successful pilot has been delivered to more than 600 students, presented by women engineers. This program will be delivered nationally.

At University, there are Women in Engineering groups that provide support for students. Teaching methods and curriculum are also important and the National Committee has participated in discussions on strategies for female students and has made a submission to the current review on engineering education.

The National Committee for Women in Engineering also has ongoing programs to support women in the profession. Some of these include national conferences, such as those held during 2007 The Year of Women in Engineering. More importantly, the National Committee commissioned the development of materials for workshops specifically for women engineers. These seminars are important for developing skills for dealing with a male dominated workplace and future leadership among women engineers. These workshops were delivered nationally in 2007 and will continue in 2008. They include:

- ***Leading the Change*** - for women with 5 to 10 years experience
- ***Managing a Diverse Workforce*** – for engineering managers
- ***Women in Leadership Seminars*** – to encourage women engineers into leadership roles

The workshops are supported by several publications including:

- ***Engineering A Better Workplace – A Diversity Guide for the Engineering Profession,***
- ***Bridging the Gaps - the Careers Review of Engineering Women*** and
- ***Women in Engineering – Stories of Inspiration*** – showcasing the careers of women engineers

The National Committee also promotes the achievements of women engineers with regular articles in the Engineers Australia magazine which also discusses issues of interest. Importantly, Engineers Australia published the list of 25 Influential Women Engineers in October 2007 – providing essential role models for women engineers everywhere. This will be an ongoing activity and women will also be encouraged to nominate for the top 100 engineers in Australia.

Social networking is important to all women and Women in Engineering Groups in every Division of Engineers Australia organise these. These activities attract 100+ attendees for some functions. In particular joint activities with Young Engineers – badged as “Gen2X – Promoting Gender and Generational Exchange” are important for younger to interact with mature engineers as role models for their career life cycle. An Eminent Speaker Program, where a prominent engineer speaks about her career journey is also under development.

We are also supporting the Breast Cancer Awareness campaign through the Purple Boots Campaign which involves the purchase of purple safety boots.

The National Committee has developed a strategic plan for the coming years.

Our vision is that engineering becomes an inclusive profession which values, supports and celebrates the contributions of women in the engineering team.

Our mission is to :

- ***Attract women of all ages to engineering careers***
- ***Retain women in engineering***
- ***Support women through their engineering career***
- ***Celebrate the achievements of women in engineering***

In particular the National Committee is developing a tool kit for industry on family friendly policies to make it easier for women to balance their responsibilities between career and family.

The Strategic Plan and information on the National Committee is available from:
www.engineersaustralia.org.au/wie

About the Author

Dr. Marlene Kanga is a Chemical Engineer, specialising in Risk Engineering. She is a Chartered Professional Engineer and a Fellow of Engineers Australia. Marlene is Director of BT Risk Services which provides risk engineering and risk management services to organisations in the private and public sector. She is also a Director of iOmniscent Pty. Ltd., which has developed intelligent software for security and related surveillance systems.

Marlene is an enthusiastic advocate for engineering as a career and has been a member of the Engineers Australia National Committee for Women In Engineering since 2006. Marlene was Vice Chair of the National Committee in 2007 and is Chair of the National Committee for Women in Engineering in 2008. This Committee ran the very successful Year of Women in Engineering 2007. This project won the President's Award for Project Excellence and the National Engineering Excellence Awards in Canberra in November 2007.

Marlene is also a Councillor of Engineers Australia (2008-2009) and National Vice President for Communications and Marketing (2008).

Marlene is currently a member representative of Engineers Australia at INWES.

SENSIBILIZING TEACHERS TO GENDER EQUALITY : REALISTIC ?

V. Lizan-Esquerrétou

associate professor in mathematics, IUFM Midi-Pyrénées/Université Toulouse II-Le Mirail, Équipe « Genre et Éducation », president of the association *femmes et mathématiques*.

Type of presentation: Oral session

Abstract:

A way to increase the number of women engineers or scientists is probably to sensitize teachers, especially in mathematics, physics or technology, to gender equality. Anyway, this is not so easy to realize. First, we'll present what opportunities different official texts open in France at present time. Then, we'll present an experiment in Toulouse associating different partners, institutional or associative, scientific or specialist in gender and education.

Keywords : Gender and education

Cv:

Associate professor in mathematics (symplectic topology) since 1999
President of the association femmes et mathematics since September 2007
Member of the team "Genre et Éducation" (IUFM Midi-Pyrénées-Université Toulouse II-Le Mirail since January 2007

LEARNER-DIRECTED LEARNING FOR THE AFRICAN GIRL-CHILD IN STEM

Folake Olubunmi Akintayo

Department of Civil Engineering, College of Engineering, University of Agriculture
Abeokuta, Nigeria.

Type of presentation: Oral session

Abstract

In Africa, 50% of the population are women and are seriously under-represented in science, mathematics and engineering fields. These women are a resource that could contribute towards the social and economic development of the continent through participating in science and technology programmes. This informed the First African Union Conference of African Women in Science and Technology convened by the African Union Commission (AUC) in Johannesburg, Republic of South Africa from 29 -31 August 2007 with the mandate to address under-representation of African women in science, mathematics and engineering fields. One of their recommendations include restructuring and linking science curricula to every day life and making it more useful to the African environment and needs, improve the quality of science teaching and learning materials, and make them women friendly. One strategy of achieving this lies in finding ways to strengthen STEM education amongst girls in Africa. In line with this strategy, the Conference of Ministers of Education of African Union (COMEDAF) has included gender in the Plan of Action for the Second Decade of Education for Africa (2006-2015) which calls for greater participation of women and girls in science and technology at all levels of higher education.

Education is vital for Africa's growth and the growing understanding among women regarding the importance of education is essential for Africa's prosperity, as educating a woman is synonymous with educating a nation. Towards actualisation of the United Nations Millennium Development Goals (MDGs), a number of commendable initiatives have been undertaken by many Africa nations to increase the enrolment of girls for the universal primary education. In Nigeria, a pilot free-feeding school programme where lunch is provided for students is already in place in some government-owned schools. Free books are also provided in some cases to lessen the burden of parents and guardians, and encourage them to send their children and ward especially the girl-child to school. All-girls science academies are also springing up to train more girls in STEM to meet the technological manpower need of the nation.

However achieving greater participation of girls in STEM calls for a new orientation to learning tagged "learner-directed learning". Professor Jay W. Forrester in his book "System Dynamics and the Lessons of 35 Years", refers to learner-directed learning as a way of organising a school so that students work together in teams of two or three to cooperate in meaningful projects for which they must do research and creative thinking. Learner directed learning shifts the role of a teacher from being a dispenser of knowledge to being a guide and resource person. Students are no longer merely passive receptors of what the teacher says. Instead the students work together to help one another and to explore issues that are new to both them and the teacher. Learner-directed system calls for the cooperation of all the elements of the educational system for its success. The teachers should be willing to try unfamiliar ideas and at ease in the non-authoritarian learning environment, the school administration should be supportive, and members of the community should show their willingness in its success. Educational philanthropists without personal vested interest except with an overall desire to facilitate improved education, inspire teachers, find funding, arranges for computers should get involved. In the United States where it has been introduced, students have been reported coming early to class, working through lunch and at home voluntarily even with no assignment given.

Learner-directed learning is an open system in which specifications for implementation and operation is determined by an open, public consensus process. Cooperation with other students in local and remote schools is maintained in a manner that facilitates portability. The system is practicable at all levels of the educational system. It is particularly useful in helping girls in STEM throw away their inhibitions and develop confidence for success. Girls can work together in small units with their friends without fear of being condemned for their shortcomings. Their mental ability is tuned to problem solving techniques at a tender age. They are trained to identify areas of needs of their society, and proffer practical ways of addressing them. Confidence to achieve set goals as a team member is developed early in life. Mathematics the bedrock of science based courses is demystified since the girl-child determines her learning process. Learning is made more interesting and at your own pace. Learner-directed learning will particularly help the African girl-child to develop her full potentials in STEM and therefore contribute to the technological development of the continent.

Keywords: Learner-directed learning, STEM, African girl-child, Education, Gender

CV:

Folake O. Akintayo is a Lecturer in the Department of Civil Engineering, College of Engineering, University of Agriculture, Abeokuta, Nigeria and a Registered Civil Engineer with the Council for the Regulation of Engineering in Nigeria (COREN). She obtained the B.Sc and M.Sc degrees in Civil Engineering and Industrial Engineering respectively from the University of Lagos and the University of Ibadan, both in Nigeria. She is currently pursuing a Ph.D programme in the Department of Civil Engineering, University of Ibadan, Ibadan, Nigeria.

She began her working career in a public sector agency responsible for the development of infrastructures in Abuja, capital city of Nigeria before she moved to a consultancy firm where she participated in the design and construction supervision of many road projects. Her main areas of engineering practice are teaching and consultancy. She provides engineering services and training on computer aided design/drafting, instructs students in engineering courses, both theoretical and practical, as well as guide them in writing their dissertations as well as supervise them when they are on Industrial Attachment.

She is a member of the Association of Professional Women Engineers of Nigeria (APWEN) and the Nigerian Society of Engineers.

PERCEPTIONS OF FEMALE PRE-SERVICE TEACHERS TOWARDS THE TEACHING OF MATHEMATICS IN SENIOR CLASSES

Tasokwa Kakota

Lecturer in Mathematics, Basic Sciences Department, Bunda College, University of Malawi

Type of presentation: Oral session

Abstract

Female teachers act as role models to girls in school. Previous research has shown that girls who are taught mathematics by female teachers are motivated to work hard in mathematics. However, few female teachers teach mathematics in Standards 6, 7 and 8 in Malawian primary schools. Moreover, there are more female than male primary school teachers in primary schools especially in urban areas. This study investigated the perceptions of female pre-service primary school teachers towards the teaching of mathematics in senior classes.

To collect data, the questionnaire was administered to 100 female pre-service primary school teachers from St Joseph Teacher Training College in Dedza district. Among other things, they were asked about their mathematics background, experiences with mathematics teachers and their attitudes towards teaching mathematics in senior classes. The results revealed that most female pre-service teachers do not like to teach mathematics in senior classes because the topics are more challenging to them and they lack confidence. Most of them do not have self-efficacy to tackle mathematics in a challenging way. According to their experience, most of them were taught mathematics in senior classes by male teachers. The female teachers were only teaching mathematics in lower classes of primary school mostly standards one and two. Those with a good mathematics background were willing to teach in senior classes. The attitudes of mathematics teachers towards them in class had an impact on their performance in class. The mathematics background was good mainly among pre-service teachers whose teachers who did not underrate them in school.

From the results, it was concluded that there is a strong relationship between mathematics background, experiences and attitudes of female teachers towards the teaching of mathematics. Female pre-service teachers who were taught by female mathematics teachers in senior classes were encouraged to work hard in mathematics and were also motivated to teach mathematics in senior classes. It was also found that those who had a good mathematics background were willing to teach in senior classes. It is therefore the role of educators to ensure that a girl child has a good background in mathematics right from primary school. Teacher trainers, more especially females, should aim at changing the negative attitudes which have been instilled among female pre-service teachers by demonstrating that one can enjoy teaching mathematics. If female pre-service teachers can be convinced by their trainers, especially females, that mathematics is easy and interesting to teach at all levels, they will be eager to teach it. This is important because female teachers act as role models to girls in schools. My recommendation is that the Ministry of education should deploy more female mathematics teacher trainers to teach in teacher training colleges especially where they are female pre-service teachers. It is also important for women female scientist like mathematics lecturers in the university to teacher training colleges so as to motivate them and act as role models.

Key words: pre-service teacher, senior classes

CV:

Ms Kakota has a Bachelors degree in mathematics from University of Malawi and a Masters degree of arts in mathematics education from Virginia Tech and State University, USA. Ms Kakota has fifteen years experience of teaching mathematics at secondary school level, teacher training colleges and University of Malawi. Ms Kakota has also been involved in develop mathematics curriculum for primary and secondary school. Her main areas of research is gender issues in mathematics. Ms Kakota has presented research findings at local and international conferences. Ms Kakota has a passion with the performance of girls in mathematics.

USING POCKET PC TO ENHANCE TEACHING AND LEARNING OF PRIMARY SCIENCE AMONG GIRLS IN MAURITIUS – AN ACTION RESEARCH

Yashwant Ramma, Hyleen Mariaye

Mauritius Institute of Education

Type of presentation: Oral session

Abstract:

Women empowerment in economic and social life is tributary to their ability not only to become politically visible and active but, more importantly, to become significant contributors and producers of knowledge. This agenda can never be realized unless more women engage in science and technology careers. For a modern democracy like Mauritius, which is signatory of the UN Convention on Elimination of all forms of discrimination against Women, girls low uptake of Science, Mathematics and technology subjects can become a serious hindrance to open access to science and technology-oriented careers for women.

More so, gender differential in terms of educational attainment and achievement in Mathematics and Science is a concern for a number of African countries, including Mauritius. Despite sustained investment in education and remarkable economic progress, enrolment of girls in science, engineering and IT courses have remained low at university level. This trend follows the low girl enrolment in science and technology subjects at School Certificate and Higher School Certificate levels (Ramma, 2001) where a gender gap of more than 4% when balanced for initial entry gap. Similarly at primary level, despite the fact that, in terms of pass/fail rates, girls generally perform better than boys across all subjects, the fact remains that a larger percentage of boys score higher grades in Mathematics and Science.

Differential attainment and achievement in Mathematics and Science will help perpetuate the gender gap in terms of science and technology oriented careers. How do we break the circle? One potential area of intervention is to shape early school experience in order to orient more girls towards science and technology oriented career choices. Several studies (Scoter and Ellis, 2001) show a difference in both the use of and attitude towards computers and science between boys and girls. Boys continue to be fascinated by computers and use them readily both inside and outside the classroom without much encouragement. Girls are often fearful of machines and need guided encouragement in order to be successfully introduced to technology (Sefyrin, 2005).

Gender inequities have also been revealed in the teaching and learning of science at primary level. Studies have also revealed that girls experience less tinkering activities as compared to boys (Ramma, 2001).

The current project considers the teaching and learning of science using the pocket PC and analyses the impact on girls' attitude towards science and technology in general. The study, which is an action research, is geared towards providing girls with more opportunities for hands on experiences in science classes through the use of pocket PCs. The Pocket PC is linked with an interface that allows girls to use data logging sensors to carry out various activities during the science lessons or alternately during field work. The data can be processed by the appropriate software on the Pocket PC or sent to a PC through Bluetooth or Wi-Fi for later analysis together with the possibility of using the mobile Word software on the Pocket PC to prepare reports. The methodology that has been developed in line with girls' learning styles enables them to forge links between previous and new experiences.

The researchers also aim at developing science curricula based on an interdisciplinary approach necessary for engaging girls in constructing purposeful knowledge structures and helping them build positive predispositions to science and technology.

The preliminary findings have shown promising outcomes in terms of increased interest in science lessons and improved skills.

Ramma, Y. (2001), *A critical analysis of the performance of girls in physics at Upper Secondary Level in Mauritius*. Dissertation. MA Learning in Organisation, University of Brighton

Scoter J V, Ellis D. (2001), *Technology in Early Childhood Education. Finding the balance*. North West Regional Educational Laboratory

Sefyrin, J. (2005), 'Understandings of gender and competence in ICT' in *The Gender politics of ICT*. Ed. Archibald J, Emms, J, Grundy F, Payne, J & Turner, E., Middlesex University Press.

Key words: Pocket PC, interdisciplinary approach, purposeful knowledge.

CV:

Hyleen Mariaye is a senior Lecturer in the Department of Education Studies.

She currently services the research methodology and the foundations of education modules. She is involved in a number of science and technology curriculum projects related to ICT namely NEPAD E school demonstration project and Physics ICT data logging project.

MARIE CURIE AND SCIENCE EDUCATION II KAMISHIBAI - JAPANESE STORY TELLING WITH PICTURES –

Mizue Yamauchi, KISSHO

Representative, Science Studio Marie, Faculty of Science, Toho Univ. Chiba, Japan

Type of presentation: Oral session

Abstract:

“Science Studio Marie” launched a science show program consisting of KAMISHIBAI (the Japanese Story Telling with a series of Pictures) performance and experiment show for young children and sometimes their parents in 2002. Firstly, we have presented a story of Madame Curie by KAMISHIBAI. Emphasis is placed on her hard work in elucidating nature of radioactivity and leading her first female laureate of Nobel Prize, together with her husband Pierre Curie and Henri Becquerel. Experiments in the show are taken from Leçons de Marie Curie, notebook of her lessons of elementary physics for children of the class organized with her colleagues. Newly developed scientific KAMISHIBAI for young children based on her lesson will be also presented. Titles are “The Wind Blowing”, “The Air Bubbling” and “Would it Float?” Our audience includes both boys and girls, and sometimes their parents. We have noticed that both boys and girls, and parents excited and enjoyed at the famous legend of Marie Curie’s experiments’ KAMISHIBAI.

Reference: Leçons de Marie Curie, recueillies par Isabelle Chavannes en 1907, EDP Sciences, 2003, Paris, (Japanese translation was published from Maruzen Publishing Company, November 2004)

Keywords: KAMISHIBAI (the Japanese Story Telling with Pictures), Leçons de Marie Curie, Science Education, Women into Science and Engineering (WISE), Public Understanding of Science

CV:

Mizue Yamauchi, Kissho is a representative of Science Studio Marie, and a lecturer, Toho University. She graduated from Ochanomizu Women’s National University (in Physics), and a further bachelor’s degree in industry and technology from Japan’s Open University.

STRATEGIES TO ATTRACT GIRLS INTO STEM AN INNOVATIVE MODEL NORTH ALABAMA GIRL SCOUTS ENGINEERING DAY

Lisa Brunegraff

Society of Women Engineers North Alabama

Type of presentation: Poster

Abstract

Many opportunities are emerging for girls in Science, Technology, Engineering and Math (STEM) careers in both the public and private sectors. These new opportunities are reversing decades of trends and socio-cultural forces generally biased against women in technical fields and roles. Differences in career interest and development between boys and girls begin very early, and irreversible choices are often made subconsciously as early as the fourth grade. Thus, a key question is: How do we plant a seed of inquiry early enough in a young girl's mind so she can recognize and take advantage of the emerging opportunities?

The challenge is to develop a high quality, **sustainable** program for girls starting at age 10 through the senior year in high school. It must consider girls from many different social and economic backgrounds. The program must give these girls a broader view of engineering and science with an experience that helps them see science and math in the world that around them. Finally, it has to be fun.

This paper details how a creative concept started as an innovative small pilot program and evolved into a major success. The entrepreneurial technical community in North Alabama provided fertile ground and resources for creating a program to address such a need. Beginning in 2000, two women engineers and a Girl Scout leader in Huntsville, Alabama decided to address this need head-on. Searching through the Girl Scouts' available interest patches, several could easily be used to develop a sustainable, annual STEM Program.

A team effort evolved to make this program become a reality. First, in cooperation with the local Girl Scout council, we reviewed all GS policies and requirements. From this review a basic plan for a half day program was developed. This documented concept and plan was then presented to the local chapter of the Society of Women Engineers. Their enthusiastic endorsement provided the beginning of a wonderful partnership. Eventually, this initial concept became an annual Engineering Day. This partnership has been the key to developing a sustainable program.

In the first year (2000), SWE members from both the local student chapter as well as the professional level were recruited to facilitate a half day program. 22 girls participated from grades 7 through 12. The Engineering Day program met all the objectives. During these events girls from different backgrounds were exposed to the principles of engineering; given the opportunity to dialog with professional and student engineers; earned Girl Scout badges or Interest Project patches; developed confidence in their abilities and knowledge; and, most importantly, had fun.

Responses on surveys indicated how surprised, informed and excited the girls were over this first program. Informal feedback from the technical women also was enthusiastic.

Based on its initial success, Engineering Day was expanded every year. After the first year it expanded to two, one day events, two years later a weekend science and engineering experience was planned. In addition to Engineering Day(s), SWE has been asked to help facilitate a full week day camp to explore engineering and science at a local university. SWE is also currently partnering with Girl Scouts to help with workshops for Space Day sponsored by NASA and the U. S. Space and Rocket Center. The current expanded set of programs now has over 300 girls participating and earning patches annually. Based on participation rate, wait list, and requests for assistance, it is one of the most successful Girl Scout program in the North Alabama region and the most successful SWE outreach program.

The North Alabama Girl Scout/STEM Engineering Day is a model that can and should be replicated in many other communities. Requiring few resources, the program can easily be developed in a similar approach in any small-medium size city in less than one year. The paper concludes with lessons learned and the path ahead for the North Alabama area.

Key Words: technical career, women in engineering, SWE programs, Engineering Day, Girl Scouts

CV:

In 2007 Lisa Brunegraff was presented the Honor Pin a national award from the Girl Scouts USA. She was recognized for her ability translate her vision of what girls can achieve in Science, Technology, Engineering, and Math, if given the opportunity. Drawing upon her art and engineering backgrounds she helped develop activities that would appeal to the girls' creativity and provide tools for them to learn about engineering disciplines. Her dedication provides sound programming to local girls, while meeting the challenge of STEM initiative.

Lisa has a B.S. Mechanical Engineering, University of Alabama in Huntsville, a B.A. Education, University of West Florida. She has 20 years experience as a Mechanical Engineer, including 14 years as a NASA contractor. She served as payload coordinator between research organizations and astronaut team for NASA. She was a Task Team Lead for a microgravity furnace test article. She is currently working for Sikorsky Aircraft as a senior staff engineer

Awards and Achievements are 2007 Girl Scouts Honor Pin Recipient, Group achievement Award: RS-84 Developmental Engine Team.

Member of developmental team for Brigman Unidirectional Dendrites in Liquid Experiment (Patent Pending)

She is a Member of the Society of Women Engineers

Adult Advisor for Girl Scouts of North Alabama.

AN INVESTIGATION INTO GENDER INCLUSIVITY IN THE CIVIL ENGINEERING AND FORENSIC SCIENCE CURRICULUM

Liza van Zyl, Mary Ayre, Sue Stocking

University of Glamorgan, Pontypridd, United Kingdom

Abstract:

We report on a project to investigate whether the dramatic differences in female participation in undergraduate engineering courses as opposed to forensic science courses can be partially accounted for by differences in the gender-inclusivity in the respective courses' curricula.

Women are still severely under-represented in higher education engineering disciplines in the United Kingdom. Nationally, only 16% of UK engineering students are female, and in the University of Glamorgan's BSc Civil Engineering course only 10% of the students are women across all years of the programme. Nationally there is also an imbalance in the mathematical and physical sciences, where about 40% of students are female. In marked contrast, the proportion of female students in Glamorgan's Forensic Science course is 70%.

An inclusive curriculum is recommended as a strategy to improve the retention, progression and success of under-represented social and cultural groups, including women students in engineering and the physical sciences. Research has shown that teaching in these disciplines tends to be male-oriented, and that some women students feel uncomfortable and to some extent excluded, resulting in either withdrawals or underachievement.

A gender-inclusive curriculum aims to include the interests, and cognitive and learning styles, of women in an otherwise 'masculine' curriculum. Importantly, another outcome of an inclusive curriculum is that all students benefit from the greater variety of learning, teaching and assessment methods employed.

The question arises as to whether approaches to the teaching, learning and assessment of Forensic Science students at Glamorgan contribute to the success of this course in attracting and retaining female students; and if so, to what extent the Forensic Science curriculum reflects the recognised characteristics of a gender-inclusive curriculum: a curriculum which acknowledges and incorporates the differing interests and approaches to learning between males and females.

This study compares the understanding and practice of a gender-inclusive curriculum in engineering and forensic science at Glamorgan. It will identify differences in their curricula which may account for the differences in female representation on these courses, and make recommendations for improving gender-inclusivity in the curriculum in these disciplines.

This project has two components: The first part of the project investigates the perceptions, understanding and practice of gender inclusivity in the civil engineering and forensic science degree programmes at Glamorgan, in order to develop insights into the reasons for the dramatically different levels of female participation in these courses. The second part of this project will be to implement curriculum development based on our findings: we will work with engineering and science staff (whose support we have already enlisted) to enhance gender inclusivity in the curriculum of selected courses. Ultimately we hope that a successful pilot project will be followed by a roll-out of a full inclusivity review and enhancement across engineering at the University of Glamorgan.

Any project that is able to enhance the participation and retention of women students in engineering is highly desirable. However, making the engineering curriculum more inclusive will not benefit just a minority of women students. Firstly, a more inclusive curriculum benefits all students because each student, whatever their gender or background, is an individual with different strengths and weaknesses, and a more inclusive curriculum has a greater variety of different learning, teaching and assessment methods that benefit a greater number of students. Research has shown that increasing the gender inclusivity of engineering and science curricula benefits all the students on the courses, not just the women. Secondly, engineers are required to operate in an increasingly multicultural world and employers require us to provide graduates who are comfortable and capable of working with people of a great multitude of backgrounds. Enhancing gender inclusivity in the curriculum is a big step towards this goal, because it exposes students to an alternative cultural context to the dominant culture of engineering and enables them to broaden their horizons.

Keywords: curriculum; gender inclusivity; civil engineering; forensic science

CV:

Dr Liza van Zyl is the Inclusive Curriculum Officer at the University of Glamorgan. She has a strong interest in researching and developing good practice in increasing the participation of groups traditionally under-represented

in Higher Education, including the under-representation of women in science and engineering. Her remit as Inclusive Curriculum Officer is developing good practice in learning, teaching and assessment with a focus on inclusivity, and this project is very much a part of that remit. She has a proven track record of peer-reviewed published research in the field of Astrophysics.

A CHANGING WORLD: REVISING THE STATICS COURSE TO PROVIDE NEW OPPORTUNITIES FOR WOMEN ENGINEERS

Rosser Sue, Laurence Jacobs, Janet Murray, Wendy Newstetter, Christine Valle
Georgia Institute of Technology

Type of presentation: Poster

Abstract:

Science and technology remain a white male bastion in the United States, as well as much of the developed world, resulting in a dearth of men of color and women in some of the higher paying jobs in an increasingly technologically-drive economy, as well as in technologies that fail to reflect women's and many of society's needs in their design and use. Many students from underrepresented groups who initially desire to major in engineering and technology, lose interest and confidence after taking the introductory gate-keeping courses. This poster depicts a \$900,000 National Science Foundation (NSF) funded project to transform the gateway course to most majors in engineering, Statics, to make it more attractive to women and to men of color.

Difficulty in model-building, a major concept in Statics, can cause a lack of confidence and a diminished sense of self-efficacy that is particularly problematic when amplified by being an under-represented minority because of gender and/or race/ethnicity. Results of feminist pedagogy and studies in effective science learning also document that men of color and women are more likely to do well when problems are placed in a context of real world usefulness. An approach to teaching the learning Statics that scaffolds students' efforts at model building, connecting abstract problems with multiple real world applications, including those from women's experiences, should benefit all students, particularly making engineering more attractive to women.

The foundational engineering course, Statics, introduces a unique approach to problem solving, which is characterized by model-based reasoning. The major intended course outcome is for students to develop the ability to create and utilize free body diagrams as a mechanism for describing and constraining a problem. This ability to abstract and define an idealized problem from complex objects in the world or textual descriptions ratchets the engineer's ability to solve the problem. Sadly, however, students routinely leave this course having learned to "plug and chug" or jump to a mathematical equation without first defining the problem in a diagrammatic form that articulates the underlying principles. This can lead to serious problems in future courses as the fundamental approach to engineering problem solving has not been understood or embraced. As a foundational course, difficulties here can impact student academic confidence resulting in a diminished sense of self-efficacy that is particularly problematic when amplified by gender and under-represented (URM) minorities issues. And such faltering so early in the major can cause a student to leave engineering.

While difficulties in the course arise for several reasons, our project seeks to address the problem of context. Our hypothesis is that women and minorities particularly, and students generally, are more likely to do well in statics when the problems are placed in the context of real world usefulness. An approach to teaching that effectively scaffolds students' efforts at model building and connects abstract principles/concepts to real world, every day applications will benefit all students while promoting diversity in engineering. Towards that end, we are developing InTEL (Interactive Toolkit for Engineering Education), a computer-based manipulable environment that supports teaching and learning in statics by mapping images from real-world environments to abstract diagrams for 2D and 3D equilibrium problems. With such digital technology, statics professors will be able to offer students important scaffolding for developing model-based reasoning by contextualizing abstract concepts and principles in lifelike models. Interacting with and manipulating these models will help students develop the kind of intuition that characterizes engineering reasoning and problem solving. Our ultimate hope is that this changed course will provide new opportunities for more women engineers in the technologically changing world.

Keywords: Engineering, Statics, Women, Virtual diagrams

CV:

Sue V. Rosser holds the Ivan Allen Dean's Chair of Liberal Arts and Technology at Georgia Tech where she is also Professor of Public Policy and of History, Technology and Society. She has authored over 120 journal articles and 10 books on theoretical and applied issues of women, gender, science, technology, and medicine.

SINGLE SEX EDUCATION IN INFORMATION TECHNOLOGY – EXPERIENCES AND PERSPECTIVES FROM GERMANY

Gerlinde Schreiber

Hochschule Bremen, Internationaler Frauenstudiengang Informatik

Type of presentation: Poster

Abstract:

The International Women's Degree Program in Information Technology at the Hochschule Bremen, University of Applied Sciences, constitutes the only single sex program in computer science at a German university. It was established in 2000 with joint financial support of the German Federal Ministry of Education and Research and the State of Bremen. After a five years' period of evaluation the program is now successfully established as part of the faculty of electrotechniques and computer science. The paper discusses the current situation and the perspectives of the program.

Starting conditions

In the public opinion in Germany single sex education is considered to be behind times. All girls'schools and boys'schools have been transformed to co-educative schools in the seventies. Now there are only confessional schools offering single sex education.

With the end of monoeducation at schools the number of female students in the natural and in technical sciences decreased. Studies showed that a significant percentage of the female students in chemistry for example had come from girls'schools. So might there be an advantage in single sex education?

In the eighties the „informatica feminine“ was established at the university Bremen as a summer school for female participants only. The success of this idea was another argument to establish a whole women's degree program in computer science in Bremen.

Nevertheless prejudices concerning single sex education remain. The two most widely spread in Germany are as follows

- A women's degree program in computer science is less ambitious and provides a minor qualification than a co-educative program. Why? Women decide for a single sex program because they are not able to work on the same level as men.
- A women's degree program in computer science can't qualify the students for a successful professional career because the computer science world is male – and women in a single sex program obviously refuse to cooperate with men.

These two prejudices contradict each other. Nevertheless they coexist permanently.

Students attracted

The evaluation during the first five years yielded the following characteristics of our students. They differ widely in age (from 18 to the beginning of the forties) and in qualification (from just leaving school to IT professionals without academic certificate). Most of our students judge their own knowledge and qualification to be low-level – though it is surely not worse than in a peer male group. Our students spend less time with gaming and with gambling around in the internet than a peer male group. A large rate of our students has got a migrational background, primarily from eastern europe, Arabian states and Africa.

The overall rate of female students in our faculty has risen from 5% before the start of our programme to 20% now.

Characteristics of the program

The International Women's Degree Program offers an education in application-oriented computer science. We emphasize work in projects with partners from different scientific or commercial areas. These vary a lot, examples are museums (concerning the use of multimedia mobile devices to convey information), shipping companies (concerning logistic questions) or arbitrary commercial databases and their robustness concerning hacking attacks.

The evaluation of the program as well as the experience during the first years has shown that our students don't like to spend time on searching, installation and test of new software. As most male students do so this difference in behaviour leads to a seemingly difference in knowledge and experience. Therefore we added the topic „search for useful software“ to our curriculum. As well we offer installation parties in the first semester to make sure that all students are the masters of their computers.

About 15% of our students have got children. They need flexible access to learning material and we offer e-learning support to all classes.

The program incorporates one term spent abroad at one of our partner universities. Our students appreciate this opportunity much more than they male colleagues in the other computer science programs. In the international term our students join coeducative classes at the partner universities.

The students are obliged to work for three months in a company. For many students their bachelor thesis or their first job arise from this practical course.

Acceptance of the program

Considering the acceptance of the program we have to regard different groups and institutions.

- Our students:
In Germany it's not popular for women to study computer science. It is even less popular to study computer science in a single sex program. The students are tired of all the comments they know quite well and they avoid discussions. The questions of others seem to mingle with their own doubts. At the end of their study the situation changes and our students are really self-confident. They know that they have worked successfully in a foreign country as well as in an IT company. According to our evaluation they think it was a good decision to have studied in the single sex program.
- Potential new students
The interest in computer science studies is not increasing in Germany, though there is a high rate of free jobs. Therefore the acquisition of new students for our program requires constant efforts. Especially we try to improve the contacts between our advanced students and schools. For example we offer a class for school girls on computer science taught by elder students once a week in the afternoon.
- Companies
When finishing their studies all of our students can decide among different jobs. The fact that they have received their degree in a single-sex program doesn't seem to be a problem at all. Either this fact calls the attention of a company and yields an invitation or the potential employer is much more interested in other information on the candidate.

Perspectives

Though the program has proved to be a success we are in no stable position. As soon as both the financial resources and the number of applications decrease the whole program is questioned.

Keywords: equal opportunities in IT education: experiences and perspectives from the international women's degree programme in computer science, hochschule bremen (the only single sex computer science programme at a german university)

CV:

diploma in computer science in 1985,
employee at Siemens,
dissertation in 1994,
professor at the international Women's Degree Programme in IT since 2003

Gender in Science, Technology and Mathematics (STM)

Promoting the girls participation in science and technology education

The Summer camp of Excellence in Science, Mathematics and Technology for young african girls

A the beginning of the 21st century, the control of science and technology is the prerequisite to ensure a lasting development. We should here recognize the essential role of women in development through education, in particular by supporting the blossoming of the girls' talents by a scientific and technological education of quality. To reassess the importance of the education of girls, it is to prepare the future with more optimism. George Hardy wrote in 1913 : "a boy at the school is a gained unit but a girl at the school, is a unit multiplied by the number of children she will have". The education of the girls does not benefit only to the girls but to the whole family and to the community, in large. It contributes to the development the nation

But also UNESCO through its project 2000 + invested much for the promotion of the scientific and technical education of girls in Africa and helped to create the African network of the scientific women and engineers .

We organised several national and international actions in Senegal and in different countries in Africa. I would quote some of them :

- With the Pathfinder Foundation of Doctor Cheick Modibo DIARRA, we organize since 8 years the "excellence camps" in sciences for the african girls
- With the Word-Links project in collaboration with FEMSA (Femal Education in Mathematics and Science in Africa), we organized a cyber scientific camp for the 40 best girls who have the Secondary education certificate of Senegal. These girls are sponsored by Her Excellence Mrs Viviane Wade, wife of President of Senegal. The camp was held during two weeks in September 2001 in Goree Ireland.
- With the Ministry of Education in partnership with FAWE (Forum For African Women Educationalist) we organized a Camp of Excellence for 70 girls of Senegal, Mali, Burkina Faso and Cameroun.
- With the FAWE we organized a camp of excellence for these 100 stock exchange.

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Presentation of “The camps of Excellence in Science and Mathematics for Young Girls”

Context and objectives

In order to cultivate an enduring culture of excellence in schools across the continent of Africa :

We organize every year for the Pathfinder Foundation of Doctor Cheick Modibo Diarra a summer camps for young girls who have distinguished themselves in their respective country in a field of science. “Excellence camps” for older secondary school pupils studying science. It's a way to motivate them, give them a chance to acquire extra knowledge and to give the best of them a shot at getting into the world's most prestigious universities. The camps are held in summer and last three weeks. Since 2000, we've held them in a member-country of the West African Economic and Monetary Union (Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, Togo) , Mauritania, Guinea

The first Camp was held during August 2000 in Mali. During that time they attended mathematics, physics, biology, and computer science classes. This first experience showed the organizers how such Camps could be used as powerful tools for regional and continental integration of Africa.

During the subsequent Camps, held in 2001 in Dakar (Senegal); 2002 in Yamoussoukro (Côte d'Ivoire) 2003 in Rabat (Morocco), 2004 in Goree Island (Senegal) ,2005 in Ouagadougou (Burkina Faso) ,2006 in Niamey (Niger) and 2007 in Porto-Novo 40 girls from 11 countries met for 21 days to study mathematics, biology, computer literacy, physics, and leadership.

The venue of the Camp rotates between the countries that elect for their students to participate in them.

These students are of the 11th grade level and will be trained to succeed their last year of high school with grades that afford them admission into the best universities in the world. The Foundation signed Memoranda of Understanding with the department of education of the concerned countries in order to choose the best girls in science and also to secure scholarships for the graduates of the Foundation Summer Camps. They also have to choose the best teachers in scientist fields.



The opening ceremonies of the camp

1 –Speeches of the President of the Pathfinder Foundation , The representatives of the country and the representative of the girls.



2 –The opening ceremony is finished at every time by a cocktail offer to the participants and to the guests, in one of the hotels of the town.



Sequences of the camps

The school activities unfolded during the whole camp, and allowed the girls to reinforce their capacities in important chapters for the class of final one in order to be better armies in their preparation for the Baccalaureate. They were trained in Mathematics, Physics and other. And they always had to do homework on each pattern.



The recreational Activities

The girls visited some scientist and tourist sites of the country and after the visit they had to do a summary of they had seen.



The launches and dinner debates

The debates have as principal objective to give rise to the interest of the girls for the sciences and the technology. The lectures are animated by scientific women or women having a definite leadership.

At every lunch and dinner we invited scientist women who did a communication on their degree course. We aim to show to the girls that they can succeed in their studies even if they are girls and meet many problem of discrimination. So these women also try to explain how they alloy their professional and social activities, for example doctor and mother. After they allowed the girls to ask them some questions.



The subjects of studies

The proposed activities of the camp was mostly inspired by the subject of the camp : Water, women problems and allowed the blooming of the girls in a friendly mood.



The subjects of studies (suite)



Other activites :

An evening presentation of the countries of the taking part.

Every delegation presents his country. That was the occasion for the girls to carry the held traditional of the country of origin, to sing the national hymn of his country, to exchange with the others and show us their customs



The cultural evenings

On each country we have visited, local cultural groups as musicians were invited



The evenings birthdays

The birthday is a family party. Those taking part to the camp who were born in August will not be able to celebrate their anniversary in their country or family. So The new family created by the camp offers them a framework in favor of this party. We share cakes and dance all the evening.



Evening « National Party »

The national party of the countries of which certain participants are native that coincides with the period of the camp is marked in a manner very special at the level of the restoration, musical organization or of another manner. This year this is the welcome country of the camp, the Ivory Coast Republic that the girls of the camp had the honor to celebrate.



The closing ceremony



The End of the Camps

The end of the camp is a very emotional moment because the girls had spent three weeks together, sharing foods, beds, cultural experiences and visiting the country and whenever the camps ends, they all have difficulties to get back home. They cried and refused to go at the airport to take the plane. But we explained them that this moment is only the end of the camp but it can also be the beginning of the new friendships between them and they only have to phone, write email or visit each other. That's why they all get an address book with the phone numbers, email and other information of each member of the camp so that they will be able to keep up their friendship in the present. In the future, they will be a way of regional integration when they will be doctor, minister, engineer because if one Senegalese engineer will need to go to Lome to discuss about a local project she will call or mail her Togolese friend so they will work together.

Productions of the young girls

JOURNAL DU CAMP - N° 1 DU 04 AU 25 AOÛT 2007



L'ECHO DU CAMP

8ÈME CAMP D'EXCELLENCE 2007 PATHFINDER PORTO - NOVO (BENIN)

DEMARRAGE SUR DES CHAPEAUX DE ROUE

Le lundi 06 août dernier, ce fut l'ouverture du 8^e camp d'excellence scientifique pour jeunes filles africaines de la Fondation Pathfinder du Dr Cheick Modibo Diarra



À l'ouverture : ici, le Vice Président de Pathfinder Sékou Diallo avec la Ministre Béninoise de l'Enseignement Secondaire.

(astro-physicien malien). Ce camp se déroule du 4 au 25 août 2007 au centre songhaï à Porto-Novo au Bénin.

Il est sponsorisé par : TVS, UNESCO, BID, BCEAO, Fondation Ecobank, UEMOA et ISESCO.

Les heureux invités étaient : Mme la ministre de l'enseignement secondaire et de la formation professionnelle, Mme la ministre de l'enseignement primaire et des langues nationales, Mr le Directeur de l'enseignement secondaire, Mr le Vice-Président de la fondation Pathfinder. Ces membres ont bien voulu honorer de leur présence la cérémonie d'ouverture du 8^e camp qui s'est déroulée dans une salle de conférence de l'Ecole régionale supérieure de la magistrature à Porto-Novo. 42 filles originaires de 11 pays différents à raison de 12 béninoises et 3 filles pour chacun des 10 pays suivants : Burkina Faso, Côte d'Ivoire, Guinée Bissau, Guinée Conakry, Mali, Mauritanie, Niger, Sénégal, Tchad et Togo. La cérémonie a débuté par des chants et danses folkloriques du Bénin. Juste après, ont commencé les discours des honorables invités. Ils ont tous insisté sur les bénéfices de la culture de l'excellence en Afrique et exhortent les participantes à travailler pour atteindre les objectifs fixés par les fondateurs de Pathfinder. La cérémonie a été clôturée à 12h35 par un cocktail.



(Suite page 3)

Editorial

Le huitième camp d'excellence Pathfinder se déroule du 04 au 25 Août 2007 au Bénin plus précisément à Porto Novo dans l'enceinte du centre songhaï, il regroupe des jeunes filles de 11 pays africains. A l'ouverture, nous avons eu l'honneur d'être avec les hautes personnalités du Bénin qui nous ont prodigué quelques conseils. Le 13 août 07 le Docteur CHEICK MODIBO DIARRA (président de la fondation Pathfinder) accompagné de Mr Djondo (président de la fondation ECOBANK) avec Mr Nzamujo (fondateur et directeur du centre songhaï), nous ont parlé de leur parcours et ce qu'ils attendent de nous jeunes filles de Pathfinder. Nous, rédactrices de ce premier numéro du journal « l'écho du camp », vous souhaitons une très bonne lecture et espérons que toutes les filles de ce 8^{ème} camp d'excellence resteront unies à jamais.

La rédaction



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Productions of the young girls (suite)



8^{ème} CAMP D'EXCELLENCE POUR JEUNES FILLES AFRICAINES

Porto-Novo (Bénin) du 04 au 24 août 2007

Édition 2007
Porto-Novo - BENIN
(site : Centre Songhaï)



Annuaire du Camp



Adress book of the summer camp

SCIENCE, TECHNOLOGY, SCIENTISTS: WHAT DO UNIVERSITY STUDENTS SAY? RESULTS FROM AN INTERDISCIPLINARY ENQUIRY AT PADUA UNIVERSITY.

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Dept. of Information Engineering, University of Padua, Italy

¹ Dept. of General Psychology, University of Padua, Italy

Type of presentation: Poster

Abstract:

Part of a wider interdisciplinary project aimed to critical assess factors which are inter-related and linked to the *leaky pipe* phenomenon - i.e. the progressive decrease in the presence of women in science and technology at growing levels of the formative and professional route -, the present intervention focuses on the representations of science, technology and scientists shared by university students enrolled in the Faculties of Engineering and Psychology of the University of Padova, Italy.

In the last few years, a team composed of women scientist working at the University of Padua in different scientific areas – social psychologists, information engineers, historians, sociologists - advanced a proposal in order to deepen knowledge on, and to provide an overview of, the components fostering the enquired phenomenon.

We noticed that the ultimate utopia of excellence in science research is one where gender issues have been resolved allowing the best human resources, both feminine and masculine, to develop science and its applications to the highest standards possible [Etan Report, 2000; Enwise Report, 2004]. As the situation is today, more women than men start out as undergraduates, obtain a degree and then drop out through the career path (the leaky pipe) leaving males in majority. This trend suggests unequal opportunities for women in science careers and high-tech employment. As regards scientific faculties, ISTAT shows that the percentage of women entering a scientific faculty is still very low, even worse is the percentage of women at the engineering faculty: for instance, about 18% in Padua University (2007).

As far as women's careers in scientific faculties are concerned, data collected in various European countries show that women are under-represented in high-level careers, the percentage ranking from 5% to 18% [Badaloni et al, 2007].

The main aim of the present investigation is to explore the relative weights of different factors related with women's presence in scientific and technologic careers, such as: gender stereotypes (e.g. masculine=competent, etc.); occupation stereotypes and expectation; gender-biased communication; self-exclusion conditioned to the imaginability of the choice ('I am not interested in' vs 'I am not able'); influence of family: implicit models in educational settings; employment prospects; nepotism and patronage, i.e. relationships (e.g. group, family, lobby, etc.); 'old boys network'; work/life balance; historic and epistemological factors inside scientific thought and practice.

These various factors may interact giving place to a complex network. Aim of the project is thus to explore the way in which "science", "scientific knowledge" and "technology" are socially constructed and the powerful effects of this construction on individual choices and possibilities.

The theory of social representation appeared to be our most suitable theoretical framework. Social representation is defined as a form "of knowledge which is socially elaborated and shared, and which has the practical aim of constructing a common, social reality" [Jodelet, 1989, p.36]. To become an object of social representations, an *issue* has to exist, framed in a specific *context*, socially *shared* [Farr & Moscovici, 1984] and in presence of *polymorphism*, with different features, values and voices given by different groups [Moliner, 1996]. In our case, our aim is to explore how young women and men of different disciplinary fields construct their "knowledge" with reference to the issue.

To this purpose, in a this first stage of the enquiry, a paper-&-pencil instrument has been submitted to university students, meant as young researchers potentially devoted to science and technology.

Method

Participants

Nearly two hundred respondents (N=194) took part in the research: The participants are university student most equally subdivided in Engineering and Psychology. Various specialization were chosen, with different gender ratio: Biomedical versus Mechanical Engineering, on the one hand, and Social & Work versus Clinical Psychology, on the other. Data were collected in the late spring of 2007.

Procedure

The instrument is composed of various sections. The first is a free associations exercise aimed to detect the content of the representation and its representation field – i.e. the symbolic and emotional texture relative to the topic: participants were asked to write, in words or brief sentences, what the stimuli "science" "technology" "scientist" (in the two Italian forms "scienziato" and "scienziata").

A section follows in which participants are asked to say whether they know gender studies and how, as well as to answer some "tricky questions" regarding the authorship of important scientific discoveries (e.g. the question "Einstein is widely in debt with his wife, Mileva Maric, a mathematician, for the formulation of the theory of relativity": is this true or false?). Further sections comprise questions regarding some of the before mentioned factors: perceived influence in academic and working life, presence of models in scientific career, expectations and foreseen strategies as regards life/work balance, values, as well as career expectations and desired economic standards.

Preliminary Results and Conclusions

Data are at present under further analysis. Preliminary ones show tendencies which we might resume as follows. Information on the issue - in terms of content of the representation – appears to be meagre and gender biased. Academic expectations and foreseen economic access are strongly differentiated by gender. Social influences in past (academic) and future (occupational) choices are little recognised; models (both men and women models of scientific career within the relational circle) are rarely present as well.

The representation fields of science and technology result well articulated but not too intriguing, as with some missing in terms of interest and emotional involvement: features of risk, threat, coldness, rigidity suggest quite a distance between the scientific and technological universe and personal perspectives of potential young training researchers.

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Keywords : Gender, Stereotypes, Social Representation, Science, Technology

CV :

Silvana Badaloni earned her degree in Physics from the University of Padua and is Associate Professor at the Faculty of Engineering, University of Padua. She is teacher of a Course on Artificial Intelligence. Her main interest of research concerns Artificial Intelligence. Since 2003, she is a component of the Equal Opportunities Committee of the Padua University and she addresses gender studies in the field of Women and Science. She is an active member of the Italian Association Women and Science. She organized the 3rd Conference Women & Science WS'06, held in Padua in September 2006.

THE ENTANGLEMENT OF GENDER AND PHYSICS: BEINGS, KNOWLEDGES AND PRACTICE

HELENE GOETSCHEL

Centre for Gender Research, Uppsala University, Sweden

Type of presentation: Oral session

Abstract:

Feminist and gender studies in natural science and technology have been carried out since the 1970s. Already in the first half of the 1980s ground-breaking studies emerged, in which female physicists, like Rosemarie Ruebsamen and Elvira Scheich in Germany, specifically dealt with their own scientific disciplines. By now an international array of researchers pertaining to many different fields such as physics, philosophy, sociology, science research, history, literary studies and other areas of research have examined players as well as organizational structures, objects of knowledge and theories, the imparting and the popularisation of physical sciences from a gender(ized) point of view. They are exploring the possibilities, ways and means of applying to the field of physics research relevant approaches, methods and theories that have been developed in other disciplines and trans-disciplinary areas. Taking US-American historian of science Evelyn Fox Keller's systematization of feminist and gender studies in physics into account I suggest the following three levels of analysis: (i) Players and organisations in physics, (ii) Gender analysis of physical knowledge, (iii) Gender-equal production and teaching of physical science.

Anyone aiming at relating physics to gender should inspect the working life and conditions that male and the few female physicists encounter when they work as researchers, designers or educators. Such investigations had been in part instigated by physicists themselves. Historical and sociological studies explore the situation of women (and men) working in the field of physics. Statistics reveal that the proportion of female physicists being employed in industry, at the university or in research institutes outside the university as well as in the individual subsections of physical science vary considerably. International comparisons show that the low share of women in western industrial countries is not to be taken as a natural fact. Work on female physical scientists is being carried out in both, historical and biographic studies. There are also works on historical couples in physics, on the occupational group of professional female physicists, on individual research institutes and on the networks of female physicists. At first sight, there appears to be no interface between physical knowledge and gender. Equally, no gender can be assigned to the objects of physical investigation and their formulas and laws. People doing physics admit that language and theory development can mirror socio-cultural influences such as the naming of a planet "Venus" or the description of the "virgin state" of matter in magnetism. Yet, in physical logic such terms are viewed as being merely an inspirational matter or trivial names of physical facts rather than part of the core explanations of the discipline. A cross-disciplinary viewpoint, though, reveals that (i) physical knowledge makes statements about gender, (ii) societal notions of gender feed into the description of the world and (iii) epistemological reflections on physics relate to gender.

Many feminist researchers doubt that it is possible to develop a new type of physics. In the respective literature there are mainly two strategies being discussed as hopeful moves in the right direction: One is the integration of gender aspects into research on physics, for instance, into the history of physics or physical science education and produce a long-term effect on the discipline's culture or even the physical knowledge itself. The other is the concentration of physical and gender competencies via trans-disciplinary research questions and research teams respectively. In my paper I would like to explicate these three levels of gender and physics and illustrate them with examples of fundamental studies of physics research. With this introduction I hope to make more physicists curious about this cross-disciplinary field and to inspire them to enrich gender & physics with their competence and experience.

Keywords: Gender, Culture, Natural Sciences, Physics

Cv:

I studied physics, history of science, social science, higher education and gender at Universities in Tuebingen and Hamburg/Germany and hold an MSc (Diplom) in physics and a doctoral degree in social history (Dr. phil.). The title of my PhD thesis reads as follows: women scientists and engineers as" part of the german women's liberation movement. Between 2002 and 2006 I worked as a postdoctoral research fellow on "degendering science. Extending conception and curriculum of the natural sciences" at the Institute of Science Education, Faculty of Education, University of Hamburg. Since 1997 I have been working as an assistant lecturer for <gender & science> at faculties of natural sciences and social sciences both in Germany and abroad. In winter 2007/2008 I was guest professor for <gender & science> at the Faculty of Chemistry of the Technical University of Kaiserslautern/Germany. Right now I am a visiting researcher at the Centre of Gender Research at the University of Uppsala in Sweden. I do research on <gender and physics> in the Excellence Programme <genna nature culture boundaries and transgressive encounters>

BIAS LITERACY AS A POLICY STRATEGY

Ruta Sevo¹ and Daryl Chubin²

¹Independent Consultant ²American Association for the Advancement of Science, Center for Advancing Science and Engineering Capacity

Type of presentation: oral session

Abstract:

In any professional field there are “literacies” or basic skills and knowledge that give us the ability to be effective and influential. Those working in the field of diversity programs in education such as the problem area of women in science and engineering are engaged in a cross-cutting field of knowledge. There is no one academic field that covers all of discrimination, sex differences, and gender gaps. It is studied by brain researchers, cognitive psychologists, career psychologists, organization sociologists, workforce analysts, anthropologists, and education and learning specialists. It is hard to be an expert in the research base behind our assumptions, our arguments, and our programs. However, we can try to learn and utilize what we will call Bias Literacy – a familiarity with core concepts from social science research in the United States that provide the evidence for discrimination and provide a consistent vocabulary for describing the problem and answering basic questions.

The slide presentation, with a handout, will describe core concepts and cite core literature as a toolkit for people in the field making the case for women in engineering programs. The outline constitutes a proposed “bias literacy” for everyone who participates in the discourse on discrimination but typically does not read the whole gamut of social science research literature.

The presentation will summarize the difference between tradition and bias, conscious and unconscious discrimination, overt and covert discrimination, and personal versus institution bias. Drawing on research in psychology and social science, it will summarize core concepts including: gender schema, cumulated disadvantage, stereotype threat, implicit bias, glass ceiling, mommy track, occupational segregation, statistical profiling, climate study, and the value of diversity in learning. It will cover several approaches to measuring whether discrimination is occurring and how improvements are benchmarked. Finally, the paper briefly outlines some of the ways individuals and organizations have sought to eliminate or reduce bias.

The goal of the presentation is to promote a common core vocabulary and a basic knowledge base for scientists, education practitioners, and policy people in the discourse on women in science and engineering. It is hoped that the presentation will help them be more persuasive and powerful in their professional life.

Keywords: research on discrimination, bias against women, discrimination concepts, evidence for discrimination

CV:

Ruta Sevo served as Senior Program Director for the program Research on Gender in Science and Engineering at the National Science Foundation from 1998 through 2005. The program goal is to increase the participation of women in science and engineering through innovation and research in education. Dr. Sevo managed funding at the level of \$10 million per year and oversaw about 150 grants in amounts from \$100,000 to \$1.5 million. During her tenure she read over 1000 proposals, covering social science research, educational interventions, and evaluation. Before that, she was an executive level information technology manager and specialist for over 18 years at the National Science Foundation and the Library of Congress. Her education includes two Masters and a Ph.D. from the University of Chicago. She is currently consulting on technical projects and grant writing.

INDIVIDUAL AND INSTITUTIONAL STRATEGIES FOR THE ADVANCEMENT OF WOMEN IN SCIENCE AND ENGINEERING

Jane Daniels

Program director, The Henry Luce Foundation

Type of presentation: Oral session

Abstract:

For many years the primary strategies required for female students and faculty members to advance were through personal adaptations to the teaching and research styles of their male professors and colleagues and to academic environments that were sometimes incompatible with their individual preferences. In the early 1960s and before, there were few women in the sciences or engineering, and no one seemed to think there was a problem. In response to several pieces of legislation in the United States (e.g. the Civil Rights Act of 1964, The Women's Educational Equity Act, and Title IX Education Amendments in 1972), the 1970s created awareness of the dearth of women in sciences and engineering. Modest funding was available from The Women's Educational Equity Act and some colleges and universities saw young women as a potential remedy for declining enrollments.

While the participation of young women choosing science and engineering majors increased somewhat dramatically during the 70s and 80s, the strategies used to create this growth were focused on the individual. As such the impact was limited. If successful efforts were curtailed or stopped due to a lack of resources, enrollments began to decline again and young women who have been "recruited" to predominately male classrooms, laboratories and faculties, were left without programs to help them adapt to the uncomfortable environments. There was another negative impact of the strategies utilized during this time period. Women faculty members were often burdened with the responsibilities for creating change. They were asked to serve on every committee that "needed a woman's voice", asked to formally advise every young woman and, informally, expected to help women students and junior faculty adapt to the environment. As a result many female faculty members had difficulty receiving tenure or promotion based on the fact that they had spent an inordinate amount of time on efforts considered less important by the predominately male promotion and tenure committees.

Late in the 1990s university administrators, funding agencies and leaders of professional organizations recognized that institutional strategies were required in the dearth of women in the sciences and engineering was ever to see significant increases at every level of the professions. The most important results of strategies developed to benefit females, in every case improved the education or academic work life or both males and females. It was further recognized that the most successful pathway to the full participation of women in the sciences and engineering was based on a combination and coordination of individual and institutional strategies.

Individual Strategies

Many individual strategies prove very successful in helping women be successful in the sciences and engineering. Each individual woman must decide for herself if the cost associated with any strategy is worth the end result.

- Obtain career information
- Understand the existing culture – learn to "fit in"
- Learn to be assertive and how to negotiate (Babcock and Laschever, 2003)
- Network with other women in your peer group. This strategy often helps women determine if the problem they experience is internal or external.

- Become familiar with as many role models as possible. Find out who has been successful before you and how they accomplished what they did.
- Develop a sense of humor but be true to yourself

Institutional Strategies

Many institutional strategies have been developed in the last ten years that have been very successful in attracting female students and faculty members to the sciences and engineering and ensuring that they are able to reach their full potential. Institutions hoping to replicate these successful strategies should first do a self-study to determine where barriers to the advancement of women might exist in their particular situation. Most often barriers are discovered at transition points—student admissions (undergraduate or graduate); successful degree attainment (baccalaureate, master's, or Ph.D.); attracting female faculty members; successfully tenuring female faculty members; promoting female faculty to associate or full professor levels; developing females to serve as department chairs, assistant or associate deans, deans, etc; nominating female candidates for national recognitions and awards. Strategies that work in small liberal arts colleges are unlikely to be equally successful at large, public research institutions. Similarly, strategies that are successful in California may not have equal success in Florida.

Student focused strategies

- A curriculum that engage the existing student body
- Teaching and learning: problem context; non-gendered language; pedagogy
- Develop pedagogy that reflects research on education, gender, race/ethnicity, ability
- Non-discriminating policies and practices—admissions, merit based awards, placement
- Culture—expectations of professors and peers
- Understand the detrimental effects of bias – cumulative advantage/disadvantage. Take control whenever possible and try not to be complicit in perpetuating bias.

Faculty focused strategies

- Adapt a successful policy or practice from a comprehensive group of tools created by NSF ADVANCE program institutions <http://research.cs.vt.edu/advance/index.htm>
- Understand sources of bias and discrimination (Valian, 1998)
- Be proactive in finding applicants for open positions. (e.g. WEPAN Faculty for the Future <http://www.engr.psu.edu/fff/>)
- Bring women onto campus for speaking opportunities, visiting professorships, etc. to showcase and familiarize senior faculty with their capabilities
- Create family friendly policies
- Increase flexibility and give the individual more control over her/his career (Rosser and Daniels, 2004)
- Understand how to attract and retain dual career couples—more than twice as many female as male scientists or engineers in academia have spouses who are also faculty members in science or engineering

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Legislation passed in the United States including the Civil Rights Act of 1964 (some believe women were added as a protected class to ensure the bill's defeat), The Women's Educational Equity Act (Title IV-A of the Elementary and Secondary Education Act of 1965), and Title IX Education Amendments 1972.

"No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance."

Keywords: Institutional Change, Advancement of Women in STEM, Organizational Behavior

CV:

Jane Daniels is director of the Clare Boothe Luce (CBL) Program at The Henry Luce Foundation. The CBL Program is the largest private source of support for women in the sciences and engineering with grants of more than \$7 million annually. Jane has worked on equity issues for women in the sciences and engineering for more than 25 years. She is the Director Emeritus of Purdue University's Women in Engineering Program and served as Program Director for the National Science Foundation's Program for Women and Girls (Research on Gender Program now). Jane was the founding president of the Women in Engineering Programs and Advocates Network (WEPAN). She is a researcher and consultant on gender issues and is the author of more than 60 articles or chapters in books on the subject. Jane is a fellow of the Society of Women Engineers and the Association for Women in Science.

GENDER BIAS IN TIME ORGANISATION OF SCIENTIFIC WORK

Maria Caprile, Núria Vallès, Jordi Potrony and Diego Herrera
CIREM Foundation

Abstract:

This study aimed to identify specific processes that can help us to understand why women have less access than their male colleagues to positions of responsibility and management, and how certain men and women who do not fit the supposedly "neutral" scientific model are discriminated against in scientific work. This article explores cultural and structural processes operating across life-cycle in daily scientific work, which hinder the presence of women in science and sustain gender biases in the scientific work.

The case studies clearly show that the regulations on use of time, both from the daily point of view and over the life-cycle, help to maintain gender inequality in the organisation of scientific work. From this perspective, it is concluded that the supposed gender neutrality in organising working time in science and the definition of scientific excellence throughout the life-cycle are subtle forms of discrimination towards women and femininity in science.

The ideal of objectivity and neutrality traditionally associated with the scientific method conceals a variety of power relationships that condition the organisation and daily dynamics of scientific work. These relationships are built on a specific masculine model of "doing" science that discriminates against women and against perspectives that diverge from this model

From this perspective, our objective was to identify the subtle processes and mechanisms that operate every day in scientific work and that help to maintain gender inequality in science. We carried out a set of case studies in institutions in a range of European countries dedicated to scientific and technical research, including an in-depth analysis of the formal and informal working organisation, the processes that sustain gendered division in scientific work and the construction of "femininity" and "masculinity" in science.

The organisation of working time in institutions dedicated to scientific-technical activity conditions the working dynamics and professional careers of men and women and the personal professional strategies that they adopt. The organisational contexts that prioritise scientific-technical working time over any other activity and that deny any relationship between professional life and personal/family life are especially prejudicial to the professional career of women. On the other hand, those institutions with time organisation based more on criteria of balancing professional life and personal/family life, which do not identify scientific-technical work with exclusive dedication, are less prejudicial to the professional career of women and help to create more equitable work dynamics.

Institutions in which there is some kind of measure or programme for work/life balance, whether formal or informal, enable women to manage and organise their time and make domestic work more visible, but do not contribute to a greater equity between men and women in scientific-technical work. The traditional sexual division of work and the unequal organisation and management of time between men and women is also applied in scientific-technical work. The work/life balance measures proposed by institutions are only taken up by women, not by the majority of men. This helps to perpetuate the traditional assignment of

roles between men and women and to associate domestic work and caring responsibilities more with women than with men.

In spite of the great differences between the forms of organisation and their consequences on the work dynamics and professional careers of men and women, to a greater or lesser extent the institutions analysed based their time organisation on the belief that the more hours one is at work, the better. Long working days were assumed to be positive and highly valued and implicitly include the stereotype that someone who is dedicated to scientific work must give up their personal and family life.

Nevertheless, the stereotype of "good scientists" as persons who give up their personal and family life and dedicate themselves fully to scientific work is contradictory. Scientific working time also includes time for socialising, personal relationships and creating identity connections. Family life and domestic activities penalise the professional career but in order to integrate in the organisation of work and obtain opportunities for promotion one must integrate personal and professional life. Working in certain institutions that are dedicated to scientific-technical investigation often becomes a *modus vivendi*, the barrier between working time and personal relationship time blurs, and in many cases this explains the very long working hours.

This dynamics particularly prejudices women (and also certain men), since as a result of their traditional role as carers, they do not have the same amount of time as men to be at the place of work. Faced with this situation, we can identify two ideal professional strategies that women scientists adopt: a more traditional strategy, associated with the masculine model of doing science, and a strategy that involves greater reconciliation of professional and personal/family life. These two strategies are seen alternating throughout the life-cycle of women scientists, but the adoption of the second strategy is often more a discursive question than a matter of fact.

Finally, the scientific model of excellence is contradictory. The professional career of research staff, their personal strategies and their professional level of success are completely interrelated with a model that is based on traditional masculine values and that tends to reward those "ways of doing things" and the career paths that the most fit these values (meritocracy, an uninterrupted career, prioritising professional life over any other kind of activity, long working hours, participating in complimentary activities, high productivity, etc.). However, the use of time related to scientific work implies integration of personal life and social relationships in working time. Furthermore, the more senior a person's scientific career, the less scientific work is involved in their role. Scientific excellence is therefore a contradictory construction, open to many processes of change that integrate new uses of time and appreciation of the scientific career path.

Keywords: gender inequality in science, scientific work organisation, organisation of time, professional strategies, gendered construction of scientific excellence

CV:

Researcher for the CIREM Foundation since 1993 on research projects related to gender, the labour market, employment policies and labour relations and women in science. Co-ordinator of several national and european research projects on women in science and women in the labour market

WOMEN IN RESEARCH DECISION-MAKING PROCESSES

Gianna Avellis and Raffaella Di Sante

mobile Women in Science Engineering and Technology Working Group

Marie Curie Fellows Association

Type of presentation: Oral session

Abstract:

The equal participation of women and men in decision-making processes at all levels is a worldwide critical issue. Women's participation in decision-making bodies involves their increased representation as well as their real empowerment through its presence. In fact, women's presence as critical actors in decision-making processes allows them not only to enhance women's presence, but to transform the content and the ways in which public policy is made in all fields.

We intend to investigate this issue in the mobile Women in Science Engineering and Technology (m-WiSET) working group of Marie Curie Fellows Association (MCFA- <http://mcfa.eu>), the association of scientists (Marie Curie Fellows) who were awarded a Marie Curie fellowship or a mobility research training grant by the European Community. The Association gathers scientists from more than 50 countries in Europe and outside Europe awarded mobility research training from the European Community and has a relevant women representation (around 30%) which is high compared to other European research associations.

The issue of women's participation in *research decision-making processes* continue to be of relevant concern. Statistics show that women are currently under-represented in the rank of Academia and in Scientific Boards and bodies committed to set the research agenda focusing on specific areas and eventually assigning public research funding to different research institutions, at local or national levels. In order to achieve women's full participation and representation at all levels of research decision-making, there must be gender equality across a range of decision-making levels, including professional associations, regional and international organisations and the business/private sector.

In October 2006 the European Commission established an expert working group (<http://ec.europa.eu/transparency/regexpert/detail.cfm?ref=1740&l=E>) to survey positive action schemes aimed at increasing the participation of women in research decision-making positions in Europe. The group findings are to be complemented by a more comprehensive survey which includes also selected non-European countries. The countries involved in this survey are, in particular, USA, Canada and Australia and the overall objective is a comparative study which includes literature review and data analysis on best practices and any actions implemented at institutional and national levels to increase the number of women in decision-making positions.

In accordance with its multi-year programme work for 2001-2005, the Commission on the Status of Women (CSW) included this issue in its agenda. The United Nations Division for the Advancement of Women (DAW) organised in 2005 an Expert Group Meeting on the same subject, with particular emphasis on political participation and leadership. Future priority of the EC is boosting numbers of women in research leading positions to 25% in 2010.

Our idea is to do it by monitoring and analysing the current situation and positive action schemes adopted in several countries beside Europe, such as United States, Canada, and Australia with the help of world-wide leading expert organisations in this field, and by comparing and transferring the best practices from these countries to Europe.

One of our main objectives is to monitor the current situation of women's representation in the areas mentioned above through the production and availability of statistics from the countries involved: Europe, US, Australia and Canada. The need to have statistical data to know what the situation is really like for women on the ground is acknowledged by the European Commission and Councils as well as the European Parliament.

The second objective is to compile already-tested "best practices" to increase the proportion of women in decision-making positions. Positive actions policies are aimed at ensuring women's equal access to and full participation in power structures and decision-making. Different actions have been implemented to-date to reach this aim, for example the creation of equal opportunities departments in Ministries, higher education and research institutions; national acts and laws; the establishment of specific programmes providing funds to ensure equal participation and transparency of recruitment or to reach specific targets.

The third main goal will be that of discussing effectiveness and efficacy of the different of mechanisms to support women researchers, and also to understand to what extent positive schemes may be adapted in Europe, for example, through a comparison analysis which takes into account the specificity of the various contexts, and in general to allow fruitful and useful exchange/transfer of knowledge on best practices. Discussions taking place in a number of workshops and meetings during the project lifetime are also meant to produce and adopt policy recommendations.

The further aim is to raise awareness on the conditions that facilitate women's representation in decision-making processes in order to adopt policy recommendations to advance women's participation in this area. Our working group will disseminate and spread results, findings, best practices, diverse opportunities, updated pertinent statistics, etc. as widely as possible at a local, regional and international level. The objectives are mainly to:

- raise awareness on the role that women leaders may play in science governance by influencing topics, needs, trends and making in general the research decision-making processes more "gender-aware"
- to ensure women's equal access to and full participation in power structures and decision-making by promoting a new knowledge base of best practices and working for them to be translated into policy
- to increase women's capacity to participate in decision-making and leadership by promoting, organising, advertising training and mentoring activities.

To achieve these aims we are in contact with several institutions, international organisations and private companies, located in Europe, United States, Canada and Australia to address diverse women needs at national, regional and international level. Partners from Third Countries will also be taken into account to allow us to establish useful synergies of resources and actions and to offer proper high level perspectives of their socio-cultural context.

An important activity is also to participate to the 7th FP to support and establish a network which will have a core function that ensures women's inclusiveness as leaders in the recognised male-dominated sectors of science and research. It will be oriented towards women scientists in research decision-making and policy definition, being actually the first International Women Network of this type.

KeyWords: women in decision making bodies and processes

CV:

Senior researcher in ICT, manager of several R&D European projects in Software Engineering, Multimedia and Mobile Telecommunications. Degree in Computing. Teaching in master courses in ICT. 20 years spent in industrial research and 2 years in academic research at Imperial College, Dept. of Computing, London. Expert independent evaluator of Call 5 Software & Services in the 6th PF, funded by MCFA.

Board member of Marie Curie Fellows Association (MCFA) and funding member of mobile Women in Science Engineering and Technology (m-WiSET), and Italian Women Innovators and Investors Network (ITWIIN).

GENDER AND RESEARCH QUALITY – A BIBLIOMETRIC APPROACH

Ulf Sandstrom

Royal Institute of Technology

Type of presentation: Oral session

Abstract:

The work that will be reported concerns the publication strategies for male and female researchers at three universities in Sweden, one in natural science, one in engineering science and one mainly in medical science. We have a gender identification of all researchers at these universities, which cover a number of 5,000 researchers in total. Using the Thomson/ISI database and a matching in relation to that database we are able to identify publications and put a gender tag on each publication, or part of the publication. We will apply different methods for publication and citation analysis, e.g. the advanced bibliometric methods proposed by van Raan (2004) and Glänzel (1996). These so called field normalized citation scores make different areas of science and engineering comparable and it is very interesting to use the gender dimension for these studies. In smaller samples we have shown (Sandstrom & Hallsten, *Scientometrics* forthcoming 2008) that there is a tendency for higher citation rates for female researchers. Whether these figures are stable in a larger population will be one of the main questions in this paper. Earlier researches on these matters have not been able to perform field normalized citations analysis. Using a large population from science and engineering we will also be able to illustrate the current changes in the gendered horizontal division of labor.

Keywords: publication analysis; bibliometrics, gender issues

CV:

Ulf Sandström is associate professor at Linköping University and affiliated with Royal Institute of Technology as researcher. He has been involved in studies of research policy for many years with a special interest in gender issues. He has published several books and papers, among them a follow-up study to Wennerås & Wold (1997) in *Scientometrics* (2008)

EQUALITY AND DIVERSITY AS A KEY FOR MANAGING COMPANIES

YVETTE RAMOS-AIVAZIAN
YNOVAIMO

Type of presentation: Oral session

Abstract

During the last years, in France, a lot of interest has been shown to anti-discrimination issues in the field of employment. In 2001, a specific law (loi Génisson) reinforces legislation on professional equality between men and women. The launch of the Diversity Chart and the creation of the HALDE organisation (High Authority against all types of Discriminations) in 2004, the extension of discriminations criteria in the employment field and recent laws on disabled people and for Equality are many initiatives aiming at a fair treatment of employees.

The European framework emphasizes an active promotion of Equality. Finally, all firms are concerned by social and economical stakes of equality and numerous organisations, private or public, initiate practices in that field, or at least are working on such issues.

In that context, the organisation that gathers over 6,000 professionals and Directors of Human Resource in France named ANDRH is concentrating efforts of communication towards General Managers and Human Resources Managers, employees and other stakeholders on the professional equality issues, with a specific emphasis on the gender issue.

Over 50 agreements on professional equality between men and women have been signed, over 1500 firms have signed the Diversity Chart, which includes actions against gender discrimination and actions for the promotion of Equality between men and women ; yet very few concrete actions on the field are really known.

If the concept of professional equality appears to be quite well defined and anchored in the law, it is not the same in France for the Diversity issues. Proposed by the management of firms and consulting companies, it is not a legal concept nor a theory issued from social science but more likely to be a « management rhetoric », historically born and spread after a few tens of years of equality policies in the USA and then in other anglo-saxon countries. This concept and its practices have an overall goal of achieving equal positive opportunities actions while limiting negative effects of these, by means of more inclusive organisational cultures bringing more respect towards differences. Diversity management and even more marketing and sales stakes also aim at answering clients and end-users needs, while allowing them identify to the companies staff : this is the business case of diversity.

In anglo-saxon countries, the question was rapidly raised about theoretical compatibility between diversity management and professional equality with gender focus, especially about harmonious cohabitation in terms of management practices. Many research work has been provided on these questions.

European countries, France in particular, have acquired recent experience in terms of professional equality. Practitioners of Human Resources Management have not yet familiar with the gender issues and their practices in management. Diversity management has really come into consistent form only after some companies initiative, impulsed by the ANDRH and the Diversity and Employment ministries in 2004 through the Diversity Chart.

The ANDRH is now partner of different EQUAL programs at the international level, with subsidies from European Union, aiming at developing diversity in a significant manner within the private and the public sphere.

In order to create a real dynamics, the active contribution of the 80 local groups of the ANDRH has created a network of « diversity and equality » correspondents since one year and diverse initiatives have started, which will be detailed in the presentation of the paper.

These initiatives have global and specific objectives, such as :

- Promote exchanges on Equal & Diversity practices on a specific region or industry
- Train the Human Resource professionals on the French State tools available but not really known
- Organise stakeholders work groups on these issues in order to stimulate and thus interact
- Reinforce the role of Human Resources Directors in the Equal and Diversity agreements to be signed between the Employer and the Employees representatives.
- Globally contribute to raising awareness within the Human Resource and Management actors, and through this process, develop their skills to convince general management on these issues.

Evaluation of these local initiatives will be reported through different manners:

- a written report to be issued for the annual period, with a oral feed-back on the actions and results at the General Assembly of the local group;
- a conference on these issues is to be organised in some local groups, gathering the State representative, the private organisations, the labour unions and industry syndicates;
- a collaborative platform can be created with different partners on these issues.

REFERENCES

- www.femmes-egalite.gouv.fr (site du Service du Droits des Femmes et de l'Egalité)
- www.andrh.fr (site de l'Association Nationale des Directeurs de Ressources Humaines)
- www.grhmgto.hec.ulg.ac.be (site d'Annie Cornet, professeure, HEC- Université de Liège, Responsable de l'Unité de recherche EGID, Etudes sur le genre et la diversité en gestion, Belgique)
- www.imsentreprendre.com (Site de l'Association IMS-Entreprendre pour la Cité, Responsable de la coordination du Secrétariat Général de la Charte de la Diversité)
- www.arborus.org (site de l'Association créé en 1995 pour la promotion du label Egalité)

Keywords: Equality, Diversity, Management, Human Resources

Cv:

Yvette Ramos holds a Master's degree in Engineering (Electronics Telecom) from the Ecole Polytechnique Féminine (www.epf.fr) in 1992 in France. She has also a MBA in Human resource and Change Management (2002) from IAE Aix-En-Provence.

With a background in Engineering and over fifteen years professional experience, starting with a position of Project Manager in the Industry to Expert in Change Management, she has developed extensive knowledge of Public & Private Partnerships on an international environment in specific areas such as sustainable development, water management and organisational consulting. With both Portuguese and French nationalities, over the last

ten years, she had the chance to work with international teams, in the private and public sector, in the business and development environment.

She holds the position of Expert at the specialized UN Agencies "ITU", the International Telecom Union, Development Bureau, (www.itu.int) and "WMO", the World Meteorological Organization (www.wmo.int) with both HQs in Geneva, Switzerland.

She is Director for Europe in the International Network of Women in Engineering & Science (www.inwes.org) and is the responsible of International relations at the Board of the French association of women engineers (www.femmes-ingenieurs.org).

She is 38, married with three children and lives in France, between Annecy and Geneva.

IN OUR SHOES – WLB, MULTITASK MANAGING

Célia Fortes

BPW BRASIL– Business and Professional Women Brazil – Director of Foreign Affairs and member of International Task Force

Type of presentation: Oral session

Abstract:

This presentation addresses difficulties, challenges and possibilities for work-life balancing inherent to women's multi-role participation in contemporary society. The presentation is based in situations experienced for working women in a broad range of activities and/or social circumstances, with emphasis in Business, IT and STEM professionals.

The presentation consists of a dynamic dramatization of a day in the life of an average working woman from morning to night, pointing contrasts and flexibility in task managing, through metaphors with women's different garments for each occasion. Literally "In our Shoes", the presentation uses the images of different shoes and garments to reflect on women's potentials to managing work and life care, while addresses the risks of unbalanced or overwhelming routines that need further planning and creative solutions.

The presentation includes the use of props and computer/video projection.

The presenter changes garments and shoes during the speech, using a set of "onion" layers of clothes, as well as presenting new objects that come out of her "magic suitcase".

Presentation can be spoken in English or French accompanied by French and/or English text in the projection, as most convenient.

Content outline:

1- Cons: Pointing conflicts

- absorbing occupations
- inflexible working hours
- children: paid help x feeling of guilt.
- subjective perception of work (stronger commitment motivated by higher responsibilities)

2 – Pros: WLB and Productivity

Conditions in which employees can balance work with their personal needs and desires became a factor that companies had to take note of both to retain them as well as to improve productivity. "Rather than expecting women to change, to fit in with a male-dominated environment, what is required is for companies to "open up to more groups of people through organisational and structural change". - *Professor Teresa Rees, The Greenfield Report 2003*

- What to expect and request from employers:

- Job Realistic
- autonomy work
- Reviews with the employees on a continuous basis
- dialogue with the employees on a continuous basis
- Part time employment plans
- Insurance
- Counseling services
- Rest rooms, food preparation services

3 – Inner Balance and task management

- Strategies to WLB independent from employers support.
- Saying Yes and No: The "slow" technics combined with the hard worker.
- Task management : choosing technics that can help you. GTD – Getting Things Done

4- Summary and Perspectives

Work/life balance will continue to be an ongoing challenge.

- Exploring Negotiating alternate change
- Slowing down options
- Simplifying

- Sharing responsibilities.
- Viewing balance as a moving target.
Current Readings:

Robert W. Drago "In Striking A Balance: Work, Family, Life,"

Sarah Susanka "Not So Big House"

Sarah Susanka "The Not So Big Life: Making Room for What Really Matters,"

David Allen "Getting Things Done"

The Greenfield Report, 2003 co-author Prof. Teresa Rees

Steve Talbott "Devices of the Soul: Battling for Our Selves in an Age of Machines,"

"Back On the Career Track: A Guide for Stay-at-Home Moms Who Want to Return to Work," Carol Fishman Cohen and Vivian Steir Rabin

Keywords: task management, WLB (work-life balance), GTD (getting things done), contemporary, women

CV:

Celia Fortes is currently an active member of BPW Brazil International Task Force. From 2005-2007 she presided BPW Rio de Janeiro, an Association of business-oriented and Professional Women, affiliated to BPW Brazil, which congregates professional partners of different areas of performance, entrepreneurs and those willing to enter the work market. For her work trajectory, she was recently awarded with the Tiradentes Medal, the higher commend of the State of Rio De Janeiro.

Recent Participations: 64 th SOEAA (Engineering and Architecture Oficial Week) – CREA RJ (Engineering, Architecture and Agronomy Regional Council) Rio de Janeiro August 2007, Brazil; International Colloquium "Empowering Women in Engineer and Technology" Global Efforts for local Empowerment

Tunis 6- 8 June 2007

Biography Highlights:

Worked ten years as Primary and Secondary Teacher.

Engineer at Banco do Brasil (Bank of Brazil)

Director of Rio de Janeiro Trade Association

General Secretary of Social Development Coordination of State Government

Vice-President of the Director Council of Banco da Mulher (National Women Bank)

Council member of Sorrio – non governmental organization

Social Assistant at ASPAS - social works with with children carrying HIV.

Helper at Foundation Santa Bárbara of orphan and/or HIV children.

Member of the Managing Advice of House Santa Ignez - daycare center for children

Founder / Director of her business: Kick – Broker of Insurances.

AN INCLUSIVE LEADERSHIP STRATEGY FOR WOMEN A CASE-STUDY FROM LEADING SEMICONDUCTOR COMPANY: FREESCALE.

Jignasha Patel, Suzane Biganzoli, Pascale Diez, Marie-Françoise Pujol
Freescale Semiconductor

Type of presentation: oral session

Abstract:

Across the globe, Freescale has defined inclusion as a key initiative. Inclusion at Freescale is about creating a work environment which is healthy, positive and productive for all employees; where everyone's talents are leveraged. Our inclusion mission focuses on making Freescale an employer of choice and best place to work. This mission links directly to business goals and activities and serves as a worldwide strategy of Freescale's that take regional specificities into account.

At Freescale, we are committed to building a culture of inclusion everywhere: in the EMEA countries certainly with the different languages, customers and technologies to add to the interesting mix. Creating a level playing field for all employees is a competitive tool. We strive to create open environments where individuals reach their potential, and where the company benefits from the full utilization of employees' talents and skills. Therefore, we are focused on opportunities to support the retention and progression of women leaders globally and strengthen the talent pipeline for the future.

In January 2007, Freescale held a 3 day "EMEA Inclusive Leadership Conference" in France. Marking a milestone for Freescale and becoming a launch pad for our 2007 inclusion activities, guests of the 50-strong audience included women and men from 12 countries and from different levels of the company. Country managers from across EMEA also participated, representing the importance of this initiative in the region. The conference aimed to create awareness and understanding of inclusion, specifically of women in leadership roles. It also provided excellent networking opportunities to generate solutions for the ongoing development of inclusion strategies.

The company has been recognized for these strategies with awards such as the Innovation in Diversity award in, "Profiles in Diversity Journal", 2007.

Building on the outcome of this workshop, governance structures and integrated action plans were defined for EMEA. In particular, three project groups were created to focus on:

- The Alumni Network: Enables people to keep in touch with Freescale and its latest market and product activities. The alumni network also provides a communication link to potential candidates for job openings.
- University Relations: Strengthens relationships with universities to encourage women to consider technical jobs in relation to
 - university awareness
 - science and technology curriculum and
 - Freescale employment opportunity
- Work-Life Balance: Retains women whilst on maternity leave. We must remove barriers for women returning to Freescale after starting a family to complement work-life balance as well as to retain skilled talent. Several practical tools are being implemented to help parents cope with this issue such as forums and on-line resources.

A case-study of these three projects, how we got there, what we hope to achieve and testimonials from employees in Toulouse, will be the core of the presentation for the ICWES conference. It will aptly demonstrate how Freescale's inclusion focused development curriculum is a working example of a strategy for equal opportunities.

Keywords : Freescale, Inclusion, Strategy, Talents, balanced worklife

Cv:

Marie-Francoise Pujol-Coumes

Diplômée de l'Institut Supérieur de Gestion - ISG Paris - 1985

Motorola : 1984- 1986 : Analyste Financier Junior chargée de la gestion des investissements

1986-1990 : Analyste business chargée des applications financière (comptabilité générale, clôture financière, gestion des fournisseurs, gestion des immobilisations) 1991-1992 : Expatriation à Phoenix

-Arizona Chargée de l'implementation mondiale d'un logiciel de demande d'achat

1993-1996 : Analyste business chargée des applications financière

1996 - : Responsable informatique de l'équipe Europe pour les applications d'informatique de Gestion.

Depuis 2006 responsable mondial pour les applications de gestion de la Qualité.

2007-2008 : Membre de l'équipe Diversité de Freescale Europe, en charge du projet "Equilibre vie professionnelle, vie familiale pour les jeunes parents"

NB : Motorola semiconducteurs est devenu Freescale en 2004

STRATEGIES FOR EQUAL OPPORTUNITIES FOR FEMALE ENGINEERS IN GERMANY

Prof. Dr. Susanne Ihlen VDI¹, Anna Buschmeyer M.A.¹, Prof. Dr.-Ing. Burghilde Wieneke-Toutaoui VDI²,

¹Technische Universität München, Gender Studies in Science and Engineering

²Vice President of TFH Berlin – University of Applied Sciences

Abstract

Activities to increase the number of women engineers can be traced back for some decades, but the actual numbers of female university students and women working in the engineering profession are not yet satisfying. From industry's and universities' point of view the situation is dramatic: strong economic growth and demographic change require more well qualified engineers, while the number of female freshmen has not grown as it could be expected. This leads to companies searching for female engineers as well as older ones and other groups that have often not been recognized before.

At the same time a globalizing world industry feels compelled to include the female perspective into product and process development. This diversity is seen as a necessity to survive in competition for better customer satisfaction. But the engineering profession with its high reputation in Germany is strongly linked to young male employees, long working hours and a housewife backing up at home, thus by far not satisfying for all groups of (possible) engineers.

The authors see three pillars for changing the situation towards equal opportunities in engineering. The following take place at Technische Universität München (TUM) or University of Applied Sciences in Berlin (TFH). The pillars are: Motivate girls to go into the technical field, change working conditions to allow women and men the same chances of a career, and support awareness building through more gender research.

1. Evaluate projects to motivate girls for technical subjects

Most famous is Girls' Day, a day when once a year parents can take their daughters into their working fields and open especially the technical field for them. Up to now more than 600.000 girls have experienced these days. Gender Studies in Science Engineering (at TUM) is now evaluating different kinds of motivating projects.

"München Mädchen Technik Tag"

A recent project tries to find the whereabouts of women, who took part in the first "München Mädchen Technik Tag" (Munich Girls' Technical Day) at TUM in 1990. More than 350 parents of the first participants were asked about the educational paths of their daughters and their integration into the working life. The results show the success of such a program. 52% of the women have started to study engineering, natural sciences, or informatics. More than 15% of the women are working as engineers today.

"Spurensuche" ("Seeking traces")

In late 2007 Gender Studies in Engineering started a new project in coordination with eight other technical universities in Germany. In this project students of STEM will be asked about their experiences in their first semesters and about their decision for such a study program. The research will be based on questionnaires of several hundred students. This project aims at finding out about the decision process and the influence of motivating projects.

2. Changing Working Conditions

Gender Studies at TUM is doing research about the work-life-balance for engineers. Therefore, we asked students and engineers as well as engineering companies about their experiences, fears and wishes concerning family and career development. Interesting first results show that the wishes, especially of male engineers who want to reach a leading position, and the opportunities they find in engineering work fields differ a lot. Young professionals want to combine time for their family with career options. The study shows that for those who want to combine family and career it is easier to negotiate about part time work, when a leading position is already reached, rather than when they are at a starting position.

TUM was very successful in the German Excellence Initiative, which led to extra funding for gender issues. With this money several initiatives are introduced giving resources to faculties with new ideas to increase the number of female students, scientists and professors. Furthermore, parents will get better opportunities to combine work and family, for example through a rising number of child care facilities. Additionally TUM has been awarded the audit "family-friendly university" of the Audit Foundation.

TFH has a unique system to enable work-life balance for all employees: Since 2007 all employees can schedule their duties absolutely flexible in accordance with their teams. After some initial quarrels this system works now with high acceptance within the university. Additionally, TFH has child care opportunities closest to the campus. Family friendliness for employees and students is of highest concern at all levels of administration.

3. Gender in teaching and learning

At both universities, TUM and TFH, special Gender Professorships were introduced. In Munich Gender Studies in Science and Engineering is a professorship that is filled by a sociologist working in the faculty for electrical engineering and information technology. This leads to interdisciplinary research and teaching, where students of electrical engineering learn about changes in the engineering profession and where technical research is combined with new aspects about gender and diversity.

TFH offers engineering study courses exclusively and therefore needs professorships in engineering. As the number of female professionals in these topics is low and the number of female scientists who combine gender and technology topics in their scientific careers is even smaller TFH decided to offer a program for those scientists who are willing to integrate gender aspects into their teaching and research at TFH. For this purpose TFH gives additional funds to these professors to support the training on gender issues in their respective areas of technology. The program has shown interesting results and is meanwhile well recognized.

Perspectives

To achieve the goal of equal participation and equal chances of women in the engineering profession changes are necessary in academia, industry and society. Changing working conditions, better child care facilities, equal promotion and more research on gender in the technical field will lead to a changed professional image and easier access for diverse groups to the technical field. Motivating projects are supposed to raise the number of women interested in technical subjects and are now evaluated. The German Federal Government has started a so called "Talentschmiede" a project to find new talents, who will support the German labour market. TUM and TFH Berlin are taking place in this project with scientific research.

Keywords: Gender, Diversity, Work-Life-Balance, Motivation Projects

CV:

Burghilde Wieneke-Toutaoui, born 1958, is currently vice president of TFH Berlin – University of Applied Sciences. She studied Mechanical Engineering at the Technical University of Berlin. In 1982, she started working as research engineer at the Fraunhofer Institute for Production and Design Technology (FhG-IPK). Her field of work was facilities planning. In 1987 she received her Doctoral Degree from the Technical University in Berlin. In 1990 she became professor for Industrial Engineering at the University of Applied Sciences Berlin, department of Mechanical Engineering.

Since then she has been actively involved in the field of Women in Engineering, inside her university and within the Association of Engineers (VDI), where she actually is deputy spokeswoman for the Women in Engineering within the VDI and the Berlin committee of this branch. B. Wieneke is member of the board of "Kompetenzzentrum Technik, Diversity und Chancengleichheit".

As vice president of TFH since 2003 her responsibilities are the restructuring of the study courses according to the European Bologna process, the improvement of teaching and study conditions and the activities to increase the number of women in all areas of her institution.

Burghilde Wieneke is a mother of three.

GENDER DIVERSITY: BEST PRACTISES IN THE INDUSTRIAL WORKPLACE

Valerie Ozier

Engineer, master in Human Resource, Program manager in High Tech Company

Type of presentation: Oral session

Abstract:

This paper presents the findings of research conducted for a Human Resource master thesis completed in 2008 at Toulouse Business School. The purpose of this research is to gain a deeper understanding of how to improve gender diversity in the industrial workplace.

There are several reasons why companies focus on gender diversity today:

- Economy as gender diversity provides best fit with customer diversity and more innovation.
- Demography because of the European active population decrease.
- Social responsibility and image induced by social and environmental ratings.

Women are underrepresented in engineering studies and therefore in the industry. Usually, the higher up an organization's hierarchy, the fewer the women.

The first part of the paper presents current and past literature review on the good practises to improve gender diversity in the industry. These practises can be classified in four main categories:

- Work life balance strategy with flexible time, part-time work, job sharing, telecommuting, maternity leave handling.
- Equity between men and women: wage, performance appraisal, bonus...
- Focus on recruitment to ensure gender diversity is met, promotion in schools to develop female engineers from a younger generation and attract them.
- Women career planning, promotions and training (mentoring, coaching).

The second part of the paper presents results of interviews done in ten companies of different sizes and sectors. These companies are recognized for their gender diversity strategy and summary of their good practises is provided. Result of a survey sent to main French engineering schools is also presented: it shows actions which could be done to promote engineering jobs to younger female generations.

Finally, highlight is put on some noticeable practises like:

- The Inclusion of men in work life balance indicators to define a global strategy for the company and connect gender diversity closely to the strategy of the company.
- A high level commitment to change the existing culture within a firm or organization to facilitate women's progression to management.
- Virtual debates on intranet to define actions to facilitate women promotion.
- A shadowing program which allows promising junior female staff to work alongside female managers for several days.
- Discretionary diversity bonuses paid to recruitment agencies when a candidate from an underrepresented group is selected.
- Job offers mentioning that the recruiting company is concerned with gender equity and that women are encouraged to candidate.
- The designation of women engineers coming from targeted engineering schools to be students' key contacts and to provide support for head hunting.

Key words: gender diversity, good practises, inclusion

CV:

I was graduated from Supélec (Top French Engineering school) in 1989. I worked during five years in Philips as sales and then marketing engineer. Then, I worked during one year as a purchasing manager in Giat Industries. Since 1996, I've worked in the same High Tech company in marketing and then program management. In parallel to my job, I've followed a master in Human Resource course since end 2006 (Toulouse Business School). I'm currently finalising the professional thesis on gender equality to complete this master in April 2008.

THE LEADING EDGE - WOMEN IN THE INTERNATIONAL COUNCIL OF ACADEMIES OF ENGINEERING AND TECHNOLOGICAL SCIENCES (CAETS)

J. Moyra J. McDill

Mechanical and Aerospace Engineering, Carleton University, Ottawa, Canada K1S 5B6

Type of presentation: Oral session

Abstract:

CAETS is a non-political, non-governmental, international organization with twenty-four national academies [1]. It fosters effective engineering and technological progress for the benefit of all societies of all countries.

Fellows of the academies in CAETS are well recognized in their discipline and have made a noteworthy contribution. Women were first appointed, to the academies of the United States and Denmark, in 1965 and by the 1990s, had been appointed worldwide [2]. By virtue of their seniority, these women represent the leading edge of women in the profession. Further study on the participation of women in CAETS was recommended in [2].

The academies Australia, Canada, Croatia, Czech Republic, Denmark, Finland, France, Germany, Japan, India, Korea, Norway, Sweden, the United Kingdom and the United States were studied.

Table 1 gives the membership, average age of fellows and the representation of women. Age data were found on academy websites and in annual reports as average or median ages and/or dates of birth. In several cases age data were provided by academies. The oldest average age for men is about 70 in Japan, the United Kingdom and the United States. The youngest women, at about 50 years of age, are in Denmark and Finland.

Table 1. Membership, Average Age and Gender

Country	Comment	Members	Age Men	Age Women	% Women	Refs
Australia ATSE	Individual	744	67	61	5.3	3,4
Canada CAE	Individual	380	64	59	5.2	5,6
Czech R. EACR	All	112	66	61	<1	7
Croatia HATZ	All	318	-	-	9.4	8,9
Denmark ATV	Active	615	58	48	9.8	10,11,12
Finland FATCE	Active	550	60	50	10	13,14,15
France NATF	All	229	61	57	5.7	16,17
Germany ACATECH	All	248	-	-	<2.5	18,19
India INAE	All	563	61	60	<1	20,21
Japan EAJ	Individual	600	71	59	<1	22,23
Korea NAEK	Full (none>65 yr)	298	60	-	<1	24,25,26
	Candidate	198	53			
Norway NTAV	All	460	60	-	5.3	27,28
Sweden IVA	Active (<65yr)	360	55	57	15	29,30
United Kingdom RAEng	All Regular	1397	70	60	<2	31,32
United States NAE	Individual	2538	72	64	4.5	33,34,35

Female participation varies, with the Czech Republic, Germany, India, Japan, Korea and the United Kingdom under 2.5%. In the mid-range of 4.5 to 6%, are Australia, Canada, France, Norway and the United States. At the high end are Croatia, Denmark and Finland at about 10%. Sweden stands alone at 15%. For comparison, the representation within the practice of engineering is 10% in Australia [36] and the United States [37], 9% in Canada [38] and 14% [37] in Sweden. As shown in [2], recent appointment levels have been higher some academies.

The disciplines¹ of over 6900 male fellows and 300 female fellows are shown in Figure 1. Disciplines were determined on a best-efforts basis using data from websites, reports and individual internet searches. The largest group of men is in Architecture, Civil and Ground/Marine Transport, whereas the largest group of women is in the Interdisciplinary Areas (Interdisciplinary Sciences, Interface of Technology and Society, Education, History etc.).

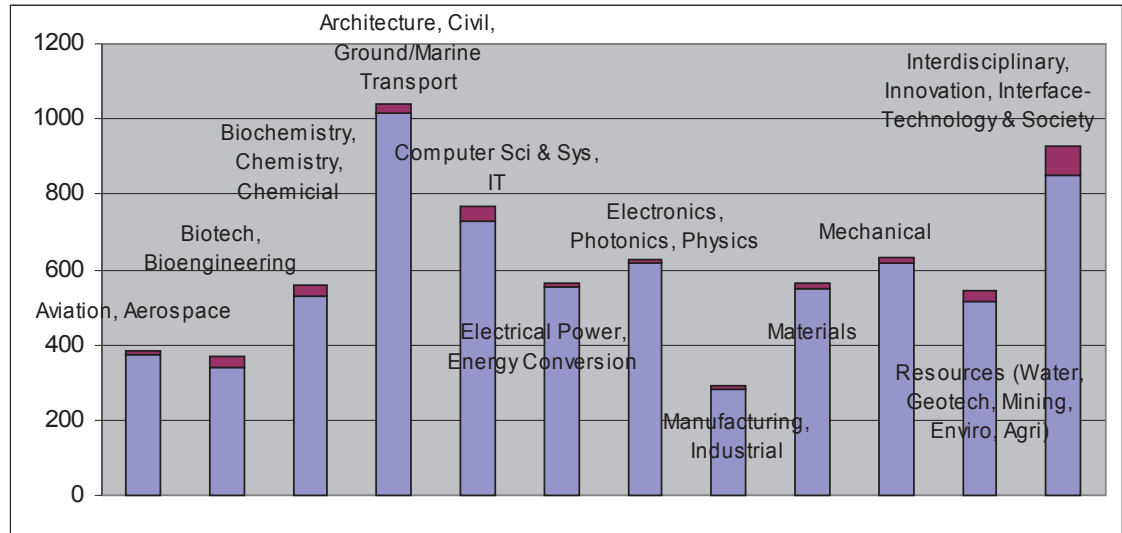


Figure 1. Disciplines of Male (Blue) and Female (Red) Fellows

Figure 2 shows the breakdown by discipline for male fellows. The largest group is that of Architecture, Civil Engineering and Ground/Marine Transport (15%), followed by the Interdisciplinary Areas (12%), Computer Science, Systems and IT (10%) and then Electronics, Photonics (9%) and Mechanical (9%). This contrasts with the smaller US-based study [2] which had the Electronics and Photonics area as the largest group. This current sample is more representative of the international community.

In Figure 3, the largest group of female fellows appears in the Interdisciplinary Areas (24%), followed by Resources (11%) and Biochemistry, Chemical (11%) and Biotechnology (11%) and then Computer Science, Systems and IT (10%).

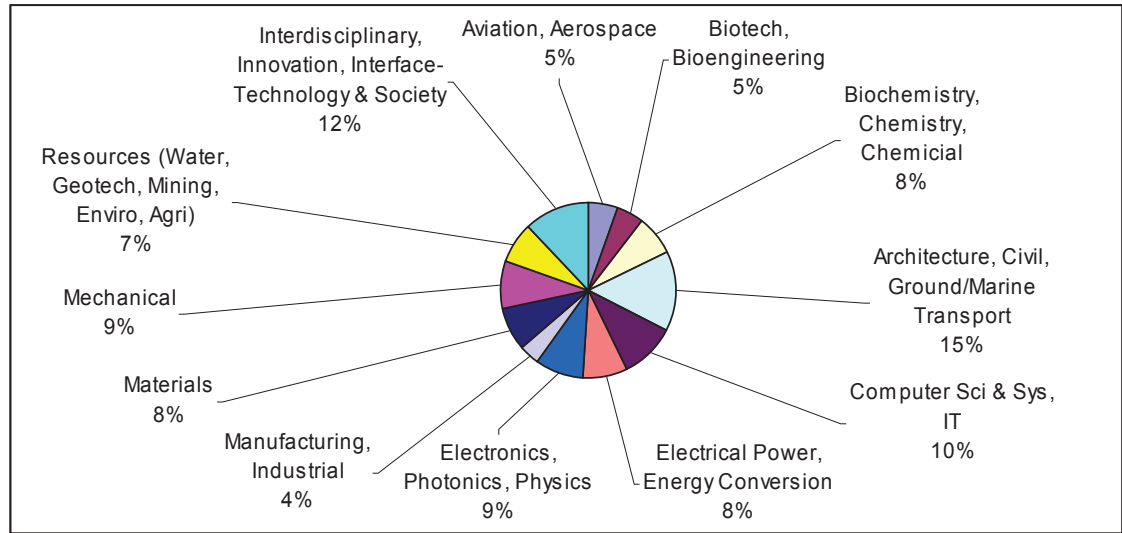


Figure 2. Male Fellows by Discipline

¹ Disciplines are based on those of the NAE. Results exclude Denmark, Finland and Japan and individuals who could not be positioned.

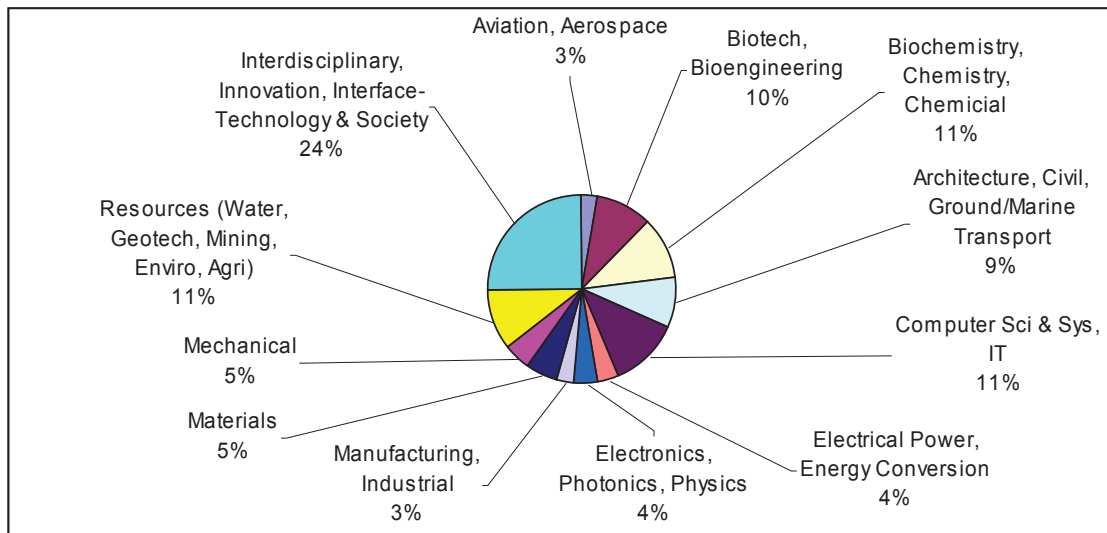


Figure 3. Female Fellows by Discipline

Contributions

Women represent a small fraction of the fellows in CAETS, ranging from less than 2.5% to a high of 15% in the academies studied. There appear to be gender differences within the disciplines with proportionately more women making their mark in nontraditional interdisciplinary areas and fewer in the traditional fields.

The Canadian Academy of Engineering and NSERC grant 41745 are gratefully acknowledged.

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Keywords: Women, Fellows, Academies of Engineering, CAETS

CV:

An engineering professor, and Associate Chair (Undergraduate) Moyra McDill is a role model for both women and men who wish to pursue engineering. A true pioneer, Moyra was the first woman to enter into and complete a doctoral degree in Mechanical Engineering at Carleton University. She was the first woman to be hired as a faculty member in Carleton's engineering faculty, and the first woman there to be promoted to full professor. Today, Moyra is highly regarded as a teacher, researcher and administrator. She received a Carleton University teaching award, a Students Choice Best Professor award and is a Fellow of the Canadian Academy of Engineering. Through her research into gender and science, Moyra works to advance women in the field. Her developments in numerical analysis for materials engineering have been adopted by several international academic and industrial organizations. Her appointment in 2002 to the Canadian Nuclear Safety Commission confirms her commitment to excellence and public safety.

**"STRATEGIES FOR MOBILIZING AND EMPOWERING WOMEN SCIENTISTS
AND ENGINEERS IN EASTERN EUROPE:
THE INWES REGIONAL SYMPOSIUM, POLAND 2007"**

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Women make up more than 50% of scientific population in East Europe and Russia. Thus, they constitute a critical factor in development, especially because of their demographic strength. Difficulties in advancements of science, scientific research and academics in East Europe means an inadmissible misuse of human resources. Although some of women have achieved academic knowledge, most of them do not hold decision-making positions due to lack of confidence, discrimination and the lack of leadership training. The lack of gender discussions in that area causes that highly skilled workforce is not completely involved into economic growth what in a fact would help to bring about sustainable development in still developing countries of East Europe and Russia. Participation of women in this development by contributing to technological advancement, industrial and economic growth, which is greatly needed during this century, may be achieved through academic knowledge and social empowerment.

Another important argument in favor of discussing all women in science related issues and in organizing of international meeting in East Europe (Poland) was the growth of migration processes in the European science, stimulating also the mobility of East European and Russian women-researchers. The symposium objectives had been chosen to respond to above problems and those related to the retention of women in careers in STEM fields. They were the following ones:

1. Create a forum for general reflections on gender and science and an opportunity to share and learn from successful strategies and programs implemented in developed countries in removing obstacles to the participation of women in Science, Technology, Engineering, and Mathematics (STEM) careers.
2. Identify strategies to make these fields more inclusive of diversity.
3. Bring participants together from various economies (developed, developing, countries in transition) to provide an international perspective on issues and challenges as some of these vary by region.

4. Discuss the culture of science and technology and potential biases and obstacles for women to progress into decision-making roles.
5. Discuss the issue of balancing career and family responsibilities.

Symposium was organized by the University of Wroclaw in close cooperation with INWES and it was funded by the Polish Ministry for Science and Education and Canadian International Development Agency (CIDA).

More than 70 women scientists and engineers from 22 countries participated in this Symposium. Those were women of East Europe and Russia, some of the USA, Canada, Asia and Africa. The expert speakers and panelists including members of the INWES Board and Polish and Russian women selected for their expertise were invited. Symposium in Poland was predicted as a one-time event that was expected to produce long-term outcomes of collaboration and networking.

Participants discussed the issues on balancing career and family, professional development, career progression and recognition of their work. Several attendees spoke of their own experience and many contributed to finding solutions to the issues. Polish universities decision-makers and administrators such as rectors, vice-rectors and deans were involved in panel discussion on how to promote gender equality in their universities. Women saw a variety of models on how to balance family and career. Issues related to the culture of science and how to eliminate potential biases in hiring, promotion, awards, prizes, were also discussed. The final aspect was for local and regional networks to be created at the meeting and afterwards. This is currently happening in Bulgaria and Zambia. Several other participants joined the network and will continue to communicate with each other.

Recommendations after Symposium in Poland suggest :

- Create responsible policies for education and research that promotes the female potential in the sciences.
- Increase the mobility of scientists in all of Europe.
- Integrate the scientific canon to improve the communication between scientists and engineers, for women and men.
- Integrate the East European and Russian women in the European science.
- Increase the proportion of women scientists from Eastern Europe with respect to international positions on gender equality.
- Foster the start-up of local and regional networks.

The Local Organising Committee received Letters of Congratulation from Secretary of State of Polish Ministry of Science and Education (prof. K.Kurzydłowski) and from Mr Johannes Klumpers-European Commission, Research Directorate-General; Directorate L-Science, economy and society; Scientific culture and gender issues.

The Symposium was a resounding success and has provided capacity building for women in science in Eastern Europe and Russia. Many of the CIDA-funded attendees are now communicating with each other and with INWES. African delegates attended the INWES Board meetings which was providing additional training and exposed them to best practices to take back to their country.

BEYOND PERFORATING THE GLASS CEILING: WOMEN'S PERSONAL SUCCESS FACTORS IN BECOMING LEADERS IN MALE-DOMINATED ENVIRONMENTS

Silvie Klein-Franke

IdeasXskills

Type of presentation: Oral session

Abstract

Male archetypes of leadership and cultural adversities make it complicated and often hinder women to achieve and keep leadership positions in male-dominated organizations. This review aims to highlight the attempts that make women successful in leadership positions.

Accordingly women ambitious for a career should generate and get aware of their specific and individual profile and ideas of where they might fit best. Therefore they need

- to reflect and realize own values, interests and working stiles;
- to appreciate their own life-history as fundamental to next career steps and the way they will approach them;
- to extract and treasure strengths and competencies that they have developed informally (i.e. outside formal education-systems);
- to test themselves under Assessment Center conditions and use the feedback as an analysis of their own potential especially regarding leadership skills and further to get orientation regarding the best direction of any further education steps.

This kind of self-development can well be aided by a career advisor and next be purposefully employed - among others - in self-marketing. Using this curriculum, women are able to generate several professional alternatives for themselves and prioritize them according to their own criteria of self-fulfillment.

For women who are already on their way to obtain leadership-positions it is essential to be self-aware and deeply self-reflexive on their own personality as stated above. They further profit from the understanding, derived from the cognitive sciences, that show human beings to be so extraordinarily successful in evolution because of their pattern-recognition competencies that enable very quick reactions – but might at the same time promote judgment on first sight. As stereotyping is one of the reasons for the difficulties women encounter when aiming for a career, understanding the differences between stereotyping and generalization is quite important. This is a prerequisite and basis on which they then can successfully apply a framework of references. These guidelines can help them

- to learn, how men and women are different;
- to predict the 'glass-ceiling' – the invisible professional barrier that women have difficulties to pass;
- to understand possible achievements as well as risks of offensive, defensive and subversive behaviors in dealing with career obstacles and barriers;
- to cope with the exposition women experience in top-positions in general and
- to be successful especially in applications, annual career talks, pay, family-compatibility and other negotiation themes.

Workshops for women on rhetoric skills, non-verbal behavior, business etiquette and even mentoring suggest that adaptation is possible. Lack of interest in these programs on the side of the women indicate that women can neither see adaptation as a way that could ever be fully completed, nor as one that will help them to achieve personal or professional fulfillment.

To realize such fulfillment leadership women – on top of knowing themselves and their male counterparts by heart need to develop certain situational skills and the ability to react strategically. Therefore they have

- to differentiate between their role in the organizational structure and their identity,
- to understand the characteristics of organizational culture in general and
- to become clear especially about those specificities that are systematically developed in organizational cultures with comparatively homogenous staff (i.e. vertical segregation of heterogeneous members) and the resulting typical and complex denial-reaction induced through 'otherness' in higher positions.

Awareness and knowledge regarding these issues empower women and help them to develop appropriate coping-strategies for and in leadership positions. The resulting self-efficacy stops career-drifting and interpreting negative occurrences as own personal faults (to the degree of physical reactions against endured professional situations). Self-efficacy has been proven already to be one of the key success factors acknowledged by women, who have reached leadership positions (actually this factor seems to be also crucial in men's careers).

Developing these skills further enables leadership women to fully understand the dynamics in heterogeneous teams and subsequently to build such teams successfully – a huge advantage in times of internationalization and merger & acquisitions (both with failure rates – depending on the studies – up to 70%). The chance of heterogeneous teams is top-performance in every respect and employing any parameter (return on investment, innovation capacity, success regarding 'war for talents' etc.), the risk is substandard performance, due to paralysis

and subdued or open conflicts – a situation quite commonly experienced especially when the first very few women come into leadership positions in male-dominated organizations.

In summary the conditions for professional success pose a severe challenge to women – often only recognized as such, when degrees, children or career ambitions unexpectedly make the 'glass ceiling' first perceptible. Common career-strategies of women so far have been predominantly adaptation and confrontation. Both have brought us quite a way and changed already some conditions – except that for the women taking one of these paths it has probably more often been a hard time than pure pleasant fulfillment. Understanding the underlying patterns, differences and systematic and predictable undercurrents brings us on in the ability to adequately react to the surrounding conditions. This can make women successful in the end as well personally and professionally as for the issue of women's participation in organizational and societal leadership.

Keywords: Glass ceiling, leadership women, career, personal success factors, diversity management.

CV:

Professional Experience:

Since 7/2005

Free-lance HRM Counsellor, Careers Advisor, Intercultural and Leadership-Trainer. E.g. Requested EU-expert on gender and research to the 7th research framework program. Training and counselling of large and small companies and organizations regarding international, interdisciplinary teamwork and personnel development. E.g.: training a German Ministry to change its organisational culture so as to support systematic innovation, consulting for an internationally successful company to become an international company, gender mainstreaming and diversity training for a bank, teaching at the *Management Centre Innsbruck*. Member of working group 'cultural change' of the *Tyrolean Chamber of Trade*.

Since 11/2004

Assigned **EU-Expert on Vocational Training**, focussing Soft and Intercultural Skill Development in project-evaluation of the *Leonardo da Vinci Programme* (Bonn/Brussels).

Since 10/2003

Lecturer for Career Management, Soft Skill Development and Trainer-Training at the *Universities of Innsbruck* and the *University of Göttingen* (ongoing). Up to July 2005: At the Faculty of Business Administration **Head of Careers- and Placement-Centre** at the interface between higher education and company-requirements. Psycho-diagnostic testing, establishing of personal profiles including informal competency portfolios with students. Recruitment of High Potentials for companies regarding their company criteria and culture. Responsible for a virtual careers network and service centre between 5 Austrian universities and companies. Member of international expert-group for the development of an international online career-counselling instrument.

10/ 2002 – 10/2003

Head of International University Language Centre, *University of Innsbruck*, reorganization of a program involving 100 courses, 64 international lecturers, 3500 students/year from different faculties. Development and implementation of a concept to establish a new institution, addressing the language and intercultural ability needs of students and staff, as well as opening the programmes to the public to be competitive on the free market. Full responsibility for concept, staff (including staff development) and resources.

4/2001 – 9/2002

Senior Officer for Programme Development and Students Affairs for the *Centre for Tropical and Subtropical Agriculture and Forestry, University of Göttingen*. Development of integration-programs for the 270 international, interdisciplinary students, organization of international symposia. Public Relations. Advisory member to the university's working groups regarding internationalization of curricula and international marketing of programs.

3/1998 – 4/2001

Coordinator of an experimental university program *International Women's University Technology and Culture (ifu)*, a postgraduate, interdisciplinary, intercultural programme in English during the EXPO 2000. Responsibility for project management and coordination including selection of personal and faculty for 3 of 6 project-areas. Later coordinator of the project-area *Information* that was held at the University of Hamburg. Involvement of 45 prominent lecturers as a faculty from all over the world, organization of international meetings, substantial participation in the development of contents and structure of the practise-oriented curriculum *Information as a Social Resource* with contributions from all sectors of ICT-technologies, Media, Computer Science, Social Sciences and Medicine for 130 participants. Representing the *ifu* on Congresses, e.g. at the EU. The *ifu* was recognized as UNESCO-project and won the prize for innovation best practice of the German Council of Universities.

1/1998 – 3/1998

Technical service and support of product management in Europe, *ICN Biomedicals*.

1/1987 – 6/1991

Research fellow in an international, interdisciplinary team at the *Max-Planck-Institute of Immunology*, Freiburg, lectures and posters on international congresses and public institutions of further education.

Higher and Further Education:

1997 – 2007

Intercultural Communication and Professional Communication Techniques, including Intercultural Trainer Training (academic training, 290 h, non-academic 30 h), coaching instruction (ongoing, 130 h so far) and NLP Practitioner (160 h).

2002 - 2006

Management: Human Resource Development (90h), International and Knowledge-Management (45 h), Diversity Management (30h) (up to here all Univ. courses), International University Marketing (German Academic Exchange Service, 15h).

2003 – 2005

academic **Career-Counselor**, (degree with honours, 600 h) *University of Klagenfurt*; Advisor CareerStormNavigator (non academic further education, 100h),

1996

Non-academic training as **Affirmative Action Officer** (1830 h), focus on communication, public relations, local and EU-law, administration, policy and best practise.

1979 – 1991

Biology: Doctoral and Diploma Thesis (Biochemistry/Cell Biology and Immunology) at the *Max-Planck-Institute of Immunology* (which in Germany was an honour as then George Köhler was director, former Noble Prize winner in medicine); before graduation extensive studies (7 month) in Japan, Thailand, Israel; student representative in the council of the Faculty of Biology, University of Freiburg (2 years).

1979

High School Graduation ranking 3rd among 120 students.

Engagements:

More Direct Democracy in

Mentoring-Platform Tyrol since 2002 (member of board); Association for Germany since 1992.

References:

Companies (HRM):

Kommunalkredit Austria, Wolf-Consulting, Infineon, Innovacell, Julius Blum, Ferrero, Hafelekar Unternehmens-beratung, Holleis, Westcam, Wüstenrot, (all Austria), Menarini (Italy), Altitude Studies (Sweden).

Publ. Instit.:

Ministry of Agriculture and Environment Mecklenburg-Vorpommern, Austrian Research Promotion Agency, Employment Center Vienna, EU-projects JoinIn, EqualAdvocate, InitiativeFrauenGründen, Frauenakademie München.

Former Chiefs:

Prof. Dr. C. Floyd, floyd@informatik.uni-hamburg.de Head of the Software-Development Dep., Faculty of Computer Science, Univ. of Hamburg, Prof. Dr. S. Laske, Stephan.Laske@uibk.ac.at Dean of Faculty of Business Management, Univ. of Innsbruck, Council of Medical Univ. of Innsbruck,

Comments by
International
Colleagues:

Dr. Silvie Klein-Franke was indeed a most valuable unit and kept this international project going despite many difficulties faced. She was excellent in every way.

Prof. Dr. Esther Williams, Vice-Chancellor of the University of South Pacific, Fiji, commented regarding ifu-coordination in 2000.

Dr. Klein-Frankes interdisciplinary interests and knowledge makes her able to see relationships as well as points of conflict in cross-disciplinary work. She has always been able to both respect the perspective of others and to suggest additional approaches to be considered. She has a sharp analytical mind and excels at quickly understanding many fields of study. Her intercultural abilities and knowledge and interpersonal skills enable her to put people from very diverse backgrounds, ages and cultures at ease, and to encourage them to expand and clarify to lessen the possibilities of misunderstandings."

Cheris Kramarae, Prof. Emerita Speech Communication and Sociology, English as an International Language, University of Illinois, USA

THE PHENOMENON OF GLASS CEILING IN THE SOCIETY OF KNOWLEDGE: THEORETICAL FRAMEWORK AND EFFECT ON PRACTICE

Dr. Karima BOUZGUENDA

Assistant Professor, Department of Management, School of Economics and Management
University of Sfax, Tunisia

Type of presentation: Oral session

Abstract

The analysis of the question "women, science and development" reveals an evolution on the paradigmatic level showing a transition from an economic to a strategic logics.

According to an economic perspective, women's status is the result of investment in the human capital expressed in terms of education, training and experience (Becker, 1971; Olson and Becker, 1983; Duncan and Hoffman, 1978...). However, this explanation is lessened with the improvement of the levels of women's education and experience in the market place (Solomon, 1978; Caire, 1992...).

The issue of women's role and place is then viewed from a sociological perspective according to which social relations determine the roles of women and men in the society (Harriman, 1996; Tharenou, Latimer & Conroy, 1994; Hamza, 1997; Martin, 2000). Consequently, the "limited" opportunities to women's access to the market place and during the career to the decisional sphere are to be explained by the absence of a gender approach (Laufer and Fouquet, 1998; Laufer, 2003). However, the efforts deployed by the public authorities, the professional associations and the NGOs have yield to the sensitization to gender approach, the promotion of mainstreaming and practices encouraging equal opportunities and valuing diversity issues (Locoh, 1996/2001; BIT, 2004).

Nowadays, women's involvement and contribution to the edification of the society of knowledge raises a "new" question related to the assessment of feminine potential in order to intensify development at a large scale. We may wonder whether knowledge has a "sex" (The Doeuff, 1998) and whether science and development are conditioned by the gender of their bearers.

Behind these various interpretations of women's status in the society lies the persistence of some "discriminatory" practices mainly with regard to job access and to advancement to decision making positions (Kanter, 1993; Powell and Butterfield, 1994; Bouzguenda, 2005). The phenomenon of glass ceiling seems to impregnate selection and promotion decisions while dissimulating the predominance of a representation based on stereotypes and bias towards women and more especially those who are qualified and educated. Indeed, professions known as "scientific" did not escape to these barriers.

The present paper exposes the results of a study on women engineers in Tunisia. The particularity of the engineer's profession lies in the fact that it concerns a profession which is, by excellence, considered as "traditionally masculine". Furthermore, it is neatly related to the domains of science and knowledge considered as the motors of development.

Research is motivated by two main facts. The first is based on statistics on women's engineers in the bar council of engineers which show that 50% of registered women do not have employment affiliations. The second fact is related to our interest for management technology as a field of academic research to which women engineers have a potential to contribute.

Based on gender theory, the study aims at verifying the hypothesis of the existence of discriminatory practices depriving women from not only job access but also promotion to decisions-making positions.

In Tunisia, women count 10% of recruited engineers during 1996-1999 which represents 11, 23% of those looking for a job compared to 24% of men been placed during the same period. Furthermore, statistics show that the tertiary sector and public administration absorbs the majority of graduated women in engineering with the proportions of 20,73% and 12,20% respectively; the industrial sector comes in the third place (35,37%) while some domains remain close to women's entry such as mines and energy (less than 3% of placements). The barriers women face at the entry level seem to influence not only promotion and advancement but also training decisions.

Secondary data underline the existence of some paradoxes pertaining to the situation of women engineers: on one hand, they have been improving their educational credentials, conquering most fields of study and research, and actively searching for jobs. On the other hand, they are placed in jobs in offices and not on sites.

The primary survey is conducted in two main steps: In a first one, we led three rounds of focus groups in three main cities of the country in order to elaborate four types of questionnaires. In a second step, we conducted a survey in eight regions of the country based on administrated questionnaires. Four categories of women engineers are concerned: employed (244 women), unemployed, jobless (89) and entrepreneurs (15) for a total of 348 women engineers, the sampling method is the snowball.

A qualitative and quantitative analysis reveals that the status of women engineers in Tunisia is mainly explained by, in addition to education, factors related to four spheres: social, professional, familial, and individual. These results confirm the hypothesis of discrimination against women engineers and call for a change policy at a large scale in order to "break" the glass ceiling which is, in essence, based on invisible and indirect barriers to personal development and thus to societal progress.

The under-representation of women engineers is attributed mainly to socio-cultural factors which seem to nurture discrimination in the domains of training, promotion, and empowerment. Interestingly, women engineers have been excluded from the private sector where they face barriers to entry. Even when they turned to self employment, things are not getting easier when it comes to dealing with suppliers, banking institutions, clients, public agents and more generally citizens. The image of women leading a business is not very well accepted in the Tunisian society.

Finally, the 89 unemployed and jobless interviewed women attribute their situation to discriminatory practices, familial obligations, dual-career problems and individual preferences. They believe that such a situation is temporary and not everlasting.

The study highlights some recommendations which may reinforce and legitimate the participation of women engineers in development.

The results of the study are published in a book entitled "Women engineers in Tunisia: Representations, roles and participation in economic life", by the Tunisian Center of Research, Study, Documentation and Information on Woman (CREDIF).

Key words: Women engineers, glass ceiling, gender, women entrepreneurs, society of knowledge.

CV:

Education: BBA and MBA (USA). Doctorate degree in Management in 2005.

Professional experience: Teaching courses in HRM, organizational theory and strategic management since 1995.

Research interests: Women career management, glass ceiling, diversity management, management fads.

NEW CHALLENGES, NEW OPPORTUNITIES FOR THE ASSOCIATION OF KOREAN WOMEN SCIENTISTS AND ENGINEERS (KWSE)

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The Association of Korean Women Scientists and Engineers (KWSE)

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²Director, Division of Analytical Research, Korea Basic Science Institute Busan Center, Busan, Korea

Type of presentation: Oral session

Abstract:

The remarkable economic growth achieved by South Korea over the past decades has been accompanied with an increased participation of women in science, technology, engineering and math (STEM). The gender disparity in the scientific field had therefore triggered about 250 women in the Daejeon area to establish an association which could help improve their status as well as protect their rights as professionals in STEM. 1993 was the year KWSE was born in the Daedok Science Park in Daejeon. Two years later, the Ministry of Science and Technology of Korea approved the association, which has grown over the 14 year period into the largest women scientists and engineers' association in Korea. The current number of members is 1200. KWSE has been actively involved in supporting fellow women in STEM in Korea; in expanding the female population in science and technology; in propagating everyday science; in upgrading the status and rights of women scientists and engineers; and in contributing to the national scientific development. The active voices of KWSE members have made possible the legal revisions for fostering and supporting women in STEM; the "Act to Develop and Support Women in Science and Technology" was legislated in December 2002. Currently, the employment quota system for women is beginning to be implemented in various institutions. Moreover, many women scientists and engineers have been promoted to positions they were not allowed to dream of before the 1990's. KWSE is now heading towards fostering stronger leadership by implementing leadership training programs and towards becoming a more globalized association. Organizing ICWES13 in 2005 has become the impetus for this internationalization process. KWSE hopes to expand its horizons not only domestically but worldwide, acting as a bridge for women scientists and engineers in the developing countries and more advanced nations.

Keywords: Korea, STEM, Woman scientists and engineers, Policy

CV:

Dr. Kong-Joo Lee is professor at the College of Pharmacy, Ewha Womans University in Seoul, Korea. She is President Emeritus of the association of Korean Women Scientists and Engineers(KWSE) and served as President of KWSE from 2006~2007. She was the organizing committee chair of ICWES 13 which was held in Seoul in 2005.

The co-author of this presentation, Dr. Mi-Sook Won, is the newly elected president of KWSE. She has served as Vice President during Professor Kong-Joo Lee's presidency of KWSE and was responsible for the formation of the Busan/Kyoungnam regional KWSE in 2003.

Both Drs Lee and Won are representatives of the largest women scientists and engineers' societies. They are actively involved in STEM activities for women in Korea and are members of various national scientific committees.

NEW OPPORTUNITIES AND NEW CHALLENGES FOR WOMEN ENGINEERS AND SCIENTISTS IN THE SOCIETY UNDER TRANSITION - THE CASE OF POLAND.

Marcelina Zuber,

PhD, Institute of Sociology, University of Wrocław, Poland

Abstract:

Polish society has changed significantly during the last eighteen years of economic transformation. Some aspects of those changes are beneficial for women scientists and engineers. Others create serious obstacles for women-specialists in STEM. The goal of my paper will be to present those opportunities and obstacles: old (resulting from the former socio-political system combined with traditional cultural norms and values) and new (resulting from the exigencies of free-market economy accompanied by changes of definitions of social roles). The impact of the previous and actual educational systems will be also examined.

Among the opportunities for women scientists and engineers in Poland I would like to elaborate on the following:

- a) new opportunities for women scientists and engineers created by the very fact of transition from the centrally planned economy to the free-market oriented one: competition is growing and companies look for more and more innovative solutions and thus the need for scientists and engineers, women and men is growing.
- b) new opportunities offered by the transformation of the economy in Poland into the knowledge-based one, thus enhancing job and career opportunities for the specialists in STEM
- c) new opportunities resulting from the migration of Poles (mostly young, well educated, males, specialists in STEM) to the EU countries making the need for scientists and engineers, female scientists and engineers included more urgent.

Among the obstacles to girls and women who want to specialize in STEM in Poland I would like to concentrate on the following factors:

- a) the role of cultural values (traditional collectivism of Polish culture confronted with individualism) and cultural myths (e.g. the myth of Mother - Pole)
- b) the impact of socialization patterns, depending on micro and macro-structural factors
- c) traditional gender roles and convergent communication styles transmitted by various educational institutions
- d) lack of interest in science and technology among girls and young women resulting from socialization processes within the family and other institutions

My goal in this paper will be also to examine the impact of transition of the educational system in Poland on the situation of female students interested in STEM in Poland, for example:

- a) the role of mathematics, physics, chemistry etc in educational paths of young people
- b) the opportunities to acquire practical technical and technological skills necessary for success in STEM
- c) criteria applied during the processes of selection for universities, evaluation criteria applied at the university
- d) criteria used in selecting Ph D students in STEM; situation of doctoral students in STEM in Poland.

Keywords: Socio-economic transformation, structural factors, culture, socialization, cultural impact, educational system

CV:

My research field is sociology of knowledge and science, specifically the constructivist sociology of knowledge. My publications concern the works of representatives of the "strong programme" in the sociology of science, evolution of Bruno Latour's approach to studies of science and also theoretical backgrounds of the constructivist approach to science.

I spent several months as a visiting professor at the Department of Sociology, Duke University, North Carolina, USA. I was also a holder of the 8-month scholarship awarded by the French Government to study at the University Paris I and to do research at Ecole des Sciences de l'Homme, Paris

A STEM WOMAN* IN THE CORPORATE GAME

Sabine Joswig, Graduate Engineer

Coach, management trainer, owner and managing director of Sabine Joswig Consulting, Gifhorn, Germany,

Type of presentation: Oral session

Abstract:

We develop playfully as children of the world. We comprehend and learn from the game. In economic journals you'll read expressions like "take-over battle, achieve (corporate) gains, price poker, fight for market shares, victory across-the-board, etc." An extraterrestrial might think this was all about competition, game and showdown. The private sector seems to be a game for grown-ups, with board-game rules.

In Germany, pachisi (ludo) is a very popular game, probably one of the first board games children are taught – through active participation in the game. The rules are passed on from the older to the younger ones. I learned to play this game with varying rules: Softer rules are applicable for beginners and small children, while with peers we make very sure that everyone, especially opponents, sticks to the rules. Open or hidden gaming associations are formed that fight or help each other. There will be uproar in the game regularly, if new players insist on different rules and mostly in a critical situation. In case of dissent, we never consulted the game rules. During such conflicts, we always tried to shape the rules through communication and (self)assertion. We tried to find a consensus, or simply be the powerful ones who decide the rules of the game for all participants and all subsequent games.

Can you perceive parallels in the corporate world?

When women start working in a company with deep-rooted ("male") structures, they are expected to prove their professional qualifications and define their positions and roles in the corporate game. No matter how men encounter her, it is how she builds her relationships with colleagues and superiors that decide how her career will develop, besides the technical, professional communication. Perhaps, if one woman works with many men, the question of stereotypical gender behaviors automatically arises, and it is fascinating to find out what role Eros plays in these relationships. Another important question in the corporate game is whether the personal and corporate aims can be reconciled, and if so, how?. Here, personal and corporate handling of power and structures, the role of competition, performance and efficiency, questions of tradition and flexibility, the formation of informal relationships and networks are all critical.

This lecture is about the hidden rules of big corporations, and how men and women deal with them. Besides professional performance, power and status, expertise and competition are significant factors also for women. Are we well prepared for "men's games"? Are we ready to simply play along and be grateful that they allow us into the game, or is it high time to get more involved in the corporate game and proactively participate in it?

To remain successful in the globalized world, should we remain relatively passive, industrious and competent pawns of the powerful or active self-confident players who would set a new course for our companies?

In my view, too many women, particularly engineers and scientists, still collapse in the face of unwritten company rules despite their excellent professional abilities and acknowledged soft skills. They have a hard time in the corporate game, still strongly shaped by men. They show excellent performances within the company, but are often uninterested in things outside their fields, or in structures and rules in general. In the West (Europe/America) female engineers and scientists are still a minority in many areas. But, a natural and truly equal cooperation is only possible if the gender mix consists of 30% women or more. As long as men are still there in superior numbers, especially in our professions, it is much easier for them to maintain, preserve and enforce their centuries-old unwritten rules and agreements. Why do we women often fall behind in the corporate game? Why does the "glass ceiling" still prevent female scientists and engineers from advancing to higher positions? What are the practical, professionally unrelated barriers that become stumbling blocks in the promotion of women, impede their careers and are often underestimated by us?

Based on many examples from my own practical work experience as an engineer, and also as a management coach and trainer mainly for women in technical professions, I will show you how ambitious women still complicate their careers unintentionally as they are ignorant of these secret rules. You will learn how men set the stage in such a way that they can keep power in their hands to a large extent. And you will see how women make men think that they are not really interested in a career. I can give you an "instruction for failure" that exposes female mistakes in the male career game. We are still almost entirely judged by male career standards and criteria.

If they have a family, women are further hindered to participate in the game. Engineers and scientists in particular have to face traditional prejudices time and again and find it hard to get attractive job opportunities if they have children. It is mostly capable and ambitious women, sorely disappointed by a game strongly unfavorable to them, who eventually quit the male-structured corporate world and successfully start their own businesses, which enables them to live according to their own values and criteria.

This lecture will give you suggestions on how to actively deal with corporate structures, and also with your own behavior. With it, women are not merely participants, but also act proactively and creatively. Now, the consultancy firm McKinsey asserts that for the survival of our globalized economy, it is crucial to model corporate structures in the way that many women have aspired for years. The corporations need us the way we are. We are required to introduce our view of the world more strongly into these structures. In return, we want to renegotiate the rules in a true dialogue and become successful together in the globalized world.

Perhaps, after this lecture, you will have more fun carrying out your good professional work with passion, to take a more active part in your company and change the rules according to your wishes.

Women in "Science, Technology, Engineering and Mathematics"

Key words: Career for women in STEM professions, - Hidden rules of the career game – good-bye "man"opoly, Corporate structures under gender aspects, Gender aspects of power, career and success, Strategies for more equality in opportunities

CV:

For further information please visit my Homepage (English and German)

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Sabine Joswig, born in 1960

1979 – 1985 Studied Industrial Engineering at the Technical University Berlin

Worked for many years at IBM Berlin, management consulting and in administration

Since 1993 Foundation of Sabine Joswig Consulting: Freelance consultant and coach based in Gifhorn, Germany. Joswig Consulting is a management consulting company focusing on coaching, training and competence development especially for woman in technical professions.

References:

Companies working internationally: Volkswagen AG, Wacker Chemie GmbH, gedas now T-Systems

Professional Associations: VDI Verein Deutscher Ingenieure – Frauen im Ingenieurberuf, VDE, dib (Deutscher Ingenieurinnen Bund), Health insurance company: Deutsche BKK

Non-Profit organizations: Administration, Church

Small companies, Individuals

Lecturer and guest lectures given at the TU Erlangen, TU Braunschweig, FH Hannover, FH Wolfsburg-Wolfenbüttel.

Author and speaker at conferences.

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Manager of a 2-year model project for the Niedersachsen Ministry of Science and Culture focusing on training women on parental leave, carried out in Gifhorn.

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INCUBATORS FOR WOMEN ENTREPRENEURSHIP IN SCIENCE AND TECHNOLOGY: A VEHICLE FOR DEVELOPMENT

Ghada El Khayat, Ph.D.

Alexandria Institute of Engineering and Technology, Alexandria, Egypt

Type of presentation: Oral session

Abstract

Women had always had important contributions to science since Hypatia of Alexandria passing by Marie Curie and reaching to today's women scientists. These contributions remain exceptional and come out of the ordinary among women groups and populations. In fact, silencing and ignoring women participation in science and technology is a tragic waste of human capital. Conscious of this reality, many activists in several parts of the world worked on enhancing women participation in science and technology education and results proved the outstanding performance of women in science and technology education. An important observation though is the declining curve of women progression in scientific careers and into managerial positions. A common progression of faculty and scientists starts at the level of undergraduate studies through postgraduate studies, Ph.D. awarding, research assistant, researcher, senior lecturer into full professor. If we look at the different shares of women and men at these different career phases, we figure out that women have the lead till the research assistant phase. After this, their share declines and men's share increases. If we extrapolate to industry, we will find the same patterns projected. Women perform and have an acceptable representation until certain levels of the organisational hierarchy and then they encounter a glass ceiling preventing them from access to leading and managerial positions. This happens because of two problems. The first is the discriminatory process to which women in different environments are submitted. The second is the role women are destined to play within their families starting with pregnancy, delivery and child care that continues for a certain length of time sufficient enough for women to lose rhythm, ambition and career progression.

On another plan, research and development is where most of the cutting-edge scientific work is being done. Increasingly it is dominated by the private sector. Two thirds of global funding for research and development is provided by private sources but women do not necessarily find opportunities to flourish in this competitive environment. In the African continent (an important part of the developing world), women represent more than 50% of the population and own less than 20% of the existing businesses. They remain underrepresented across high technology fields and this under-representation is not only a waste of capital but a waste of opportunities for development in developing countries. The global competition requires today that companies make more products with high quality, low cost, perfect service, utmost personalization and above all quick delivery and short lead-time. This calls for more research and development effort for new product development utilizing existing technologies and scientific findings and eventually developing new technologies and making new scientific discoveries. It is in producing new technologies and developing the know-how that nations develop.

So how can we help women professionally progress and nations develop? Small and medium size enterprises (SME's) have been offering developing countries chances of economic growth in the last decades. However, these enterprises are not necessarily science and technology based and hence they neither produce competitive products nor new technologies. Besides, programs promoting SME's are not especially targeting women in many parts of the developing world. In this paper, we present field findings on obstacles faced by a number of Egyptian women in their initiatives establishing their SME's. These included insufficient access to funds because of the absence of a credit history and a business track record, insufficient recognition by the government and limited education and vocational training needed in many cases. Family commitments of married women also constitute a big obstacle. In some case, women has tendency to avoid male dominated business sectors. The findings confirm the need for a remedial action.

To deal with this situation, suggestions for economic development based on promoting women entrepreneurship in science and technology are presented. Incubators appear to be the solution for almost all obstacles. Business incubators that support the entrepreneurial process help increase the survival rate for innovative companies starting up new businesses. Experiences of business incubators in Europe and the United States confirm that they allow higher success rates. Incubators will ensure that women receive the necessary mentoring, training, technical and scientific support. Developing countries hence need a model for the establishment of such incubators defining their roles, their needed resources, their management styles and their sectors of intervention. A model is presented in this paper and it shows that different society resources and actors have to come together for this incubator effort to work in the developing world. A promoting strategy for women entrepreneurship in science and technology also needs framing and directions are presented.

Having women entrepreneurs in science and technology in the developing world is getting half the population to contribute to new product development applying science and technology findings. It also paves the way for the development of new technologies, approaches and methodologies. This directly contributes to the nations'

development. Support materialized by business incubators is needed and the complete awareness of the social role women play is extremely important in order to accommodate different family constraints and to provide adequate solutions.

Keywords: women entrepreneurship, business incubators, product development, science, technology

Cv:

BSc. Electrical Engineering, Alexandria University Egypt (1989), Masters in project Management, Université Senghor, Egypt (1995), Ph.D. Industrial Engineering, Ecole Polytechnique de Montréal, Canada (2003). Currently, professor at the Alexandria Institute of Technology and consultant to industry. Certified trainer with the AUF (Association Universitaire Francophone) in the field of Educational Technologies. Acted as a close collaborator to Chaire Marianne Maréchal, Montreal, Canada in promoting women in science and engineering. Member of the Adhoc committee of the African Union working on the establishment an association for African women in Science and Technology. Areas of teaching and research include operations management, quality management, logistics, scheduling, product development management, operations research, artificial intelligence and expert systems. Mother of Mariam and Ali (9 and 7 years).

WOMEN ENTREPRENEURSHIP IN NORTH OF FRANCE

Fatima Ait Zahrir, Marjorie Dubuc, Anne-Marie Jolly, Francoise Maux
ENSAIT

Type of presentation : Oral session

Abstract:

The North of France delegation of the French association "Femmes Chef d'Entreprises" realised that there were no indications about women managing enterprises in the North of France. They decided to realise a telephonic enquiry so as to know better those women.

So as to limit the task only the 750 enterprises managed by women and of more than 10 persons were solicited. The aim was also to see if Women managers of the north of France had the same characteristics as the other French women managers: North of France entrepreneurship represents 7% of the national entrepreneurship.

In France there are about 570 000 women that manage enterprises, it is about 30% of the managers of enterprises. The average age of women manager of enterprises is 38.

. Each year 80 000 women create or take up a company. In France in 2002, women are 29, 8% of the creators of enterprises. These enterprises are more specifically enterprises of commerce or services to individuals. Very often women create very small enterprises: 70% of them are single person enterprise.

Often women have difficulties to get foundings for the beginning of enterprise: one woman on three has invested less than 3800 euros to create its enterprise and one on two less than 7500 euros.

Method of work: The women had to answer by phone to 19 questions whose responses were analysed by the Sphinx software. 163/750 of the women were ok to answer the questions.

Results: The women were mostly "gerent" of their enterprise; 61, 3% of these enterprises were between 10 and 19 salaries 35, 6 between 20 and 99 salaries and 3, 1% more than 100 salaries.

30, 7% are service enterprise, 22, 1% are commerce enterprises, and 21, 5% are industry enterprises. These women have mostly administrative and financial responsibilities in their enterprise.

From a more private point of view: 77, 9 of these women live in couple; 90, 8 have children (37, 4% have 2 children). 81, 6 % of these women declare they have no problem to manage both family and profession.

It is interesting to notice that 87, 7% of the women would make the same career if they have to make their life once more!

Motivations of these women are the will to make the family enterprise go on, the desire if freedom, and the idea of challenge.

Specificities of Northern women:

41, 1% is between 40 and 49 years old, 37, 4% are more than 50 years: they are older than the national population.

Others and it is more surprising have chosen entrepreneurship to work with their husband.

For the other point of view we can say that women manager of enterprises in the North of France are very similar to those of other regions.

Cv:

AM JOLLY is full professor in Ecole Nationale Supérieure des Arts et Industries Textiles.

Her fields of research are multicriteria decision systems for sustainable development, logistics and data fusion

FROM AN IDEA TO A PATENT

Marianne von Rauch
European Patent Office

Abstract:

Patent system

To explain patents and their use, I would like to tell a story.

Once upon a time a man had a glorious idea to construct a chair with 3 legs only. This chair would never again wobble due to physics law. So he worked on a prototype and after a while he got a stable one, having one leg in the middle on the front and two on the back side. But he didn't tell anyone what he's doing all the time in his shop. Some of his friends and family got curious and used all kinds of pretext to come into the shop. He got furious, and hid himself inside his shop, put on a perfect alarm system. His only social event remained to go to the local bar Saturdays. Of course everyone got drunk and he was telling most of his finding there. After years and years to building prototypes he finally constructed a chair with 3 legs. He dreamed of becoming rich, getting a patent and starting a business and therefore he demanded a patent. Of course his dreams cracked.

If he would have been a woman, she would have had the 3 leg chair idea too, she would have built a prototype too. But hers would have two legs in the front and one at the back otherwise no lady with a skirt could sit in on decently. She would draw different 3 leg chair models and then she would make a survey about the needs. In a next step, she would further search on the internet about furniture and would find out that after more than 500 years of sitting, people had already found all kind of chairs with any number of legs. Maybe she would direct her attention on designing chairs either for people with special needs or simply being cool. Before demanding a patent she would inform about patents.

What is a patent?

In fact, the owner of a patent has the right to produce and use his invention if he fulfils all the other national laws and regulations. He can prevent others to use his invention commercially. The state gives him such monopoly for up to 20 years in return of a disclosure of his invention.

Coming back to our example of the 3 leg chair, it has to be new, including an inventive step and being industrial applicable. Our inventor will describe it thoroughly, may include one or more figures and at least one claim, which is necessary to demand the size of requested protection.

Any patent application has to have a "technical character", therefore discoveries (as deciphering the genome), mathematical methods, scientific theories (as relativity theory), computer programs, diagnostic methods, treatments for humans, business methods or plant or animal varieties.

Where demanding a patent?

If our inventor has created this 3 leg chair, he can ask for a patent at one of the patent offices. In our example the inventor is living in Lille (France), he knows that Belgium, Netherlands, United Kingdom and Germany are not far away. So he might want a larger protection than merely in France and choose directly a European patent. It will cost more money than a national one but he could decide up to 34 European states, including Turkey, which are member states of the European Patent Office (EPO) while having only one patent application in one language and following one procedure. He will get a search report and an examination of his application.

What does the EPO do?

For the search report an examiner will look in a database containing ~60 million patent documents for prior art. Hereby, it is evaluated if the invention has already been published. All available prior art with a quoting about its pertinence will be published together with the patent application after 18 months. In a second step, a substantive examination will be done which might lead to amended claims, being new and inventive. After an opposition period, wherein a concurrent could complain against the patent, the granted patent will dissociate a bundle of national patents.

What are the advantages of patents?

Patents help to advance technology, help to launch new products or processes, increase the market share, recover research and development (R&D) investments and safeguard R&D results.

Back to our story, the man committed some of the so called "seven deadly sins of an inventor". First of all, he tried for years to build his chair without informing himself about the existing chairs. Therefore he was some 100 years too late. Then, he didn't study the needs of the market, his 3 leg chair is not easy to sell for office chairs. Job security law interdicts 3 leg chairs for most of the jobs. On top, he tried to keep his invention secret, so that everyone became curious to see it. A "bad" person could have filed an application in the meantime. But on the other hand, he talked very openly about his chair in the bar, so spoiling his secret. This has the same effect. And finally he thought that a 3 leg chair could make him very, very rich. And he wants too much money for his idea. Maybe he could have had more success with his perfect alarm system instead of the 3 leg chair.

Keywords: Patent system

Cv:

Born and brought up in Berlin (west), Germany, in 1993 graduate with the Diplom in Energie- und Verfahrenstechnik at the Technische Universität Berlin whereby one year at the Ecole de Mines de St. Etienne,

France, working in district heating (EKT, DKM) in Berlin and Dortmund, Germany, doing research to characterize magnetic properties of electro- steel in the frame of a European search project at the Universiteit Ghent, Belgium, working for an industrial filter installation in an incineration plant (Genevet) in La Défense, France and joining the European Patent Office in 2000 first in The Hague, Netherlands and since 2003 in Munich, Germany

FEMALE START-UPS IN RESEARCH AND TECHNOLOGY – AN INTERESTING ALTERNATIVE?

Helene Schiffbaenker, Birgit Woitech

Joanneum Research, Institute of Technology and Regional Policy, Vienna

Abstract:

During the last years the significance of start-ups as an essential instrument of economic policy has steadily increased in Austria. It is widely agreed that a high density of newly founded enterprises has positive effects on the competitive position as well as the innovative capacity of the country and accelerates technological change. The growing interest in start-ups can also be seen in the increasing number of empirical research focussing on different aspects of foundation. Most of them did not include gender-specific questions; moreover entrepreneurship or the foundation of a company is still often seen as "gender-neutral". Different from the United States or Germany research on female entrepreneurs has not a long tradition in Austria, but recent studies (e.g. Schwarz/Grieshuber, 2003; Heckl et al., 2005) increasingly address gender-related issues as well as women and entrepreneurship.

Those studies, highlighting not only the density of female start-ups but also characteristics, motives and attitudes of women towards the formation of a company, provided similar results as in other countries: They indicated a distinctive gender-gap concerning the amount of start-ups, the sector and line of business as well as the number of applicants for financial support. However, no specific survey has yet been done on the high-tech-sector. The paper focuses on this specific sub-sector and aims at describing not only the situation in Austria but furthermore discusses different approaches ("best principles") in fostering female entrepreneurship in research and technology.

Compared to other countries the share of female start-ups in general, and especially in the research and technology field, is rather low in Austria. The reasons for these findings are various and often add to each other. The small amount of potential female start-ups as well as the lower density of women setting-up a new business form sort of "double barriers": Women are not only underrepresented in technical and engineering studies/educations but they are to a lesser extent than corresponding to their formal qualification level employed in research and/or technology-intensive firms (=potential founders). At the same time they do not have access to networks or resources, which are an important prerequisite for success, especially in starting a new business (=decreases motivation and density). According to Bourdieu (1983) not only economic (i.e. financial resources) but more over social (e.g. contacts) and cultural capital (e.g. identification with a certain working culture) is necessary for being successful.

Therefore detailed information on parameters, influencing the individual decision to start a new business, have to be identified and analysed according to their gender-specific impact. Moreover the initial situation of women and men with respect to economic, social and cultural capital has to be taken into account. The paper summarizes results from different studies concerned with the number of (potential) female start-ups in research and technology, their endowments and motivation for high-tech-start-ups as well as barriers for women (e.g. access to financial capital, networks, grants etc.). A special attention is drawn on barriers stemming from the research and technology-intensive field itself, as for example working conditions or working culture. It further highlights characteristics of female founders in Austria, in general and for the research and technology sector, and discusses structural framework-conditions as well as specific needs of women.

Based on these empirical results different "problem fields" for female start-ups can be identified. Simplified they can be divided into five core areas: education, occupational position, financial resources, reconciliation of work and private life, perception of the self/perception of the others. Depending on the stage of the foundation process they can vary in impact, scope and importance.

Now, a policy aiming at a higher rate of female founders in research and technology has to tackle those different problem areas, but the main questions are which ones to address first and with which intensity? In the context of an analysis of international good-practice models for supporting female start-ups best principles have been elaborated. They can be also seen as essential prerequisites to turn start-ups in research and technology into an interesting career alternative for highly qualified women. Although very general at first sight, they can be taken as a guideline for politics in order to step-by-step increase the attractiveness of entrepreneurship for women by providing specific support according to their different situations and needs. The authors want to put these principles up for discussion and make no claim to be complete, but one might see them as a starting point.

Keywords: female start-ups in research and technology, Austria, gender-gap, motives and barriers, good practice, best principles

Cv:

Birgit Woitech has studied economics at the University of Vienna. Since 1999 she works as a senior researcher at JOANNEUM RESEARCH, Institute of Technology and Regional Policy, Vienna. Her main research priorities are in labour market policy and evaluation. Her work thereby focuses on structures and developments of regional labour

markets as well as gender-related issues. She is familiar with quantitative as well as qualitative methods and has some years of experience in developing, managing and implementing projects in different areas and policy fields.

GENDER ASPECTS OF INVENTIONS: EUROPEAN FEMALE INVENTORS AND THEIR PARTICIPATION IN RESEARCH AND DEVELOPMENT

Kordula Kugele

ESGI, European Studies on Gender Aspects of Inventions. Statistical Survey and Analysis of Gender Impact on Inventions. Hochschule Furtwangen University

Type of presentation: Oral session

Abstract:

1 Female inventors in the European knowledge-based society

Innovation and the creation of economic value from technological knowledge have become central strategies to transform the European Union into the most competitive and dynamic knowledge-based economy in the world by the year 2010 (EC 2003a). Since there is already a shortage of highly trained and qualified personnel, more researchers are required to reach these ambitious goals. Europe needs to incorporate the full range of innovative and inventive potential of the society; therefore it is necessary to strengthen the role of women in research and development (R&D) (EC 2003b). Empirical evidence shows that the diversification of the workforce and the incorporation of gender in the creation of technological knowledge are increasingly becoming important factors for innovation and economic success (Bührer and Schraudner 2006, Rübsamen-Waigmann 2006). In contrast, uniformity is seen as a severe hindering factor (Matthies 2006). Even though, the proportion of women in higher education has risen significantly in the EU, a pronounced horizontal and vertical segregation in education and employment is present. Women are especially under-represented in industrial research where in 2003 only 18% of all researchers were women (EC 2006:28).

The creation, exploitation and commercialisation of new technologies are vital factors for countries to stay competitive in the modern marketplace. Based on a strong relation between patents and R&D activities (OECD 2002), patents are seen as key measures of innovative output of countries and organisations (Greif 1999). Moreover, in the ESGI research project patents are used as indicators for the successful inventive achievement of researchers. But even though, the European Commission monitors the percentage of female researchers, patent statistics do not provide gender related data, leading to a lack of hard data on gender aspects of inventions, i.e. the inventive activities of women in Europe. Nowadays, many women are responsible for outstanding inventions, but their share to patent applications in Europe and the corresponding technologies is hardly known as only few and limited studies were conducted so far (Greif 2005; Naldi and Parenti 2002, Haller 2006).

2 The social shaping of technology

The paper is based on the assumption that the development and output of technological knowledge are socially constructed processes which are embedded in a wide field of institutional, structural and cultural realities (Blättel-Mink 2005). Science, technology development and knowledge creation are closely related with questions of gender, influence, control mechanisms and power (MacKenzie & Wajcman 1985). The historically constructed male image of engineering systematically has masked out women's contribution to technological development. Wajcman (2004: 32) points out that historically the prototype of an inventor is described to be of male gender. Consequently, many inventions of women were documented under the name of a man in the patent offices.

The outcomings of the ESGI analysis that will be presented at the ICWES 14 conference focus on gender aspects of inventions. They highlight the contribution of female researchers and engineers to the creation of technological knowledge, women's inventive achievement and scientific excellence in the European knowledge-based society.

3.1 Empirical results: Analysis of the patent database

The empirical results are based on a European cross comparative secondary database analysis of patent applications to the European Patent Office (EPO) with the priority years 2001-2003. As patent databases do not provide the gender of the inventor, a comprehensive, multi-stage first name assignment procedure was carried out by application of a first name database as well as by the assistance of native speakers. Altogether 93% of all European names could be classified as male or female.

The database analysis shows that 8.3% of all European inventors are women and 91.7% men, but pronounced differences between the European countries are found. The female proportion ranges from 23.1% for the highest achieving country Lithuania to 4.8% for the last achieving country Austria. It stands out that the highest proportions of female inventors are found in the Eastern European Union Member States, which in contrast show very low patent activities in absolute numbers. Germany, where nearly 50% of all European inventors reside, reaches a female share of only 6.1% and therefore significantly lowers the European average.

All patent applications were allocated to eight sections and 31 technical units by fractional counting (contribution). Concluding these findings, the contribution of women inventors is highest in all sections, which are related to medicine, health, chemistry and food production. In contrast women's contribution is lowest in the transporting, mechanics and construction sections; but these technologies account for the highest numbers of patent applications in the database. Furthermore, the results indicate that female inventors invent in larger groups than men do. Detailed results of the patent database analysis will be presented at the conference.

3.2 Empirical results: Input-Output comparison

The analysis of the ESGI study focuses on the comparison between women's success in patenting and their participation in research and development in different economic sectors. Patent statistics do not easily match with

data on R&D personnel. For that reason the author developed a methodological approach for the input-output comparison which will be presented at the conference together with more detailed results of the comparison. First analysis reveals that in all European Member States the success of women in patenting is lower than their participation in R&D.

4 Discussion

The pronounced gaps between the input-output indicators raises different questions: Why are female researchers and engineers underrepresented in the measurable knowledge creation? How can the variations between the European countries be explained? To answer these questions, the outcomings of the quantitative data analysis will be merged together with the results of an online-survey on gender aspects in the innovation climate, which is carried out in the ESGI project.

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Key Words: gender and technology, patents, female inventors, female researchers

CV

Kordula Kugele holds a masters degree in social sciences. In the ESGI project she is mainly responsible for the statistical data analysis of a patent database, a comprehensive data comparison as well as the gender impact assessment. Kordula Kugele was trained as a lab technician and worked in pharmaceutical research before she went to Asia to work in community development aid for six years. After working several years in adult education in Germany she took up studies in social sciences. Her research focus at Hochschule Furtwangen University is on gender, technology and science where she worked on different gender related projects.

ACADEMIC TRANSFER, INCUBATION AND ENTREPRENEURSHIP – A PROMISING FIELD FOR WOMEN SCIENTISTS?

Fuchs Stefan, Achatz Juliane, Kleinert Corinna, Rossmann Simon

Institute for Employment Research ("IAB") of the German Federal Employment Agency

Type of presentation: Oral session

Abstract:

With the rise of the 'triple helix' of university, industry and government relations, tasks relating to the economic and social uses of science have become increasingly important. New interdisciplinary fields open new posts for graduates, e.g. in technology transfer or the strategic development of large research units. If the role of science in society changes, we may expect that women's role in science may also be affected, in particular regarding their participation in emerging and changing fields.¹

At the example of German technology transfer organizations we examine the status and the occupational trajectories at different stages of the careers of women scientists and engineers in the field. We analyze their working conditions in various organisational settings, and finally ask if women retain their prominence in the field as its status rises.

We attended to these research questions by interviews with 5 CEOs and 25 female employees in selected technology transfer institutions in two German high-tech metropolitan areas². We used a semi-structured interview guide including routing questions on the individual career history, the organization as a workplace as well as respondent's work experience and work-life-balance. From the qualitative data, reoccurring patterns in the emerging occupational field of technology transfer were identified, for example on different fields of activity, the various entry routes into technology transfer, the multi-faceted organisational structures and practises in the field, the balance of career and family, and gendered career opportunities. To validate the patterns, a focus group was held with senior managers and experts in technology transfer.

Our study shows that technology transfer is a field in transition. It is highly attractive for both men and women from an exclusive first look on inventions and new ideas in science. The field also displays flat hierarchies, diverse activities with a high level of self-responsibility and flexible time use at work. These positive features of the field are counterbalanced by poor wages, in particular in public sector technology transfer organizations and although most people have been awarded more than one academic degree in the past. While there is considerable flexibility in working-time to balance career and family, the workload in the notoriously understaffed public sector organisations is huge. Finally, because hierarchies in the field are flat, upward mobility is barely existent.

We also found that the proportion of women differs between the types of organisation under study, its specific duties, prestige and level of professionalisation. For example transfer organization of universities is mostly embedded into public administration with low wages in relation to the field average and good part-time opportunities. They also have a broad understanding of technology transfer, including professional development and trade fair services. We found a higher share of women there than at the level of academic departments. In the prestigious German non-university research institutions, the proportion of females in technology transfer is considerable lower than that among the academic and scientific personnel. This observation lends support to the notion that unlike in other countries, for example the U.S., women in German technology transfer fall back behind their male counterparts at a fast pace even in occupational fields where they have (re)appeared only recently once enough rewards and prestige have been accumulated or assigned to attract men.

Key Words: gender, technology transfer, career opportunities

CV:

Stefan Fuchs is a sociologist and is currently head of the Regional Research Network at the Institute for Employment Research (IAB) in Nuremberg, Germany. He has conducted extensive research on women in science, supported by the National Science Foundation, the Max Planck Society, the Volkswagen Foundation and the Robert Bosch Foundation. In 2002 he reviewed the situation of women in

¹ See Etzkowitz, Henry, Stefan Fuchs, Namrata Gupta, Carol Kemelgor, and Marina Ranga (2008): The Coming Gender Revolution in Science. Pp. 403-428 in: E. J. Hackett, O. Amsterdamska, M. Lynch & J. Wajcman (Eds): The Handbook of Science and Technology Studies, 3rd Edition. Cambridge: MIT Press.

² "Women in Innovation, Science and Technology" is a project financed by the 6th EU Research Framework Programme (for more information on the project see <http://wist.ncl.ac.uk>) with partners in Finland, Germany, Romania and the United Kingdom.

science in Germany for the Enquete Commission on Globalization of the German Parliament. Together with other researchers he is currently working on an EU project on the situation of women in innovation, science, and technology. He is a member of the EU Expert Commission on Women in Science and Technology (WiST 2)

UKRAINIAN NGO “WOMEN IN SCIENCE”: OUR POLICY IN WORK WITH YOUTH

Iryna Vavilova ^{1,3}, **Vira Troyan** ^{2,3}

¹NTUU “Kyiv Polytechnical Institute”

²NU “Kyiv-Mohyla Academia”

³NGO “Women in Science”, Kyiv, Ukraine

Abstract:

During the last century considerable changes took a place in educational sector of the Ukrainian economy. Namely, if to compare the beginnings of XX and XXI centuries, we will see the following. Yet 100 years ago the Ukrainian girls did not have an access to higher education and only somebody from them have obtained it in the European universities. Without exaggeration we can say that the system of education and its achievements at this level were the most extraordinary accomplishments of the former Soviet Union.

In 2007 about 2,700,000 citizens (of which 54 % are females) were students of 966 higher educational institutions. Beginning in 1991, there has been an increase in the number of post-graduate students (13,600 in 1991 and 25,000 in 2007). Although the total number of scientists has decreased during this period because of a “brain drain” both outside and inside Ukraine, the number of Doctors and Candidates of Sciences has been slowly increasing. A greater fraction of those taking science and engineering degrees during this period were women: 54% of graduate students, 54% of Candidates of Science, 27% of Doctors of Science, and 10% of members of Academies of Sciences. For comparison, 10 years ago, in 1996, these indicators were: 30% of Candidates of Science, 14% of Doctors of Science.

But there is some imbalance as regarding area of research, for example, the percent of women working in Phys. and Math., and Technical sciences and having scientific degrees is the following: 20-30% of Candidates of Science, 6-10% of Doctors of Science

The policy of our nongovernmental organization in question to attract girls onto S&E is to make concrete steps and to follow women-leaders examples. So, what we did and do:

- Lecturing in schools and lyceums; demonstrating equal opportunities to get scientific career; books and advertising cinemas about famous Ukrainian and foreign women-scientists;
- Annual calendars “Great Ukrainian Women in Science, Education, Engineering”, books as «History of the Kyiv Higher womanish courses», «Role of Woman in S&E», «Gender relations in science» etc.;
- Encyclopedic issue “Women-scientists and engineers in Kyiv”;
- Initiative to establish academic Scientific Award by Antonina Prihot’ko (nuclear physics and energetic) in the National Academy of Sciences of Ukraine;
- Organization of school of leadership for women-researcher and girls-students as well as the issue of bulletin “Basic rules of preparation and writing of scientific projects. Funds and programs which support women-scientists. Advices to the leaders”. Conducting series of seminars «Gender studies and scientific educational policy».
- Initiating and implementation of project «Development of suggestions to the State program of assistance for women-scientists as to return to scientific activity after an interruption on the care of children». Organization of “:School of Young Scientist” and conferences for young scientists in various research area with financial support of participation of girls-students;
- International conferences «Women in Science and Education: Past, Present, Future” and “Gender Component in the Structure of Higher Technical Education and Natural Science” (every even year, the next will be in 2008, October).

Key words: gender studies, gender policy, women-leaders

CV :

I was born in 1959, July 10, in Krasnodon city (Ukraine), graduated from Taras Shevchenko University in Kyiv, speciality “Physics-Astrophysics. Lecturer” in 1984.

Ph.D. thesis was defended in 1995 (regarding methods of research of the large-scale structure of the Universe). About 80 scientific publications, including monographs, text-books, encyclopedic issue. Scientific researcher of the Institute of Space Research of the NASU-NSAU, Assistant-Professor of the NTUU “Kyiv Polytechnical Institute”. Now I am a person who working on Doctor Hab. thesis. Vice-chair of the NGO “Women in Science”. I am awarded by state order of the Princess Olga III degree (2002) for scientific achievements. Vice-president of the Ukrainian Astronomical Association. Project-manager of various projects and programs. Vice-editor in chief

of the advertizing journal of the NAS of Ukraine "Svitoglyad" (World Outlook). Married, one son (born in 1980) as well as now I am grandmother.

FRENCH WOMEN IN SCIENCE: STATUS AND ACTIONS

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Members of the association Femmes et Sciences

Type of presentation: Oral session

Abstract:

The " Femmes et Sciences " (Women and Science) association, in close partnership with "*femmes et mathématiques*" (Women and Mathematics) and "Association Française des Femmes Ingénieurs" (French Women Engineers), aims at countering the decrease of interest for science presently observed among students by encouraging high school pupils, and particularly girls, to choose scientific careers at various academic levels. This action also involves teachers and adults liable to influence students' choices. The overall situation of women seems to be improving very slowly. We briefly describe the situation and present the various structures created and actions taken in France to fight gender discrimination and promote parity.

Present status of women in French university and in research

The fact that scientists in universities or research institutions are in general civil servants or state-employees, hired on a permanent position in their early thirties, allows women to start a family not too late in their life. In CNRS (National Center for Scientific Research), as well as in French universities, the global percentage of women is about 30%. However this percentage is not equally distributed according to rank: there are about 40% women associate professors and research associates, but only 18% women professors and research directors, indicating the persistence of a "glass ceiling". Furthermore, the average age for the promotion to director is 43.8 for men and 46.7 for women.

If we consider women working in CNRS in mathematics and physics, the percentage of women is only 17%, although 43% of the students who reach the A level in science ("baccalauréat") are girls. The age distributions for men and women are approximately flat for both, and the percentage of men and women above 40 years old is about 65%. Therefore the situation has remained stable with time over a 40 year period. The situation concerning the glass ceiling appears slightly better for mathematics and physics, where the percentage of women is 21% for the lower rank and 13% for the Directors. But the probability to have been promoted Director of Research for men and women above 40 years old is 70% for men and only 51% for women.

In conclusion, the situation has not improved, neither in the number of women working in mathematics and physics, nor in the glass ceiling effect. To try to explain this situation in the case of CNRS, two reports propose the fact that women invest more in scientific animation, logistics, security, vulgarization and other collective tasks which are very useful for the whole scientific community, but not well taken into account for promotions (see <http://www2.cnrs.fr/presse/journal/2724.htm>).

French Structures favoring parity

In order to promote parity, detect and show up inequalities, several structures have been created in France:

- The Observatory of Parity between women and men has been created in 1995 by the Government (see <http://www.observatoire-parite.gouv.fr>)
- A Mission for Parity in Research and Higher Education was established in September 2001 at the Ministry of Research. It has produced White Papers on Women in Research in 2002 (see <http://www.recherche.gouv.fr/parite/rapports/frf.htm>), and on Women in Industrial Research in 2004 (see <http://www.enseignementsup-recherche.gouv.fr/parite/rapports/livreblanc2004.htm>). It has also created the yearly Irène Joliot-Curie Awards to reward actions favoring the presence of girls in scientific and technical studies and improving the equality between women and men in research.
- At the CNRS, a Mission for the Place of Women (see <http://www.cnrs.fr/mpdf/>) started in March 2001. It has organized sessions of sensitization on gender issues for the CNRS staff in different regions of France.
- In 2005, the government created a High Authority against Discrimination and for Equality (HALDE, see <http://www.halde.fr/>) which examines all the situations brought to its attention.

These structures, as well as associations such as Femmes et Sciences (Women and Sciences), try to watch the numbers of women nominated in committees, address complaints when necessary, and propose female speakers for national and international conferences, workshops and exhibitions.

Mainstreaming

The reasons why sciences do not attract many girls are still not clear. When questioning girls in high schools, some answer that scientific studies are too long or too difficult, but girls represent more than 50% of students in medical studies where studies are still longer, with a very selective process at the end of the first year. Furthermore, girls usually do better in school but seem less self-confident than boys. Girls also answer that they want a job with strong human relations and think that in scientific positions, one only speaks to instruments and not to humans. This point reveals a lack of information about scientific jobs, and also a bad influence from fake stereotypes about them. The actions undertaken in France tend to give better information on scientific jobs, and especially to show women working in science and technology.

- In several associations such as Femmes et Sciences, *femmes et mathématiques* and Femmes ingénieurs, women scientists present their job and their discipline to teenagers, girls and boys, and to teachers.
- New websites (see list below) have been created, some of them devoted to girls, proposing documents and videos presenting scientific jobs. Now the Société Française de Physique (French Physical Society) also has web pages dedicated to women.
- Paper documentation has been elaborated and widely distributed in high schools in France.

Web sites

<http://www.femmesetsciences.fr/>
<http://www.femmes-et-maths.fr/>
<http://www.femmes-ingenieurs.org/femmes-ingenieurs>
<http://www.sfpnet.fr>
<http://www.elles-en-sciences.org/>
<http://www.ellesbougent.com>
<http://www.industrielle.com>
<http://www.onisep.fr/>
<http://www.lesmetiers.net>

Keywords: French women in science: statistics, associations

CV :

Florence Durret is vice-president of the French Women and Science association. She received her PhD in astrophysics in 1982 and has been an astronomer at Institut d'Astrophysique de Paris since 1983. Her main activity is research, mainly dealing with observations of galaxies and clusters of galaxies. Besides doing research, she is also involved in teaching astrophysics at graduate level, and also giving lectures to high school teachers.

WOMEN IN SCIENCE AND ENGINEERING ... MAYBE

Cecilia Moloney

NSERC/Petro-Canada Chair for Women in Science and Engineering, Atlantic Region
Memorial University of Newfoundland

Type of presentation: Oral session

Abstract

Introduction

Despite many advances over the past 30 years and more, the participation in Canada by women in many fields of science and engineering continues to lag behind that of men. For example, the percentage enrolment by women in full-time accredited undergraduate engineering programs in Canada has remained near a plateau of approximately 20% for the past ten years¹. At the same time, by irony, there appears to be a decline in interest in activities and initiatives to promote the increased participation and well-being of women in science and engineering. Reasons for this decline may include: media reports of the feminization of Canadian universities in general, including suggestions that efforts are now needed to encourage boys and young men²; fatigue among many long-term supporters of women in science and engineering, combined with declines in interest among young women in being involved with or associated with these efforts.

The two opposing observations—that the rates of participation by women may have plateaued in some fields, and that interest in promoting increased participation may be falling—combined with the assumption that there is still work to be done, have led to the suggestion in this paper that a new approach is needed to working for the increased participation of women in science and engineering.

Why Women in Science and Engineering?

There are many reasons for seeking more women in science and engineering. Canadian industry seeks a wider pool of skilled workers, more diversity within their workforce, and broader perspectives contributing to design, decision-making, etc. Government seeks to promote the creation of jobs and wealth, in part through increased industrial activity, particularly in the high-technology and scientific sectors, as well as to promote a wider set of goals including fairness and equity which will lead to an enriched culture. Universities seek to contribute to societal goals, and to promote strong enrolments in their academic programs.

On the individual level, a young woman who is making a career choice is primarily concerned with personal satisfaction, career and economic success, and the fulfilment of her life goals. Similarly, many individuals who work on initiatives to promote science and engineering, as I do, are motivated by desires to assist individual women and girls to realize their dreams, as well as by concerns for increased vitality and diversity within their engineering or scientific disciplines.

On the surface, the plateauing of enrolment percentages, as in engineering programs in Canada, may suggest that women are not as motivated or interested to pursue engineering as are men. However, the situation is complex, with many other factors involved. For example, women want to have careers which allow them to balance their work and personal lives, and in particular, careers which are not inconsistent with the prospects of motherhood and childcare. This is just one area where more work needs to be done. I claim that this particular concern, as well as many other, may be incorporated into a broader perspective and approach, one based within a framework of social innovation and powered by imagination.

Women in Science and Engineering ... Maybe

When situated within a larger context, efforts to promote women in science and engineering can be seen as contributing to social change. A recent book by Frances Westley et al. titled *Getting to Maybe: How the World is Changed*,³ arising from the work of the Dupont Canada-fostered think-tank on social innovation based at McGill University, provides interesting perspectives on the conditions necessary to effect social change. The “maybe” in the title stands in stark contrast to our Western desire for certainty and for the measurable outcomes more typically expected of our initiatives. However, “maybe” expresses an attitude of possibility and of the imagination of new realities not yet in existence, and therefore is a powerful and enabling expression for social innovators. I believe it also expresses the place we have now reached in our efforts on behalf of women in science and engineering, from which more progress “may” happen, but perhaps only if we can think and see differently.

Getting to Maybe echoes the philosophy of education of Maxine Greene, whose landmark work *The Dialectic of Freedom*⁴ outlines a framework for the kinds of education required in a technological society, one which encourages us not to take for granted the individual freedoms we already have in Western countries such as Canada and the US, but to work for the creation of public spaces in which diverse human beings can develop in community to be the best they can be. Although Greene does not write specifically about women in science and engineering, I believe her view would be that women motivated to pursue science and engineering would be empowered to do so in the authentic public spaces she speaks of.

Both Greene and *Getting to Maybe* suggest that we need to foster our imagination, as well as our objective rationality based on questioning and understanding as precursors to action, as it is imagination which will allow us

to “see” what does not yet exist, and which, when combined with our objective rationality, can allow us to chart paths towards its realization.

On one level, the reality “not yet in existence” which we intend is the increased participation of women in science and engineering; on another level, it is the changed world which can be brought about by women (and men) more fully engaged in science and engineering.⁵ This new reality may be enabled by asking young people, and especially young women, to think not only of what’s in it for them in science and engineering, but also what they may be able to give to the world through their work as scientists or engineers. Without placing undue burdens or expectations on the shoulders of young people, such a strategy can invite them to become active participants in the human adult community which is striving for change on many levels and in many parts of the world. This approach may resonate with the motivations of the current postmodern generation and culture, and thus enable their imagination and humanity, and engage their sense of agency as innovators in a global world.

At the same time, *Getting to Maybe* tells us that social change changes the entire system, including the social innovators themselves. Hence, accompanying the questions to be posed to young people, we must also ask what changes are needed within ourselves, and within the institutions and cultures of science and engineering.

Conclusions

This paper suggests a new approach to promoting the participation of women in science and engineering, one which would result in more women entering science or engineering not only because they are motivated and interested in the science or engineering fields themselves, but because doing so would be consistent with the realization of their other life goals, including being mothers, making a difference in the world, feeling at home in a more humanistic world, etc.

¹ See *Canadian Engineers for Tomorrow: Trends in Engineering Enrolment and Degrees Awarded, 2001-2005*, Engineers Canada, 2006. Available http://www.engineerscanada.ca/e/prog_publications_2.cfm

² See, for example, Daniel Drolet, “What’s up with boys: Minding the gender gap,” *University Affairs*, Association of Universities and Colleges of Canada, Oct 2007, pp. 8-15. Also available http://www.universityaffairs.ca/issues/2007/october/gender_gap_01.html

³ Frances Westley, Brenda Zimmerman, and Michael Quinn Patton, *Getting to Maybe: How the World is Changed* (Toronto: Vintage Canada, 2007)

⁴ Maxine Greene, *The Dialectic of Freedom* (New York: Teachers College Press, 1988)

⁵ Among the many dimensions implicit in this statement, there is a social justice dimension which resonates with many young people in Canada today. The interest evident on Canadian campuses in the work of Engineers Without Borders suggests that young people today have a deep desire and motivation to make a difference. See <http://www.ewb.ca/en/index.html>

Key words: Women in science and engineering; motivation; imagination; freedom; social justice

CV:

Dr. Cecilia Moloney is a Professor of Electrical and Computer Engineering at Memorial University of Newfoundland, and the NSERC/Petro-Canada Chair for Women in Science and Engineering (CWSE) for the Atlantic Region. Since starting her term as Chair in July 2004, Dr. Moloney has initiated a program of activities towards realizing her Chair’s mandate. These activities range over: outreach and mentoring for students; presentations, networking, and collaboration within Atlantic Canada; and research into the under-representation of women in science and engineering. Dr. Moloney’s engineering research develops nonlinear computational methods for applications in digital image and signal processing.

AFTER-SCHOOL SCIENCE TEACHER AS AN INITIAL STEP FOR RETURNERS AFTER CAREER BREAK

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Type of presentation: Oral session

Abstract

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Only a low percent of women continually develop their careers in science and engineering after their childbirth in South Korea. An initiative for motivating and supporting young mothers towards future educational path and careers in science and engineering was undertaken in the framework of network with the Busan city office of education. After-school science teacher was one of the most significantly effective steps for returners from their career break, given that it balances work and family. The paper discusses the important elements of training schemes addressed to women deciding after-school science teacher as an initial step for their career attempts. The study reveals that after-school science teacher could acquire a wide range of qualifications apart from their technical background, such as good professional level and training experience, as well as willingness, communication skills and other individual characters related to their personality.

Key words: after school science teacher, returner

WORK LIFE BALANCE FOR WOMEN IN STEM

Samana Zehra

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Abstract:

Having a balance between work and personal life is a great blessing in today's frenetic life style. Unfortunately, most of the working individuals, both men and women, are facing the dilemma of making unhealthy life choices. Spending more time at work leads to missing important aspects in personal life such as family, friends, personal care and interests, while investing time for meeting the challenges of personal life, can make concentrating on the job more difficult. These factors are the root cause of stress and disharmony in life.

Over the past few decades, a substantial increase in demand of longer working hours has been observed. There was a time when there were clear boundaries between work and life at home but with the changing world, these boundaries have become vague for most of the working men and women. A few important reasons of this situation are globalization, advancement in information technology, financial needs, employer's expectations and increasing competition at work places.

Men and women are the pillars of our society. Though, both of these genders have inherent differences in physique, temperament and responsibilities defined by nature but to meet the financial and personal challenges in today's world, they are working together, shoulder to shoulder, in all professions of life. Women are making their mark in science, technology, engineering and mathematics, hence proving that they are no less in potential and talent than men.

We must realize that women have to bear some additional stress while working because single women in general and married women in particular have to look after their families and home affairs besides their required input at workplace. A married woman has the added responsibilities of child bearing, children upbringing, taking care of the elderly at home, cooking, cleaning and other house hold chores. With the man working extra hours, the woman of the house at times has to play the role of a father as well. Nearly, all over the world, it is assumed that a woman has to perform these tasks besides their professional obligations. This culture is more prevalent in Asia, especially South East Asia.

With the passage of time, the number of women in STEM education is increasing but not all of them are able to pursue STEM careers. There are numerous reasons behind this, a few of which have been discussed earlier. More over many women do not get permission from their families (in South East Asia) and at times availability of fewer opportunities due to gender biased employers can also become hurdle in career development. Nearly all women who pursue their careers in STEM encounter work-life balance problems.

Long working hours and job demands complicate a woman's work and home life affecting home affairs, child care and even sexual relationships. Sometimes a woman must decide either to carry on with career or family. Concentration on career can deny her the rights of finding a life partner, enjoying her children, family affairs and personal health care. On the other hand if she takes some time off from work then it becomes very difficult for her to reenter into her relevant industry, because of the competition, advancement in technology at a fast pace and attitude of employers who think that she is not fully committed with her job. And if she does find a position, it may be a lower one with lesser pay.

To facilitate women in STEM and even other fields of life, many organizations have been actively involved in devising policies and procedures in the recent years. Such facilitations include reduced working hours, remote working options, career breaks, maternity leaves, and child-day care centers at educational institutions, workplaces and local surroundings. Women in STEM may adopt the following to combat the work life balance:

Discuss job flexibility with employer. Progressive employers realize the worth of good employees; therefore, women should negotiate with employers and try to use different working options to deal with their short-term family and social problems. The employer may be able to provide flexible working hours or remote working (from home) and this flexibility will enable a woman to reduce her stress and take care of other responsibilities. In the worst case, a woman should opt for a less demanding job in the same field.

Share your work. Doing all work single handedly is not practically possible. Working women can use job sharing at home with partner and other family members. Servants can also be hired if affordable.

Improve time management. Try to plan out the home and work related activities for every week. Organize household errands by doing them in batches rather than doing loads of same work (e.g., laundry, house keeping) in one day, especially on a holiday. Try doing routine chores on working days rather than holidays. Keep some time for recreation and family gatherings on days off.

Feel pride and not guilt. A woman in STEM should be proud of working side by side with her male counter parts and handling household activities at the same time. There should be no guilt of working and having a family at the same time.

Striving for work-life balance is a process that takes time. Every woman may have a different approach to achieve this balance. They need to find the one which works best for them.

Keywords: stress, employer, working hours, responsibilities, family

CV:

Samana Zehra has been affiliated with University of Engineering and Technology as an Assistant Professor for the last 3 year. Earlier she was working as a Professional Services Consultant in Teradata NCR. She has a Masters degree in Computer Engineering and a Bachelor's degree in Software Engineering. Working in two different places enabled her to experience Hence she has experience of working in industry as well as teaching. Samana has a publication titled 'Wireless Security Audit of WiMAX' which was included in the proceedings of International Conference on Wireless and Optical Communications (WOC) 2007. She has participated in the Seminar IIWE 2006 organized by International Institute of Women in Engineering. She was winner of the poster competition in IIWE 2006. Samana has personal interest in women related issues.

ARTICULATING WORK LIFE BALANCE: PERSPECTIVES OF WOMEN RETURNERS TO STEM

Clem Herman and Barbara Hodgson

The Open University UK

Type of presentation: Oral session

Abstract:

This paper explores work life balance issues facing women returning to work in STEM after a career break, based on the experiences of participants in an online course at the UK Open University. The course provided a series of personal development planning activities, and required them to focus on work life balance issues, identifying the factors they would need to consider in order to successfully return to work.

The term Work Life Balance has entered everyday discourse as a way to articulate the conflicts and dilemmas raised by changing work patterns and life choices. For those who are contemplating returning to paid work after a period away from the labour market, the achievement of a balance between the demands of their working life and those of their other commitments becomes of paramount concern. Considerations are not just practical but also emotional and raise fundamental issues about women's roles as well as personal priorities and ambitions

Research suggests that there are particular problems within STEM sectors for women returners such as the lack of flexible and part time working opportunities, and long hours culture.¹ Other studies have indicated that women make choices about working in these sectors based on evaluation of their work life balance options, and putting family considerations first, often jeopardise their future career progression²

There is an expectation of mobility for most scientific careers, particularly academic careers. Young single women are just as likely to take up these opportunities abroad as their male colleagues, but once women have partners and children they are less likely to do this. Moreover women scientists are more likely than men to be in relationships with other scientists whose careers will also require mobility – in such cases it is more often the women in these “dual career” relationships who decide not to take up opportunities that require moving abroad, especially when there are children involved. These women are thus more likely to follow their male partners in ‘tied migration’ than vice versa.³

Not all returners have had career breaks for raising children - others take time to study, to travel, to look after elderly parents, or due to their own ill health. However, the overwhelming majority of women returners in our study had taken breaks in order to do ‘family work’ prioritising this over career progression. Choices are not made in a vacuum but in the context of patriarchal societal values, and in the case of the STEM industries, within the context of masculine work ethics and cultural norms. Women returners, not only face practical issues and constraints when they decide to return to work, but they are also faced with a change in their identities and orientation towards work and motherhood⁴

In order to gain a more in depth understanding of how women perceive and deal with the range of issues loosely labelled under the heading ‘work life balance’ we analysed the women's responses to this activity and their views on Work Life Balance in the context of returning to their STEM careers. Qualitative data came from online conferences contributions, telephone interviews and online surveys carried out after the completion of the course. This revealed a similar set of outcomes to those found in

¹ People Science and Policy Ltd and Institute for Employment Research University of Warwick (2002) Maximising Returns to Science, Engineering and Technology Careers. London, Department of Trade and Industry: 76

² Herman, Clem and Debbie Ellen (2004) “Access Denied: Career progression versus work-life balance amongst women network technicians” conference paper presented at Gender Perspectives in Organisations: Impact and Life Choices Roskilde University, Denmark 22nd January 2004

³ Ackers, Louise. (2004). "Managing relationships in peripatetic careers: Scientific mobility in the European Union." Women's Studies International Forum 27(3): 189-201

⁴ Marks, G. and Houston D. M. (2002). "Attitudes Towards Work and Motherhood Held by Working and Non-working Mothers" Work Employment Society 16(3): 523-536

previous studies of women returners⁵ including significant levels of underemployment. Of those who had found employment after the course, 46% were working at a lower level than before their career break and just under half were not working in a STEM occupation i.e. they had gone back to work in another sector.

Some of the key issues raised were related to mobility. This included wanting to work locally in order to be able to take children to and from school etc. Another recurring issue was the effect of 'tied migration'— several had moved abroad to follow their partner/husbands job and consequently had given up their own career or at least put it on hold, taking other lower paid and lower skilled employment. Many of the women, especially those living in rural areas, had searched for jobs in their locality but found there were no suitable employment opportunities at the level they required in their sector but expressed unwillingness to uproot their families in order to progress their own careers.

Finding suitable childcare was not surprisingly a major consideration for many of the women. However this was not just a case of finding a nursery place or a childminder/babysitter for a pre-school child. For many of them these issues stretched out for several years with different considerations as children grew older.

Some of the women articulated clearly the identity transition that they were facing and the need to embark on a process of change. Women who have taken career breaks (and who have partners/husbands and/or dependent children) are faced with having to make changes not only to their own lives but also with the impact that their changes will have on those around them. Even when there is a strong economic imperative, many of the women find this a difficult transition. There were a few exceptions where men were taking on main responsibility for childcare but despite their high level qualifications and potential for career success, gender roles and expectations are still strongly entrenched even among women without dependent children.

The development of a public discourse around work life balance has provided more awareness of the need for a range of different and flexible working patterns. Indeed recent legislation in the UK has obliged employers to offer flexible working for those with dependent children. However it remains to be seen to what extent these measures can improve the opportunities of women returning to STEM careers without a fundamental change to both the working cultures and the gendered division of responsibility for family care. The lived experiences of women returners facing transition in their roles and identities, can offer a valuable insight into precisely these issues.

Key Words: women, work-life balance, career, mobility, gender

CV:

Clem Herman is a Senior Lecturer in the Department of Communication and Systems at the Open University in the UK. She has recently developed and implemented a pioneering online course for women returning to Science, Engineering and Technology after a career break, in partnership with the UK Resource Centre for Women in SET. Before joining the Open University, she was the Director of the Women's Electronic Village Hall (WEVH) in Manchester which attracted wide interest as one of the first community ICT access centres in Europe, pioneering the use of ICTs to empower women and as a tool to combat social exclusion. Her recent research has included women's experiences of 'becoming digital' at community ICT centres, a three year research project on the lives and careers of women IT technicians and a comparative study of women engineers and scientists in Latvia, Poland and the UK.

⁵ Tomlinson, Jennifer, Wendy Olsen, et al. (2005). Examining the potential for women returners to work in areas of high occupational gender segregation. London, DTI: 108

STILL A WOMEN'S TOPIC? – GERMAN ENGINEERS IN CONFLICT BETWEEN CAREER AND FAMILY

Prof. Dr. Susanne Ihlen, Anna Buschmeyer M.A., Dipl.-Päd. Sabrina Gebauer
Technische Universität München, Gender Studies in Science and Engineering

Type of presentation: Oral session

Abstract:

When in 2004 a lack of engineers was proposed in Germany, this sounded unrealistic, because there were more than 5 million people unemployed in Germany at that time. But the labour market changed: in 2006 about 48.000 engineering positions could not be filled at the time planned. Simultaneously, more women than men in engineering were unemployed (2006: men: 4,7%, women 12%; VDI 2007). The lack of engineers is thus accompanied by a high unemployment rate of female engineers. So companies are today seriously searching for women engineers but it needs time building up a quite new target group for recruiting.

Until today institutional structures are dominated by male decision makers – women are still stopped in their career by the “glass ceiling”. In opposition to their male colleagues they still seem to have to decide between children or career (comp. Ihlen 2006). Companies are thus asked to change their options for young professionals towards the needs of men and women. This is true for first recruiting processes, but also for the phase when companies want to keep their engineers even if they start a family.

Gender Studies in Science and Engineering is assigned by the VDI (Association of German Engineers) to do a study on the compatibility of career and family. The study includes research on young professionals, engineers and companies from the technical field. The focus is laid on engineers in leading position, so it is asked about the possibility to follow a career in combination with family needs. The research project is split into two phases. The first one is already completed; some of the results will be presented in the following. In the first phase we questioned 35 students and young professionals of engineering subjects about the fears and wishes they have about family friendliness of their future employer. At the same time we interviewed the human resources departments of eight companies about the opportunities they offer their employees in leading positions. The results of this first research phase were partly surprising. While nearly all of the asked 35 engineering students claimed that they want to have a leading position in the future, most of them (31) stated they also wanted to take some form of parental leave, when they have children. Most impressive for Germany was the result, that even 26 men mentioned these two wishes (which is all but two of the asked male students). At the same time companies seem not to realise these changes in gender roles by now.

All of the asked experts think that family friendliness is positive for their company. Some have even special offices or departments that deal with family friendliness.

The results of the first research phase can be shortly presented as the following:

1. Responsibility for a family is still seen as a women's topic. There are hardly any projects about men in parental leave. It is still usual to think about women when it comes to family duties. Engineers in leading positions are usually not part of the strategies.
2. In companies that are influenced by the US-culture, topics like diversity management are more self-evident and often found in a special department. This leads to a company-wide policy towards family friendliness. In smaller enterprises it is often easier to find individually created possibilities to combine family and career, for leading positions as well.
3. Nearly all human resources managers we talked to were open towards individual negotiations. It shows that those employees who have already reached a leading position are in advance. For them it is often easier to find solutions to come back into the company.
4. Young professionals are afraid of reducing their working time at a too early moment in their career, because they cannot show their total commitment to the company.
5. The idea that you cannot share a leading position is present in nearly all interviews with the human resources experts. The wishes of future engineers to take some parental leave when they start a family will consequently come rarely true if the company cultures are not changing.
6. The technical field is still coined by traditional role models. Very “male” structures are still usual in companies and for leading positions. This leads to difficulties for women to climb up the career ladder. Leaders still fear that women will leave the company soon for pregnancy and child care reasons. This is true even though our research has shown that most female engineers do not have children and the others are only taking a very short parental leave.
7. For career planning of engineers it seems advantageous to be in a higher position already when deciding for a short phase of part-time work. Usually human resources managers develop a huge interest to keep those employees in their companies. To work part-time in the first years of a career may constrain future career options stronger.

In the second part of the study more companies were included and engineers were asked about their experiences with the combination of family and career. Both of the surveys are actually running, thus the results will be presented for the first time in April and can then be published in Lille.

Keywords: Work-Life-Balance, Gender, Career, Family

CV:

Prof. Dr. Susanne Ihlen, Born 1964, studied Social Sciences in Duisburg and Aachen. She was doctoral student at the Centre for Research and Development in Higher Education/Department of Informatics in Mechanical Engineering in Aachen where she got her PhD in 1999. From 1999 till 2004 she was Manager at the Association of German Engineers (VDI). In December 2004 she became the first professor for Gender Studies in Engineering at the Technische Universität München. Her main research fields are sustainability in the engineering profession, the development of a changed image of the engineering professions, careers of female engineers, gender and diversity in companies and university and engineering education with regards to gender and diversity.

TAKE YOUR PICK: WORK-LIFE BALANCE OR RETENTION AND PROGRESSION: WOMEN ENGINEERS IN UK's ENGINEERING INDUSTRY?

Haifa Takruri-Rizk, Natalie Sappleton¹, Sunrita Dhar- Bhattacharjee

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Abstract

Work-Life balance is defined by the UK's Work Foundation as *being "about people having a measure of control over when, where and how they work. It is achieved when an individual's right to a fulfilled life inside and outside paid work is accepted and respected as the norm, to the mutual benefit of the individual, business and society"*. The Women in North West Engineering (WEWIN) research team at the University of Salford wanted to find out how prevalent a work-life balance culture was across the engineering industry. In this paper we present some of the data that was collected through survey questionnaires and in-depth interviews during the lifetime of the WEWIN project. We found that the relationship between work-life balance, retention and progression is fairly complex. In certain cases more men, in particular those in high positions, than women are taking advantage of work-life balance policies. We argue that women engineers' poor take up of work-life balance policies is a function of their lower position in the vertical workplace hierarchy.

According to a survey carried out by the UK's Department of Trade and Industry (DTI) in 2002 as part of their Work-Life Balance Campaign, flexibility in working arrangements is high on the list of priorities for applicants when selecting an employer¹. A difficulty in arranging flexible patterns of work, combined with a paucity of good quality affordable caring services may make it extremely difficult for female engineers to combine employment with parenting without compromising one or the other (EOC, 2005).

Longitudinal analyses of a cohort of science graduates' occupational transitions and employment histories by Fielding & Glover found that only a quarter of women with children in their sample were employed full time, compared to 93 per cent of those without (Fielding & Glover, 1999). Female employment in science and engineering amongst women falls over time, especially after the age of 29 – the median age of childbirth in their sample. The rate of exit from the labour market altogether rises dramatically after the age of 27 incidentally, this is also the age when most engineers have begun the 'upward mobility track', or the path to management (Maskell-Pretz & Hopkins, 1997).

Looking at the consequences of embracing a work-life balance way of working and living versus abandoning the long hours working culture and how does this lessen women engineers prospect of progressing or staying in the industry: opportunities for networking and access to role models and mentors has been identified as a contributive factor to progression in an industry. One way in which female engineers may find it difficult to penetrate the corporate and social networks in engineering firms relates to working hours (Roberts and Ayre, 2002).

Our survey asked the respondents (female and male) a number of questions to identify if they are able to maintain a good level of work-life balance and if this is supported by the firms they work in. Surprisingly, the majority of both male (43%) and female (48%) respondents agreed with the statement that "I am able to maintain a good life-work balance", suggesting that a long-hours culture in engineering is a thing of the past. However, there was a mixed response to this issue in the interviews. Whilst a long-hours culture seemed to be present in some organisations, some interviewees did not seem to think working hours were any longer than those in other industries. Long hours seem to be expected in organisations which operate a 24-hour plant. This is more likely in certain engineering sub disciplines such as chemical or mechanical engineering. Some interviewees based in these sectors talked about working for firms which demanded, 40-, 50- or even 60- or 70-hour weeks.

¹ "More People Want Flexible Hours Than Cash, Company Car or Gym"; DTI Press Release; 30 December 2002

"I never did any more hours than I had to...Well I wasn't really committed as such...That's partly why I didn't progress. I think if you gave more hours and more determination and stuff..."
Female, Former Civil Engineer, 31-45 yrs

Whilst the long-hours culture does not seem an inherent feature of all engineering organisations, atypical working patterns do exist. Engineers in certain sectors often have to work anti-social hours, or spend extended periods away from home, particularly in certain engineering sectors, such as civil engineering or the petroleum industry.

"We do a lot of anti-social hours. Sometimes we have to check things on a weekend or we have to do Public Consultation and we do that in an evening whereas a lot of the general departments like Personnel or HR just work a normal working day."
Female, Highways Design Engineer, 26-30 yrs

Such working patterns are obviously incompatible with the domestic lives of those with primary care responsibility for children or other dependants.

Our quantitative data showed that engineers were aware that their organisations operated a wide variety of policies aimed at addressing employees' work-life balance but there is a low take up of such opportunities in particular amongst women. One interviewee suggested that the higher take-up amongst male engineers is a direct result of vertical segregation; opportunities for flexible working are greater at more senior levels in organisations – levels at which fewer women are to be found:

"[There are] no formal arrangements for flexible working. But to be honest, you know, I'm at that sort of level where you, you're really left to manage your own time"
Male, Chemical Engineer, 31-45 yrs

In conclusion, established working habits, such as working late, or unpredictable hours may be organisational norms in male-dominated industries like engineering, to which some female – and male – engineers may find it difficult to subscribe to. Since there are strong associations made between the numbers of hours a person works and his or her skill levels a large relative take-up of part time hours for females, and a low male take-up, despite the consideration for some semblance of work-life balance, may lead women employees away from the status of "ideal" flexible employee (Benschop & Doorewaard, 1998) – and may subsequently prevent them from penetrating intimate working and social networks and hence reduce their progression prospect.

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Keywords: work-life balance, engineering industry, women, flexible working

Challenges Faced By Women in Engineering in Pakistan: Can Supportive Strategies Help?

Durdana Habib,

National University of Computer & Emerging Sciences, Pakistan,

Key Words: Cultural barriers, retention, diverse workforce, best practices, equal opportunity.

Inequality between men and women is a global problem. It is not confined to Pakistan but the level of inequality in Pakistan is greater than in most other countries. The Fourth UN World Conference for Women took place in Beijing in 1995, with active participation from both government and civil society from Pakistan. The Platform of Action was translated into Pakistan's National Plan of Action (NPA) endorsed by the Prime Minister in August 1998. However reasons for slow implementation of plans to advance the status of women in Pakistan include weak government machinery to co-ordinate implementation of plans to advance the status of women. Among other reasons is a conservative social culture that sees men as the primary breadwinners. Policy makers have not been able to address women's concerns due to lack of information and statistics on gender issues on which to base policies. The allocation of resources to this sector has not been sufficient. Although women's status in Pakistan has improved, major disparities still exist in social and economic indicators between women and men. The "gender gap" between women and men is wider in Pakistan than it is in countries of similar income levels according to UNDP's Gender Empowerment Measure [1].

As women engineers and scientists step into their professional careers, they become aware of the challenges that lie ahead. They face a more difficult scenario while job-hunting as compared to their male colleagues. The situation of Pakistani Women is particularly tough as they are located in a geographical region that places cultural barriers to women's employment. They all face the stereotype that a woman's ultimate responsibility is towards her family. This places doubts in employers' mind as to whether the young woman in question would survive the societal pressures. An analysis of the factors that affect a woman's decision to stay at work, shows that support from family as well as the employer are crucial. Human resource policies of companies can provide a supportive and indeed motivating framework to enhance the retention of women engineers and scientists. The commitment from the top to have a diverse workforce is vital. Corporations need to understand that diversity gives them access to the best talent in an increasingly competitive market. There has to be recognition for companies with thoughtful and forward-looking policies and best practice initiatives. At the national level, enacting "Equal opportunity in science and technology" can improve employment and training opportunity for women scientists and engineers. The whole manner of policy formulation needs to be assessed to see how women's special needs can be incorporated within a sound-planning framework.

Since most women today still bear the primary responsibility for the family, women are more likely to be confronted by the trade-off between career and family and are more likely than men to "sacrifice"

their career for the sake of their children. Companies need to be aware that women have a lot to give but are burdened with 100% of the childcare issues. There has been a growing trend among women to shift from industries that are “face time” driven and instead choose those that are performance driven and flexible [2]. Another potential danger could arise if corporations start to recognize a pattern where they see qualified women, in whom they have invested much in recruiting and training, leave the company when they start a family. This could make hiring women a “liability”, in the same way as today it is considered a risk to hire a 25-year old single women. Women are generally not tough bargainers and often end up with lower salaries than their male colleagues with similar competencies.

Several different strategic areas of support can be identified. There is a need for developing and promoting women's leadership and decision-making abilities. Policy oriented research studies and reports can support better policy making and program design for the advancement of women. There can be provision of seed money for “Innovative Initiatives” to government and non-governmental agencies to test out new ways of addressing gender issues that can be applied on a larger scale if successful. Use may be made of relevant materials, such as brochures, posters and videos to spread greater awareness of gender issues among key decision makers and the general public. Setting up of informal networks which serve as a platform through which women share views and experiences. Such networks could work closely with women's organizations across the globe. Facilitating access to best practices on gender issues in the Asia region and publicizing them in our culture is another strategy [3]. The process of change, however slow, has a chance of gaining momentum which might set the ball rolling.

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WOMEN IN SCIENCE AND TECHNOLOGY IN THE TRANSITION

Svetlana Aslanyan

Center for the Development of Civil Society, 15 Aghayan St., 17, 0025 Yerevan, Armenia

Type of presentation: Poster

Abstract:

The present paper delineates the historical background and evaluation of gender relations in Science, Technology and Medicine from socialism to transition. I will also discuss changing attitude in the Armenian society toward women involvement in science and research in the transition.

After the independence declaration Armenian Republic inherited a relatively well-developed and industrialized country. It had an educated population; gender equality was declared in Constitution. In 1987 Armenia had more than 300 scientific research institutions and research centers, according to the Human Development Report, 1995, Armenia.

The structure of science organization in Soviet System allowed everyone (men/ women) to make a scientific research. As a result, in 1980 the rate of women-scientists in Republic was 39,8%, in 1994 - 52,6%, according to the National Report on the condition of Women, 1995. One of the advantages of socialist system was free education. From the first days of soviet power establishment the task was state – to eradicate the illiteracy. In all villages schools were created, at first designed to provide 7 year education, later ten year, and full secondary education. All church schools had been transformed to soviet schools. Despite the extreme ideologization of soviet schools and specific features of women-leaders of soviet type, the overall literacy of population and obligatory ten year education, as well as the fact that almost everybody were employed in Soviet Union, the equal rights had been declared, provided that three generation of women grew up in Soviet Union having equal rights with men. They have been capable to implement any work and many komsomol and communist leaders were among them.

Our research showed that Armenian women have made significant contribution into the scientific and technological development. Based on gender disaggregated data for Armenia we will discuss the distribution of Armenian scientists in different scientific fields and classification according the level of position the women scholars held. It should be mentioned that both gender aspect of exclusively professional relations and comparative analysis of gender peculiarities of professional relations and main model of relations in private sphere, family relations are specific to illustrate interactions of women with the science and technology on an example of gender distribution of scientists in National Academy of Science of Armenia. Figures clearly affirm high professional activity of women, meanwhile women made only 17,2% from total number of doctors of sciences working in the Academy, only 5,8 % women constitute Actual Members¹ of Academy of Science of Armenia. The data was gathered in 1997 for the project *Drafting the Roster of Professional Women in Armenia*, implemented by the CDCS². By this once more can be confirmed the existence of gender "glass ceiling" of professional promotion that is not easy to overcome for women.

A more thorough analysis of the status of women with higher education in science confirms general observation made in that they did not have the same responsibilities in technology and science fields and did not wield the same power. A case study for Armenia also reveals important differences in women's place in scientific technological activities. The main imbalance in Armenia was and is reflected in the percent of women on decision making positions, such as directors or even department heads at scientific institutions, chairs or deans at the universities. The downfall of Communist regime created hope that now people would come to science just feeling to be called to research and not from other considerations. However the loss of traditional social orientates, as well as distraction of the traditional system of values resulted in withdrawal of scholars from science. A sharp reduction of financing of science and hard economic and social situation in transition do not create conditions for scientific development and prevents the engagement of women's intellectual potential. The scientific development drastically detained. Numerous highly qualified specialists especially the young ones had given up the scientific activity. Some left Armenia in the search of opportunities and institutional support. During the Soviet era many tasks were accomplished by the state, with the collapse of centralized economy opportunities for free education for everyone were excluded.

Meanwhile the independence and new era have brought great opportunities for collaboration, scientific exchange. The spread of Internet, teleconferences have extended the capabilities of individuals and organizations, since destroyed the barriers for communication. The Internet has had a great role in developing collaborative projects and getting funding for them.

In the transition period scientific development drastically detained. Numerous highly qualified specialists especially the young ones had given up the scientific activity. Some left Armenia in the search of opportunities and institutional support. During the Soviet era many tasks were accomplished by the state, with the collapse of centralized economy opportunities for free education for everyone were excluded. A sharp reduction of financing of science and hard economic and social situation of the country do not create conditions for scientific development and prevents the engagement of women's intellectual potential.

As Armenia makes transition toward democracy, increased civic activism and leadership among women

¹ In Armenia like in Soviet system of science organization two kinds of Academy members existed: Corresponding members Actual Members of Academy.

²The Center for the Development of Civil Society, Armenian non-governmental organization and I am founding president.

scientists have become critical. However, the predominately male-led government does not often hear women's opinions and consider their needs. This makes ground for integration of efforts directed to find women's ways of networking in science and technology, discussions of their contributions to gender politics of networking.

Keywords: Gender, women, research, science, technology

CV:

Svetlana Aslanyan received her PhD in linguistics from the Institute of Linguistics of the National Academy of Sciences of Armenia. She is currently leading researcher and head of research group at the same institute. She has over 20 years research and teaching experience.

She is the founding president of CDCS, Center for Development of Civil Society, and its Women Scholars' Council division, which conducts a number of programs to improve the condition of women and children in Armenia. Since 1996, she has devoted herself to researching the role of women and the problems associated with the Women's Movement in Armenia.

She is currently conducts research on the role of women in establishing a democratic society.

Dr. Aslanyan has worked in the U.S. as a Fulbright Scholar, where conducted research on the role of women in establishing a democratic society. She has done a great deal of research in the area of women's issues and gender development.

Her publications include two monographs, six dictionaries, and a series of scientific articles, a Reader "Gender: History, Culture and Society". Recently, Dr. Aslanyan prepared a course of lectures entitled "Introduction in Gender: History, Culture and Society."

Dr. Aslanyan has conducted several workshops at international and local conferences.

SCIENCE AND TECHNOLOGY INDICATORS AND GENDER POINT OF VIEW.

Dra. Norma Rodriguez Martinez, Dra. Lilliam Álvarez

Type of presentation: Poster

Abstract:

The Science and Technology Indicators show the impact of Science and Technology in the development of each country, in special concerning the use and exploitation of natural resources with more intensive and vigorous scientific and technological research. Building indigenous capabilities for developing newer technology or newer uses of existing technologies requires a considerable investment in research infrastructure. However investment in physical infrastructure alone will not suffice. There should be a corresponding matching investment in human capital combined with an efficient and effective administrative machinery to develop and administer an appropriate human resource policy for their proper utilization.

The country is conscious that without making the best use of scientific and technological tools potentially, a social, cultural and economic developments as well as the progress of the nation as whole is not possible.

One of the integral features of the S&T policy should be to develop a system of S&T indicators as an essential tool for planning, evaluation and continual refinements to the policy process. Such indicators are needed to provide a solid statistical base for making policy decisions

S&T indicators are the collection of data assembled to answer questions about the S&T system. S&T indicators could provide vital tools for policy development and management. They also could provide critical tools for program evaluation, for assessing the outcomes and impact of all sorts of science, technology and investments made on it. Ideally, an indicator should be relevant to the characteristics it is measuring; it should be supported by relevant and timely data, sensitive to what it is measuring

The present work include the analysis of the actual indicators with the recommendation to include others that allow properly evaluate the Science and Technology impact including the gender point of view. The present work recommended the introduction of various parameters viz intramural expenditure, researchers, auxiliary, technical and administrative manpower etc.

CV:

Ph.Doctor in Geology, Proffesor of the High Institute of Technology and Applied Science in Cuba, Member of the Cuban Academy of Science and member of the TWOWS. Advissor of the Ministry of Science and Technology of Mozambique since 2006.

WOMEN IN DECISION MAKING BODIES: THE NIGERIAN PERSPECTIVE

Iniobong Louisa Usoro¹ and Elizabeth Azee Oricha²

¹Federal Roads Maintenance Agency, Abuja, Nigeria

²Federal Capital Development Authority, Abuja, Nigeria

Abstract:

There are untold numbers of women around the world doing amazing things in their country. Today we have nine female presidents in the world, Argentina, Chile, Finland, India and Liberia to mention a few.

Why are women interested in occupying managerial positions? This is because, it is from the top that you can contribute more to policies and decisions that would have more impact on the establishment or the society as the case may be. In addition, women need to participate in the decision making process otherwise the views and opinions of men would always predominate.

This paper assessed the status of women in decision making in the past, where we stand today and the way forward with particular reference to Nigeria. Data was collected from the private and public sector, the target audience was professional women particularly those occupying managerial positions. The data collected was analyzed qualitatively and quantitatively to identify strength, weaknesses, opportunities and factors which militate against women attaining managerial position in government and the industries. It makes recommendations as regards policies modifications, attitudinal changes and a change of orientation in female education. It also suggests strategies for making it to the top and how to respond to challenges and make positive impact while there.

Keywords: leadership, Nigerian women, professionals, education, managers

CV:

I am 43 years old with a Masters degree in Engineering. I have been practising engineering for 23years. I have worked with government all my life.

I worked actively in the field constructing new roads eg. Supervision of the construction of additional carriageway along the existing Abuja-Keffi rd. (52km). It consisted of building 3nos cloverleaf interchanges and 3nos river bridges. I worked extensively in the Management Information Unit seeing to the smooth running of the department.

Presently, I am the Chief Maintenance Engineer for the Federal Capital Territory (Abuja and its environs). My duties are inspection, supervision and maintenance of federal roads in the FCT.

I have membership in several professional bodies:-

- Association of Professional Women Engineers (APWEN) –Vice President
- Nigerian Society of Engineers (NSE)
- Nigerian Institute of Management (NIM)
- Society Of Women Engineers (SWE)
- American Society of Civil Engineers (ASCE) and
- Institute of Transportation Engineers

I am married with three daughters. I have a strong passion for female gender issues believing that every woman should be challenged to live and experience life as deeply and fully as she can.

ADVANCE: PROMOTING FEMALE SCIENTISTS

Karin Siebenhandl, Sabine Zauchner, Michaela Gindl

Donau-Universität Krems, Krems, Austria

Abstract:

There are significant differences in the career paths of male and female scientists. The road towards faculty positions not only takes longer for women, but there is also a significant portion of female candidates who drop out before reaching their goal, a phenomenon appropriately referred to as 'leaky pipeline'¹. This syndrome feeds on itself, since the paucity of females in leading positions, both in academia and industry, results in few role models for ambitious graduate students to emulate.

The ADVANCE project (<http://www.advance-project.eu>)² addresses the issue of gender equality in science and research and intends to make a contribution towards 'plugging the leaky pipeline'. The project consists of two components: a Mentoring and Coaching Program and a Summer School Program and is targeted especially scientists in natural sciences and technology as well as in academia and in industry.

Both parts support female scientists in acquiring research and career management skills and provides tools to enable female scientists to successfully pursue and develop their careers. Participants are exposed to expertise in structural and organisational aspects of scientific career promotion, enhance their skills relevant to academia and industry, and experience a mentor-mentee relationship with senior researchers who function as rolemodels. The ADVANCE initiative also supports the personal career strategies of the participants. Hence, the participating female scientists receive a broad repertoire of skills that are highly relevant for career development.

The Mentoring and Coaching Program

At its core, the Mentoring and Coaching Program seeks to enlighten participants about the channels of communication in both academia and industry in relationship to career development and advancement. The implementation of the ADVANCE Mentoring and Coaching Program started in December 2006 with the application procedure and was completed by the end of 2007. Each ADVANCE partner institution nominated responsible persons for the Mentoring and Coaching Program, so-called 'catalysts'. It was the task of the catalysts to recruit three mentees within their own institution and three corresponding mentors from their own or from an outside institution, and to assure the running of the program.

In the ADVANCE project, the terms mentoring and coaching are understood in the following fashion: Mentoring is a long term relationship that has both a personal and a professional dimension. It is established between two persons, a mentor and a mentee. The goal is to promote the mentee in terms of career development, networking, organisational know-how, etc., within the academic and industry research context. Coaching, in contrast, is a short term relationship that entails a focus on specific professional or personal issues. Coaching can take place either bilaterally (individual coaching) or in small groups (group coaching). Coaching aims at a quick and focused collaboration between the coach and the coachee, the former supporting the latter in developing her/his own skills.

The Summer School Program

The first part of the ADVANCE Summer School (module 1) took place from the 23rd of July to the 3rd August 2007 at the Danube University Krems, Austria. Module 2 was held from the 7th to the 9th September 2007 and was designed as an intensive follow-up with regard to the strategic career plan component.

¹ Rees Teresa (1998). Mainstreaming Equality in the European Union. London and New York. European Commission – Directorate-General for Research/The Helsinki Group on Women and Science /Teresa Rees (2002a). National Policies on Women and Science. [online]. <http://cordis.europa.eu/improving/women/policies.htm>, [15.02.2007]
European Commission – Directorate-General for Research (2002b). National Policies on Women and Science in Europe A Wake-Up Call for European Industry. [online]. http://ec.europa.eu/research/science-society/women/wir/report_en.html [15.02.2007]
European Commission – Directorate-General for Research (2004). Gender and the Excellence in Making. [online]. www.euburo.de/arbeitsbereiche/fraueneuforschung/Download/dat_fil_736, [15.02.2007]

² Funded by the European Commission through the 6th framework program, "Science and Society", duration: 01.09.2006-31.08.2008
Consortium: Academy of Management, Lodz, Poland; Danube University Krems, Austria (Coordinator); Helsinki Collegium for Advanced Studies, University of Helsinki, Finland; IFZ-Interuniversitäres Forschungszentrum für Technik, Arbeit und Kultur, University Klagenfurt, Austria; GGeP-The Graduate Gender Programme, University of Utrecht, the Netherlands; South-West University "Neofit Rilski", Blagoevgrad, Bulgaria

Thirty-three scientists participated in the ADVANCE Summer School.³ Mean age was 34,48 years, the youngest scientist was 23 years, and the oldest was 54. The structure of the participants represented a broad variety of nationalities (13), and various disciplines (25). The participants came from both Eastern (13) and Western countries (20), and there was a broad distribution of career stages: pre-doctoral (7), post doctoral (14), and PhD students (12).

The Summer School was organised by the Danube University Krems and focused on training in strategic career management, personal management, gender awareness, networking, funding in theory and practice, and communication strategies. The topics and didactic approaches were based on a literature review⁴ and an 'expert workshop' which was organized in order to evaluate and supplement the predefined topics with respect to a European perspective, the Summer School curriculum and the didactical approach were revised and adapted to European needs⁵. Outstanding experts were invited to give insights in their biography, career paths, experiences and knowledge in academia and industry to highlight good practice and role-models. As the reflection on gender and science was a continuous focus of the Summer School, all lecturers and trainers as well as the group moderators were required to be competent in dealing with gender issues, both in terms of a theoretical knowledge of gender theories, as well as in practice when interacting with participants in the context of the Summer School.

Outlook

The innovative aspect of the ADVANCE project was to provide a gender-sensitive training concept that focuses on evoking sustainable learning experiences by utilizing a broad variety of didactic methods. This approach combined personal, structural and contextual aspects, and supports the participants in transferring theoretical inputs into their own career context.

Based on the final formative evaluation results, the Summer School curriculum and the Mentoring and Coaching Program will be refined in 2008. The ADVANCE consortium will develop so-called "transfer models" with the goal of achieving sustainable implementation in the organisations involved. To this end, both the resources of the Summer School and of the regular coaching and mentoring in the context of personnel development will provide valuable on-going resources.

These models will be made available free of charge to interested institutions and will comprise the following components:

- 1) Refined Summer School Program
 - Detailed Curriculum
 - Teaching Materials
 - Trainers` Network
- 2) Refined Mentoring and Coaching Program
 - Profiles of mentors and coaches
 - Training program for catalysts/mentors
 - Implementation plan for the program

Key Words: Training activities, Mentoring and Coaching, Leaky pipeline, Promotion of female scientists in natural sciences and technology

CV:

Degree in landscape planning and architecture from the University of Natural Resources and Applied Life Sciences, Vienna (Austria) in 1997 and doctorate at 2004. Researcher at Donau-Universität Krems. Founding member of the initiative "Technology and Women". 2004 Austrian (ÖGUT) Environmental prize (Technology and Women). Since October 2007 Head of Research Center KnowComm at the Department of Knowledge and Communication Management.

Main interests: perspectives on sustainable technology design, Usability and applications of traffic telematics, information design, quantitative and qualitative measures to improve the status of women in science and engineering.

³ The application process took place between December 2006 and the end of January 2007. In total, 190 female scientists applied for the Summer School, however only 17 could be chosen for participation.

⁴ e.g. Gindl, Michaela, Hefler, Günter (2006). Gendersensible Didaktik in universitärer Lehre und Weiterbildung für Erwachsene. In Anita Mörrth, Barbara Hey, Koordinationststelle für Geschlechterstudien, Frauenforschung und Frauenförderung der Universität Graz (Eds.), geschlecht + didaktik. [online]. http://www.uni-graz.at/kffwww/geschlecht_didaktik/#top, [28.02.2007].

Dalhoff Jutta (2006): Anstoß zum Aufstieg – Karrieretraining für Wissenschaftlerinnen auf dem Prüfstand. Bielefeld: Kleine Verlag.

⁵ Zauchner, Sabine & Gindl, Michaela (2007). Advance Project: Workshop Report [online]. http://www.advance-project.eu/project-archive/wp-2/deliverables/advance_d2_workshop-report.pdf/download, [31.08.2007]

Projects:

MUTIK: Multiplikatorinnen in der IT Welt, 2002-2004 (Country of Lower Austria), EQUAL

SITCOM: Simulation IT Carriers for Women, 2004-2006, Socrates (Minerva) project.

Gender Coordination for PROLIX, (FP6) 2005-2008

Coordinator of ADVANCE, Science and Society, 2006-2008, 6th Framework, EU

STRATEGIES OF EQUAL OPPORTUNITIES

Adrienne MABOTI

Type of presentation: Poster

Abstract:

Since the birth of the company, the woman was subjected and excluded from the professional sphere. The community evokes only its interest for the family. It is with an aim of fixing the principles of the religion and morals for the education of the future generations that one taught him the bases from the reading.

The inferiority which characterizes it prohibits him the statute of citizen and thus the access to its rights. It is excluded from the political life and the public affairs. However, the evolution of the society gradually forces the right to grant more interest to the women because this one must adapt to the evolutions of the society. Its objective is procreation and the house works, essential with the cohesion of the society. However this work is not recognized and thus does not have any commercial value. It was initially necessary to recognize these "virtues" as a woman to him. But little by little, with the evolution of the society which considered its potential with work, it succeeds in fitting in the commercial sphere.

The equality of the sexes is a condition essential with the realization of the program of Millennium. It is not only one moral requirement but also a decisive aspect of human progress.

While recommending reforms legal and social, it modifies already landscape social and political. In many areas of the world, a girl born in 2008 is probably promised with a better future than a girl born in 1980.

Vis-a-vis with employment:

It is very frequent that the women devote the majority of their working hours to tasks not remunerated At by the domestic activities, and that there remains to them less time to devote to a remunerated employment, the women continue to assume the greatest part of the domestic tasks Although during last decades the participation of the women in the life activates progressed much, other improvements are always made wait, with regard to in particular their conditions of work, recognition of the work not remunerated of the women, the granting of a support for the guard of the children and the elimination of the practices and laws discriminations which prevent them from reaching the property and the heritage. While ensuring the women, on an equal footing with the men, the possibility of having access to an income and of managing it, one approaches considerably the realization of the women's rights. A whole series of interventions will be necessary to fight the negative attitudes with regard to the women in the world of work. The governments must adopt the measures legislative, financial and administrative necessary to create an environment favourable to the entrepreneurship of the women and their participation in the active life. It is advisable to promote the social policies which allow the women and the men to reconcile family career and responsibilities

within the hearth:

When a woman the bent frank ones in her family, his/her children, in particular the girls, have more chances to be provided education for. The children whose mother was not informed were likely at least twice more not to attend the school which the children whose mother had attended the primary school.

The men have a role essential to play. By encouraging the decision-making on an equal footing, by applying the shared responsibilities relating to the domestic tasks and education, the men can contribute to the fight against discrimination sexist in their community. As for the women, they are catalysts of the change while disputing and condemning the discriminatory attitudes in their community, female associations can promote the women's rights for the generations to come

In political life:

In spite of their participation limited to the national and local political play and the process of rebuilding after conflicts, the women engaged in the political life and with the government contribute nevertheless to make evolve/ move the things. Their influence is not limited to the adoption of more vigorous legislations in favour of the women but they also help the bodies decision makers to become more democratic and more egalitarians. Several of the pernicious effects of discrimination related to the sex, which it acts of the low educational level, of the social attitudes which challenge the competence of the women in the stations with responsibilities, like the heavier workload which falls to them, continue to limit their participation in the political life Nowadays, the women have access to good more activities than before; the rows of girls do not cease growing bigger at the school, the

political proportion of woman increases even at the top of the State. To arrive at the equal opportunity between the men and the women: From the political point of view to amend the electoral law in favour of the woman to organize courses to promote the women in policy to introduce into the political diary, the promotion of the woman on all the level to encourage the participation of the women in policies by the systems of quotas to standardize rules within the national legislations From the social point of view to make a sociological study to identify the stereotypes promoted in the education of the children by the parents on the level local to extend from the social services to the village to reinforce the capacity of ONG female in automation of the women by other women The from an economic standpoint to develop the service in order to reduce the current women of the problems family to carry out courses of the small businesses to instigate the implication of the women in the businesses From the education point of view to develop the programme of education for the women and to adapt the courses to the needs present for the market of employment to help the women to perfect their competences by the training courses, seminars, conferences etc... to give the same access to education to the girls and to the boys to enable them to enter on an equal footing the active life.

Keywords: women, career, government, NGO

CV:

Named Adrienne Maboti Lundombi was born in Kinshasa on August five one thousand and nine hundred and sixty five in Democratic Republic from Congo. Single person, mother of one child. Graduate of State science section, option: chemistry- biology Graduated in techniques applied, section: electricity, orientation: industrial electricity. This formation was sanctioned by the rank of Engineer technician at the higher institute of the techniques applied. Bachelor in electronics, option: data processing applied. Sanctioned by the diploma of Engineer. In the same institute. began my career as maintenance man.

In 2001, I was allowed under statute at the Ministry for Foreign Affairs and international cooperation with the rank of attached of office of second class.

- Intendant with the cabinet of the vice-Minister to the International Cooperation, Secretary of cabinet of the vice-Minister of primary, secondary and professional education.

I followed several formations sanctioned by the certificates on:

- techniques practises of computer in the Asia-pacific training center in Beijing/chine.
- three modules of the executive courses on the Congolese diplomacy.
- the food management of catastrophe.
- management of procedure of funding UNFPA and UNDP

I am General Secretary of the Circle of the women Engineers and scientists of Congo

USING COMPUTER-BASED SYSTEMS TO ADDRESS THE GENDER IMBALANCE IN COMPUTING

Margaret Ross, Cornelia Boldyreff, Hannah Dee, Jo Komisarczuk, Beth Massey, Fran Paterson

BCSWomens Specialist Group, UK

Type of presentation: Poster

Abstract:

The paper discusses the skills shortage of computing and IT professionals both currently and expected within the next 10 years. It also considers the imbalance between males and females in the computing industry. There is some evidence that while a department may show nearly 45% of female staff they are all in customer facing or administrative roles rather than technical roles. The decreasing numbers of students applying for degree courses in computing, and also at school where there is a lack of pupils considering computing as a career are also discussed.

There are many organisations worldwide attempting to address these imbalances, but the paper will consider mainly the role of the British Computer Society (BCS) and in particular one of its Specialist Groups, BCSWomen (www.bcswomen.bcs.org). This is a volunteer driven group to support professional women working in Computing and IT and to encourage more women and girls to join this profession.

BCSWomen is mainly an Internet-based group of over 800 women (with eleven percent of them outside the UK). Any member with a technical or work based related problem can raise it with the group as whole, and there are usually four or five possible solutions offered by various members, and further discussion can then be continued off-line. The issues of skills shortage, and the reasons for them, with experiences of women who are working in IT, reasons why it is unattractive and what we can do about it are regular topics for discussion, thus there are a number of low level activities actively undertaken by group members, arising from this. The CV advice system is provided to the members, by the members, advising of best-practice and also how to keep their CV "alive" during long career breaks. Support is also provided during these breaks. Many members of BCSWomen have benefited from formal mentoring through MentorSET as well as informal mentoring through the e-group.

Many of the women are active locally meeting informally with other members of BCSWomen in their area. Some women have taken on the role of BCSWomen representatives on their local BCS branch committee, ensuring that there are suitable events, that are relevant to women, e.g. provision of technical updating presentations for women returners and also seminars on the softer skills.

Support is provided to Careers and IT teachers, by women volunteers, attending careers events, and talking to teachers and also pupils about careers in computing. They are also able to utilise a set of the freely available, on-line BCS leaflets on career progression and typical roles in the computing profession (<http://www.bcs.org/server.php?show=ConWebDoc.2893>). They can also provide posters for the schools, to provide information about the opportunities. There are also posters that demonstrate that IT professionals are not "geeks" and have interesting lives outside the work environment. Through its research project on the history of Bletchley Park women, the group has raised public awareness of the early pioneering women in computing in the UK.

Many of the BCSWomen are active in organising competitions and prizes for all age groups, from primary, secondary school and the sixth-form age group from 16 to 18 years. These are designed to be equally attractive to both girls and boys. An examples of this is the BCS Hampshire Branch's schools competitions (www.hampshire.bcs.org).

As well as using e-group support via yahoo and the BCSWomen website, the group has recently launched itself on FaceBook and LinkedIn. Postgraduate research students within the group have investigated the role of social networks in computer science education. This links with active support developed by BCSWomen members for women students in their universities, such as that developed at the University of Lincoln in its WSET project, to ensure successful transition from degree study to professional practice for women studying Computing. The forthcoming Lovelace Colloquium (<http://www.comp.leeds.ac.uk/lovelace>) for undergraduate women and the Hopper Colloquium for postgraduate women, have both been organised by BCSWomen to encourage women to stay on in academic computing.

In conclusion, similar activities are being provided across other technical professional organisations, such as those led by the IET (www.etechb.co.uk, www.scenta.co.uk). BCSWomen are perhaps unique in their extensive employment of relevant computing technology to support their organisation.

Keywords: Gender Issues, IT Skill Shortage, Self Supporting Group, British Computer Society Womens' Group

CV:

Margaret Ross is Professor of Software Quality at Southampton Solent University.

Margaret's area of interests are quality, outsourcing and greening within a computing context and addressing the IT and engineering skills shortage, by encouraging women and girls into IT. She has been Conference Director since 1992 of the annual series of Software Quality Management international conferences, aimed at benefits to industry, and since 1995 of the annual series of international educational INSPIRE conferences. She has edited thirty books, and has been actively involved with the Software Quality Journal since its inception.

Margaret is a Freeman of the City of London, Liveryman of the Worshipful Company of Engineers, longstanding independent member of the Parliamentary IT Committee and was awarded an Honorary Doctorate from the University of Stafford and an Honorary Fellowship by the British Computer Society.

Margaret Ross has been and is influential in the British Computer Society (BCS), currently holding various positions including that of nationally elected member of the BCS Council, and Vice Chair of the BCS national Quality Special Interest Group, and on the national committee for BCSWomen.

FRANCE AND INFORMATION TECHNOLOGY: WHERE ARE WE AT ? A GENDERED VIEW ON THE DECLINING INTEREST IN IT.

Collet, Isabelle ¹, Morley Chantal ²

1. Université Paris X Nanterre, Centre de recherche Education – Formation

2. Télécom Sud Paris, Département des systèmes d'informations

Type of presentation: Oral session

Abstract:

Among the technical and scientific studies, the evolution of the computer sciences draws attention. From the 1980s, in France, more and more men have chosen this field but in the same time, the number of women has remained the same. By studying computer scientists' discourses and questionnaires completed by first-year science students, we observe the computer scientists' image has changed in the past 30 years. Before the microcomputer, ICT jobs were service industry scientific jobs. They were quite attractive to female scientists. Then, the representation of the computer scientist sticks on a man solely enthralled by his computer (Collet, 2006).

However, computer scientists have many motivations and interests which have led them to choose this career. Unfortunately, women have difficulty in finding their place because of the stereotype pregnancy. Moreover, in opposition to men, female students often choose this career thanks to their representation of their future job which is in touch with the reality of the workplace. But only few of them find the way. Once on the job market, they endure an active discrimination from some colleagues or managers and gain few supports, even from other women. In France, women network, especially in STIM are still at their beginnings. Finally, many of them quit IT, the others make a career in non strategic activities areas, like technical documentation or training. In such areas, they soon meet the glass ceiling.

Recently, an OECD report (OECD, 2006) has drawn attention to the declining interest in science and technology studies amongst young people. Because of the gender gap in ICT amongst professionals as well as academics, one recommendation is to promote equal opportunity for male and female students. However, in order to reverse the trend of declining interest in ICT, the causes of this phenomenon should be studied. Why and how should women be attracted to studies that men prefer to ignore? As a contribution to this issue, we have explored the loss of interest in technology amongst ICT students. Our research starting point is the persistent male image of technology (Wajcman, 2000), which affects the choice of studies (Marry, 2004). Our research objective is to examine how male and female students cope with this male image as they evolve in their schools. We have conducted this research in France in an engineering school and a management school both oriented towards ICT. This research is based on 30 student interviews (1st and 3rd year students) and on 20 accounts from 2nd year students. Our basic questioning was: What attitude do you have to technology? (Collet, Morley et al., 2007)

The results show a persistent male stereotype of technology for most male and female students. Men often consider themselves as being « naturally » close to technology, however, they consider it in their strategic interest to distance themselves from it. When women master technology, they apparently want to protect the integrity of their gender identity, sometimes vigorously. Their objective is not to show their supposed "natural" remoteness from technology, but rather try to prove that this "loose but strong" attachment has not transformed them. The distancing strategies differ according to experience. Male students with a previous major involvement in technology, abandon it regretfully, only because they feel a social depreciation of technology. Male students who have been less involved in technology feel obliged to justify their late involvement and then their detachment. They think that they retain technological legitimacy, even when moving beyond technology. Some of them use technology as a source of power. Female students, on the contrary, don't feel obliged to justify their detachment, which appears more « natural », and they rarely rely on any technologically based authority.

In conclusion, the analysis has shown a practical relationship to technological knowledge. Even light technological training can be used as a guarantee or a source of power. This is a major factor in the persistence of the technologically gendered stereotype. Men who are no longer involved in technology still consider that they master it because it is a « natural » component of their identity. Female students on the contrary, in the same position, give up such a claim, already difficult to defend, and do not use technology as source of power.

Collet, I. (2006). *L'informatique a-t-elle un sexe ? Hackers, mythes et réalités*, Prix de l'Académie des sciences morales et politiques Paris, L'Harmattan.

Collet, I., C. Morley, et al. (2007). *A gendered view on the declining interest in technology. Gender, images and global contexts*, Helsinki, Finland, 3rd Christina Conference on Women's Studies - 4th European Gender and ICT Symposium.

Marry, Catherine (2004). *Une révolution respectueuse : les femmes ingénieurs ?*. Paris, Belin.

OECD (2006) *Evolution of Student Interest in Science and Technology Studies Policy Report*.

Wajcman, Judy (2000). "Reflections on Gender and Technology Studies: In What State is the Art?" *Social Studies of Science* **30**(3): 447-464.

Keywords : gender, IT engeneering, stereotype

CV :

PhD in education

LES FACTEURS IMPLIQUES DANS LA SOUS-REPRESENTATIVITE DES FEMMES EN SCIENCES ET GENIE ET L'INFLUENCE DES STEREOTYPES

Ghazzali Nadia, Lee-Gosselin Hélène, Myrand Marie-Eve
Université Laval

Type of presentation : Oral session

Abstract:

La sous-représentativité des femmes dans le milieu des sciences pures et appliquées ainsi que du génie est une situation préoccupante autour de laquelle plusieurs acteurs se mobilisent, ceux-ci proviennent autant du milieu de l'industrie que de celui de la recherche. Par ailleurs, la littérature est riche en études tentant de discerner les causes ou origines de la faible présence des femmes dans les milieux scientifiques. Or, la question est loin d'être résolue afin de savoir quels sont les tenants et aboutissants de cet état de fait.

Au fil des ans, une foule de pistes ont été étudiées par rapport à la question et vont dans plusieurs directions. Malgré tout, il ne semble pas exister pour le moment d'articles ou de documents permettant de faire le point sur l'état actuel du savoir en la matière. Il est également difficile de cibler de manière isolée les facteurs influençant la sous-représentativité des femmes en sciences et génie de même que leurs impacts réels. La littérature sur le sujet permet cependant de constater que plusieurs facteurs influencent la problématique et ce, tant de manières directes qu'indirecte.

Un tour d'horizon sera ainsi proposé afin de cerner l'ensemble des connaissances actuelles entourant les facteurs étant déjà identifiés dans la littérature comme ayant un lien avec la problématique. L'accent mettra en relief les différentes recherches où les résultats vont dans le même sens, de même que celles où il y a dissension. Les liens d'influence et d'interdépendance entre les facteurs seront également développés. La présentation permettra ainsi de bien circonscrire les différents leviers possibles et ainsi permettra de pointer des pistes de solutions pour augmenter la représentativité des femmes en sciences et génie.

Les éléments qui seront abordés toucheront un spectre assez varié et complémentaire de facteurs ayant une incidence sur la problématique. Dans un premier temps, il sera question de l'environnement scolaire entourant les jeunes filles, lequel est susceptible d'avoir un impact sur la détermination de leurs choix professionnels. Dans le même sens, l'influence des pairs et des autres individus significatifs sur la décision de carrière des femmes sera également abordée. Les facteurs sociaux ayant trait aux modèles de carrière qui sont traditionnellement proposés aux femmes et qui influencent le choix de ces dernières seront aussi touchés.

Un autre facteur abordé sera celui ayant trait à l'impact de la culture et des normes en vigueur dans le milieu des sciences et du génie. D'autre part, il sera aussi question de la conciliation travail-famille et de toute l'influence des éléments personnels sur la détermination et l'évolution d'une carrière en sciences et génie. L'attitude des parents et l'impact des encouragements reçus par les jeunes filles à poursuivre des études ou une carrière en sciences seront également abordés.

Finalement, une attention particulière sera accordée à toute la sphère entourant les stéréotypes et préjugés qui viennent interférer dans la décision des jeunes filles de faire carrière dans un domaine scientifique. En effet, la représentation des femmes dans les espaces scientifiques réfère nécessairement à des choix que ces dernières doivent exercer par rapport à leur domaine d'étude ou de travail. Ces choix, de plusieurs manières, peuvent être teintés par des stéréotypes qui, dès lors, jouent un rôle important à plusieurs plans. Ainsi les stéréotypes occupationnels liés au genre, influenceraient les femmes à occuper d'autres types de fonctions que celles scientifiques. Également, les parents, professeurs, conseillers en orientation scolaire et autres individus significatifs, par le truchement de leurs propres stéréotypes, sont susceptibles d'influencer la sous-représentativité des femmes en science. Finalement, l'ensemble des stéréotypes liés aux sciences et à la place de femmes au travail qui sont exhibés socialement crée une pression sur les femmes, les dissuadant du même coup d'entamer une carrière scientifique.

FACTORS INVOLVED IN WOMEN'S UNDERREPRESENTATION IN SCIENCES AND ENGINEERING

Ghazzali Nadia, Lee-Gosselin Hélène, Myrand Marie-Ève
Université Laval

Keywords: Women, Engineering, Sciences, Under-representation

Under-representation of women in the fields of engineering and sciences is a worrying situation that several studies have addressed through the years, trying to identify causes and solutions. But no synthesis paper seems to exist today, enabling a clear overview of the current situation. The purpose of the proposed activity is to gather and summarize the different factors involved. In particular, it will address school environments, peer pressure, social factors, culture and norms in engineering and sciences, the work-family conflict, parental attitudes, and stereotypes.

Cv:

Université de Laval

LE PORTRAIT SOCIOMOTIVATIONNEL DES FEMMES QUI PERSÈVÈRENT DANS LE DOMAINE DES SCIENCES, TECHNIQUES, INGÉNIERIE ET MATHÉMATIQUES (STIM)

Simon Larose
Université Laval

Type of presentation : Oral session

Abstract:

Dans le contexte actuel de la mondialisation des marchés et de la nouvelle économie, la présence d'une main-d'œuvre qualifiée dans le domaine des sciences, techniques, ingénierie et mathématiques (STIM) constitue un atout important. Actuellement, le renouvellement de cette main-d'œuvre se vit difficilement, notamment en raison des problèmes d'intégration et de persévérance des jeunes dans les programmes d'études postsecondaires reliés à ces domaines. En effet, certaines études en éducation et psychologie scolaire constatent des déclins de l'intérêt pour les mathématiques et les sciences entre le secondaire et le collégial (Seymour & Hewitt, 1997; Larose, Ratelle, Guay, Senécal & Harvey, 2006a) et des problèmes de persévérance chez les jeunes qui choisissent de poursuivre des études postsecondaires dans ces domaines. Au Québec, dans les programmes de sciences, de techniques biologiques et de techniques physiques au collégial, c'est respectivement 30, 40 et 50% des jeunes qui n'obtiendront jamais de diplôme même si ces derniers sont suivis sur des périodes de plus de dix années (Données du fichier du MELS, 2005). Dans les programmes de sciences et génie des universités québécoises, c'est plus de 30% des étudiants qui quittent ce secteur sans diplôme (Larose et al., 2005).

Ce problème est d'autant plus alarmant lorsque l'on considère le clivage important entre les sexes quant à l'accès et la réussite dans certains secteurs de pointe. Les techniques physiques, le génie et l'informatique, pour ne nommer que ceux-là, souffrent d'une sous-représentation chronique d'effectifs féminins depuis des décennies. Dans ce contexte, la recherche sur les femmes et les sciences a fait des progrès importants depuis les 20 dernières années, notamment en documentant les facteurs personnels et contextuels responsables du désintéressement des femmes pour certains secteurs scientifiques de pointe comme le génie et les technologies supérieures. Ce courant de recherche a également généré des hypothèses intéressantes quant au profil des femmes qui persèverent dans des programmes d'études postsecondaires conduisant à des emplois dans ces secteurs. En dépit de ces percées, très peu de travaux ont cherché à dresser ce profil en clarifiant ce qui relève précisément du genre (i.e., les différences fondamentales entre hommes et femmes) de ce qui relève précisément du comportement de persévérer (i.e., les différences fondamentales entre un individu persévérant et un individu non-persévérant). Cette distinction est importante puisqu'elle permet de nuancer les contributions respectives de la nature et de la culture dans la poursuite d'études scientifiques. L'objectif de notre communication est donc de présenter un modèle descriptif et empirique du profil sociomotivationnel des femmes qui sont les plus susceptibles de terminer des études postsecondaires et de faire carrière dans le domaine des STIM.

Ce profil sociomotivationnel sera élaboré à partir des résultats de deux grandes études longitudinales que nous menons au Québec depuis 1998 et qui visent à mieux comprendre les déterminants de l'intégration et de la persévérance des jeunes intéressés par des études et carrières dans le domaine des STIM. Ces études ont permis de questionner plus d'un millier de jeunes hommes et de jeunes femmes à différents moments de leur cheminement scolaire (fin du secondaire, pendant les études collégiales et au début des études universitaires). Elles ont également permis, à partir d'entrevues, de préciser les parcours uniques de chacun des participants et ainsi de statuer sur leur persévérance. Les questions ont visé la mesure de facteurs personnels comme les motivations intrinsèques et extrinsèques à poursuivre des études en STIM, les sentiments de compétences disciplinaires, l'adhésion à différents stéréotypes, l'attachement à la communauté scientifique et la clarté du choix de carrière, et des facteurs contextuels comme les pratiques pédagogiques des enseignants de STIM, le soutien des parents et amis, la nature du travail rémunéré pendant les études et la participation à des activités parascolaires et extrascolaires dédiées à la promotion des sciences.

La conception du profil prendra en considération quatre groupes différents d'étudiants et d'étudiantes : les filles qui ont persévéré en STIM, les filles qui n'ont pas persévéré en STIM, les garçons qui ont persévéré en STIM et les garçons qui n'ont pas persévéré en STIM. Les différences qui émergeront de cette analyse comparative permettront de mieux saisir le profil unique des jeunes femmes qui persèverent en STIM ainsi que de réfléchir sur les contributions respectives de la nature et de la culture sur leur persévérance.

A SOCIOMOTIVATIONAL PROFILE OF WOMEN'S PERSISTENCE IN SCIENCES, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM)

Simon Larose
Université Laval

Keywords : persistence, women and sciences, motivation, pedagogy

In the current context of market globalization and the new economy, it is a great asset to have a workforce qualified in the fields of science, technology, engineering, and mathematics (STEM). However, currently, it is difficult to renew this workforce because of problems related to the integration and perseverance of youth in post-secondary academic programs in these fields. Indeed, studies in education and educational psychology have found that interest in math and science declines between high school and college (Seymour & Hewitt, 1997; Larose, Ratelle, Guay, Senécal & Harvey, 2006a) and perseverance problems exist among young people who choose to pursue post-secondary studies in these fields. In Quebec, 30, 40 and 50 percent of young people in college science, biology and physics programs respectively will never obtain their diplomas in STEM. This is the case even though they have been followed for periods of over ten years (Data from MELS file, 2005)., More than 30 percent of students leave Quebec university science and engineering programs without their diploma (Larose et al., 2005).

This problem is all the more alarming when we consider the wide gender gap in access and success in some leading-edge sectors. For decades, a chronic under-representation of women has affected physics technology, engineering and computer science, to name a few. In this context, research on women and science has made great progress over the last 20 years, in particular by documenting the personal and contextual factors responsible for women's lack of interest in leading-edge scientific sectors such as engineering and high technology. This research stream has also generated stimulating hypotheses on the profile of women who persevere in post-secondary academic programs leading to jobs in these sectors. Despite these breakthroughs, very few studies have sought to develop this profile by distinguishing what specifically pertains to gender (i.e., the fundamental differences between men and women) from what specifically pertains to perseverant behaviour (i.e., the fundamental differences between a perseverant individual and a non-perseverant individual). This distinction is important because it helps to differentiate the respective contributions of nature and culture in the pursuit of scientific studies. Our paper thus aims to present a descriptive and empirical model of the socio-motivational profile of women who are most likely to complete their post-secondary studies and make a career in the STEM field.

This socio-motivational profile will be developed using the results of two major longitudinal studies which we have been conducting since 1998. The aim of these studies is to better understand the determinants of the integration and perseverance of young people interested in studies and a career in the STEM field. The studies involved interviewing more than one thousand young men and women at various points in their academic trajectory (end of high school, during college, and at the beginning of university). Based on these interviews, the unique trajectories of each participant could be specified and their perseverance could be determined. The questions measured personal factors such as intrinsic and extrinsic motivations to pursue studies in STEM, feelings of competency in these disciplines, attachment to the scientific community and clarity of career choice. They also measured contextual factors such as pedagogical practices of STEM teachers, parental and peer support, type of paid work during studies and participation in para- and extracurricular activities aimed at promoting science.

The profile will be developed for four groups of students: young women who persevered in STEM, young women who did not persevere in STEM, young men who persevered in STEM and young men who did not persevere in STEM. The differences emerging from this comparative analysis will allow us to better grasp the unique profile of young women who persevere in STEM and to consider the respective contributions of nature and culture to their perseverance.

“YOUNGER WOMEN MAY FORCE ORGANIZATIONAL CHANGES THAT EARLIER GENERATIONS HAD DIFFICULTY ACHIEVING, IN SCIENCE AND TECHNOLOGY”

Hélène Lee-Gosselin, PhD, Marie-Ève Myrand, MBA

Faculté des sciences de l'administration, Université Laval, Québec

Type of presentation: Oral session

Abstract:

Research has shown that several social factors seem to play a significant role in the “push or pull” factors that influence women’s decision to pursue a career in science and engineering. Whether it is through personal experience or through anticipations or fears related to them, these factors seem to have contributed to the limited progress women of recent generations have made in science and engineering. Work/family balance is one of these social factors. Organizations are slow to recognize these “personal/family” concerns as legitimate in a working environment and are very slow to change some practices to accommodate such reality. What do we know about the ways organizations in science and technology address these issues? Do they have policies around Work-family balance? And if they do, are they used? Are “science and technology” organizations among the “innovators” on that front or do they lag behind?

There is growing evidence that men and women of Generation Y have particular values and characteristics that are in sharp contrast with those of previous generations. One of these is the desire of women to pursue both, a career and a family, during the same time frame rather than in sequence; There is also some indications that women of Generation Y wish to have more children than professional women of previous generations.

How will interact the characteristics and aspirations of women in Generation Y and the organizational practices in science and technology? Do we know what has to be changed for these trends not to be on a collision course? Which are the most important challenges ahead for young people interested in science and technology and the organizations that will need to attract and retain them.

This presentation will characterize the status of work-family conciliation practices and the challenges that can be foreseen to accommodate Generation Y .

“Les jeunes-femmes auront-elles plus de succès que celles qui les ont précédées, à transformer les entreprises en Science et technologie? «

Hélène Lee-Gosselin, PhD, Marie-Ève Myrand, MBA

Faculté des sciences de l'administration, Université Laval, Québec

Mots clé: équilibre travail-famille, politiques et pratiques organisationnelles

La recherche a montré que divers facteurs sociaux interagissent pour susciter ou freiner la décision de femmes de faire carrière en sciences et technologie. Tant par l'expérience personnelle de ces facteurs que par les anticipations ou craintes des femmes à leur sujet, plusieurs facteurs sociaux semblent expliquer le lent progrès des femmes des dernières générations, en sciences et technologie. La conciliation travail-famille est l'un d'eux. Les entreprises et les organisations sont lentes à reconnaître que les préoccupations de la vie personnelle ou familiale sont légitimes dans un environnement de travail; elles sont aussi très lentes à modifier certaines pratiques ou politiques pour accommoder cette réalité, et surtout, les demandes explicites et implicites que les femmes formulent à cet égard.

Que sait-on sur la façon dont les entreprises du secteur des sciences et technologies considèrent et tiennent compte de ces enjeux? Ont-elles des politiques concernant l'équilibre travail-famille, et si oui, sont-elles utilisées? Quelles sont leurs pratiques réelles? Les entreprises du milieu des sciences et technologies sont-elles innovantes à cet égard par rapport au milieu des affaires en général ou, au contraire, tardent-elles à rendre légitime ces préoccupations et mesures?

Il y a de plus en plus d'indications à l'effet que les membres de la Génération Y, épousent certaines valeurs et ont certaines caractéristiques qui se distinguent de celles des membres des générations précédentes. L'une d'elle est le désir des femmes de cette génération de poursuivre une carrière et la maternité simultanément, plutôt qu'en séquence. Il y a aussi des indications à l'effet que les femmes de la Génération Y désirent avoir plus d'enfants que les femmes professionnelles des générations précédentes.

Comment peut-on anticiper les interactions entre les caractéristiques et les aspirations des femmes de la Génération Y et celles des organisations en science et technologie? Sait-on ce qui devra changer pour limiter les risques de

conflits majeurs entre ces tendances et surtout, le risque que les femmes s'éloignent des sciences et technologies? Quels sont les défis les plus importants qui se profilent à l'horizon pour les jeunes femmes intéressées aux sciences et technologies et pour les organisations qui devront les attirer et les conserver?

Cette présentation fera le point sur les pratiques et les politiques de conciliation travail-famille en science et technologie, et sur les défis de la prise en compte des caractéristiques de la Génération Y à cet égard.

Key words: work-family balance, organizational practices and policies

CV :

Faculté des sciences de l'administration, Université Laval, Québec

**ELSIE GREGORY MACGILL: LEADER & PIONEER CANADIAN ENGINEER
(PAPER 1 FOR PANEL: PAST TO PRESENT: BUILDING INTERNATIONAL LEADERSHIP
NETWORKS FOR WOMEN SCIENTISTS AND ENGINEERS)
SYMPOSIUM ON GENDER & LEADERSHIP IN SCIENCE & ENGINEERING**

Crystal Sissons, Ph.D. Candidate, B.Ed.
University of Ottawa, Department of History

Abstract:

Elsie Gregory MacGill was a pioneering woman engineer. She was the first woman to graduate from the University of Toronto in Electrical Engineering in 1927, and in 1929 she then became the first woman in North America to obtain a Masters in Aeronautical Engineering. She began work in Canada in the 1930s at Fairchild Aircraft Limited, and just before World War II began she bargained successfully for a promotion with Canadian Car and Foundry. As a result she obtained the position of Chief Aeronautical Engineer at the company's plant in Fort William, Ontario (presently Thunder Bay, Ontario). She held this position until 1943 when she relocated to Toronto, Ontario to set-up her own practice as an independent consulting engineer. As MacGill established herself as a consultant she served as a member of various engineering and women's organizations.

Elsie Gregory MacGill became known as a leader within the engineering field. She was acknowledged for her expertise and innovative work as an aeronautical engineer and her promotion of women engineers. How did MacGill become known as a leader? What initiatives did she undertake that set her apart as an advocate for women in engineering? What impact did her actions have pertaining to other women engineers?

This paper is based on my SSHRC-funded doctoral thesis entitled: "Elsie Gregory MacGill: Engineering the Future and Building Bridges for Canadian Women, 1918-1980". It will explore MacGill's activities on behalf of women including her involvement with the American Society of Women Engineers (SWE), and the Canadian Women in Science and Engineering (WISE). She was recognized by SWE for her contributions to the field of engineering and went on to serve the organization in a wide variety of activities. As a result of her impact she was contacted during the planning phase of the first International Conference of Women Engineers and Scientists (ICWES) to recommend potential participants. Later, when WISE was in its early years she was asked to address the growing organization and provide what insights and inspiration she could as an engineering role model.

It will be illustrated that MacGill was instrumental in supporting women in the engineering profession both at the time they began their universities studies and throughout their careers in the field. The argument will be advanced that MacGill fought publicly for women's equality within engineering. In fact, she was not afraid to voice her opinions on behalf of women regardless of whether she had the support of an organization behind her or had to forge ahead as an individual with an independent point of view. As we shall see, a case-study assessment of her leadership is illustrative of the character pioneering women engineers' possessed in the male-dominated fields they worked in. Moreover, her life can be linked to her contemporaries and to those who came afterward.

Key Words: Activism, Engineer, Gender, History, Leadership

CV:

Crystal Sissons is a Ph.D. Candidate at the University of Ottawa's Department of History. She is currently in the final stages of her SSHRC-funded doctoral thesis is entitled: "Elsie Gregory MacGill: Engineering the Future and Building Bridges for Canadian Women, 1918-1980". She also holds the position of Program Manager for the University of Ottawa's Women in Engineering Research Group (UOWERG), which is conducting a study entitled: "Society Centered Educational Practices and Retention of Women in Engineering".

**BECOMING A NATIONAL LEADER FOR WOMEN IN SCIENCE AND ENGINEERING:
DR. MONIQUE FRIZE, 1989-1994
FROM PAST TO PRESENT: BUILDING INTERNATIONAL LEADERSHIP NETWORKS FOR WOMEN IN
SCIENCE AND ENGINEERING," SYMPOSIUM ON GENDER AND LEADERSHIP**

Hilary Ashe

University of Ottawa, Canada

Type of presentation: Oral session

Abstract:

As a founding member and current President of the International Network of Women Engineers and Scientists (INWES), Monique Frize is a major international player in furthering the progress of women in science and engineering. The first woman to study engineering in Ottawa, Canada, Monique Frize graduated from the University of Ottawa in 1966 with a Bachelor of Applied Science in Electrical Engineering. In 1970, Frize graduated from Imperial College of Science and Technology in London, England with a Master's in Philosophy in Electrical Engineering (Engineering in Medicine). She obtained her doctorate from Erasmus Universiteit in Rotterdam, The Netherlands in 1989. She has been an engineering professor at Carleton University and the University of Ottawa since 1997. In addition to becoming an Officer of the Order of Canada in 1993, Dr. Frize has received countless other honours in the form of awards and honorary doctorates.

This study focuses on Dr. Frize's contributions to the advancement of women in science and engineering as the Northern Telecom/Natural Sciences and Engineering Research Council of Canada (NSERC) Women in Engineering Chair and Chair of the Canadian Committee on Women in Engineering (CCWE) during the years 1989-1994. In this capacity, Dr. Frize's mission extended to elementary and secondary schools, universities, the workplace and the profession itself. Dr. Frize also demonstrated her commitment to her mission by addressing the broader context of issues affecting women and their place in society. Indeed, there were significant developments during her time as the Northern Telecom/NSERC Women in Engineering Chair and Chair of the CCWE, particularly in the university setting. Engineering faculties at Canadian universities started to hire more female professors and implement programs to encourage and welcome women into engineering. Female enrolment in engineering programs in Canada started to increase more rapidly than ever before.

For the most part, this study of Dr. Frize's leadership for women in science and engineering is based on a vast assortment of documents contained in the *Dr. Monique Frize Archives* at the University of Ottawa. These documents include scholarly articles, newspaper articles, promotional publications, speeches, and correspondence. An interview with Dr. Frize helped to synthesize and contextualize the information.

Keywords: Activism, Engineer, Gender, History, Leadership

CV:

Hilary Ashe is pursuing full-time graduate studies in History at the University of Ottawa, with funding from the Social Sciences and Humanities Research Council of Canada (SSHRC). She is set to complete her Master's Degree in September 2008 with a study regarding attitudes towards late-nineteenth-century British imperial governance and colonial administration.

“FROM PAST TO PRESENT - BUILDING INTERNATIONAL LEADERSHIP NETWORKS FOR WOMEN IN SCIENCE AND ENGINEERING,” AS PART OF THE SYMPOSIUM ON GENDER AND LEADERSHIP

Breton Niddery

University of Ottawa, Canada

Type of presentation: Oral session

Abstract:

The ICWES conferences are held roughly every three years, in different locations across the globe and are sponsored by INWES. This paper proposes a historical examination of the ICWES conference series, its origins, organization and structure, as well as of its main themes. The increasing focus on Gender issues will also be addressed. The first conference was held in 1964 in New York City, in the United States. Since then, there have been an additional twelve conferences. These have been held in various countries including the United Kingdom, France, the Ivory Coast, Hungary, Japan and Canada. The fourteenth will be held in July 2008 in Lille, France. Each meeting is held in a different host country and each one has a different theme.

The theme of each conference creates the focus for the technical and sociological papers which are presented at the conferences. Past conferences have covered topics such as the environment, food production, pollution, and health care. Many of the themes and topics discussed at these conferences focus on the idea of working towards a better future and using their work to help people to have more enjoyable, healthier lives. The focus on the future indicates a desire to improve the world through the work done by these women.

The conferences are also increasingly concerned with the challenges women scientists and engineers face in their work environment and beyond, and with the best ways to encourage more women to train and remain in these careers. They also allow women to compare their lives to those of women engineers and scientists working in different countries. This helps to create a global perspective on women in science and engineering. In sum, this paper will show how the ICWES conferences have provided a forum for women in the scientific community throughout the world to meet, to demonstrate how their research is working towards building a brighter future and to encourage other women to join them in their career paths.

This paper will be based on the rich conference archives preserved on the INWES website as well as CD Roms, which have been made for some of the conferences. These sources provide great insights into the main issues outlined above. Secondary sources pertaining to women in engineering and science will provide the historical context for each conference.

Keywords: Women, Gender, History, Organization, Activism

CV:

Breton Niddery is a student at the University of Ottawa, in Ottawa, Canada, working on her Masters degree in History. She has volunteered with her university's Experiential Learning Program as a biography writer of female engineers. Her areas of interest include Gender, Canadian History, and Anthropology.

WOMEN IN STEM LEADERSHIP. WHICH LEADERSHIP ?

Deschênes, Claire

Université Laval

Type of presentation: Oral session

Abstract:

The AFFESTIM (Francophone Association about Women in Sciences, Engineering, Technologies and Mathematics) recently gathered scientific papers for a collective book which pertains to the leadership of the women in STEM. The authors come from various teaching institutions, technological companies, government agencies and associations who are involved on women in STEM issues. Free to choose their subject, while being at the junction of the three elements leadership / women / STEM, we note that the authors covered the subject according to various points of view and very different approaches. Young and less young women, local, national and international levels and sociological, educational, historical even psychological approaches, in short an extremely rich potpourri... A constant, all of them aim at facilitating and at reinforcing the participation of women to the advancement of a just and balanced society through the STEM. We will present this information in a consolidated way.

Keywords: women in STEM, leadership, collective book, AFFESTIM

CV :

Dr. Claire Deschênes is Professor at the Faculty of Science and Engineering at the Université Laval since 1989. She created the LAMH (Laboratoire de Machines Hydrauliques) a Fluid Mechanics Laboratory incorporating facilities for measuring hydraulic turbomachines.

Deschênes was also one of the five Canadian women scientists to be chair of an NSERC Chair for women in Sciences and Engineering from 1997 to 2005. The main objective of the "Chaire CRSNG/Alcan pour les femmes en sciences et génie au Québec" was to encourage the participation of women in Science and Engineering at all levels. She is currently President of AFFESTIM (Association de la francophonie à propos des femmes en Sciences, Technologies, Ingénierie et Mathématiques) and General Secretary of INWES (International Association for Women in Science and Engineering)

TO DEVELOP AND EXERT A LEADERSHIP IN STEM: TO COUNTER THE PERPETUATION OF PRECONCEIVED IDEAS

Lafortune, Louise

Université du Québec à Trois-Rivières

Type of presentation: Oral session

Abstract:

The leadership of women in STEM is a process which exerts its influence on personal, regional and international levels, on economic, political, social and educational aspects. It is developed by individual and collective thinking and is exerted in a spirit of dialogue and in sharing of power. This process falls under a thinking practice where the analysis switches the comprehension of past or present actions and causes adjustments for future actions with the aim to support the accessibility, the quality of work and the perseverance of the women in STEM. This leadership can take various forms such as exerting a trade, being supportive and proactive, denouncing obstacles to the participation of girls and women and to extend this influence beyond the working place up to social and international levels.

Considering the current levelling off of the participation of women and girls in STEM, the leadership will be examined during this communication according to the role of the scientific women (Lafortune and Landry, to appear), to the role of the school personnel (Lafortune, 2006) and to the role of the young people (Lafortune and Solar, 2003) regarding the perpetuation of preconceived ideas, bias and stereotypes.

DEVELOPPER ET EXERCER UN LEADERSHIP DANS LES STIM : CONTRER LA PERPETUATION DES IDEES PRECONÇUES

Lafortune, Louise

Université du Québec à Trois-Rivières

Mots clés : femmes en STIM, leadership, préjugés, stéréotypes

Le leadership des femmes en STIM est un processus qui exerce son influence sur les plans personnel, local et international, économique, politique, social et éducatif. Il se développe par la réflexion individuelle et collective et s'exerce dans un esprit de concertation et de partage du pouvoir. Ce processus s'inscrit dans une pratique réflexive où l'analyse aiguille la compréhension des actions passées ou présentes et suscite des ajustements pour les actions ultérieures et ce dans le but de favoriser l'accessibilité, la qualité du travail et la persévérance des femmes dans les STIM. Ce leadership peut prendre diverses formes qui se résument au fait d'exercer un métier dans les STIM, de poser des gestes de soutien et d'action, de dénoncer ce qui cause des obstacles aux filles et aux femmes et d'étendre cette influence au-delà des frontières de son lieu de travail jusque sur un plan social et international.

Considérant le plafonnement actuel des femmes et des filles en STIM, au cours de cette communication, le leadership sera examiné en fonction du rôle des femmes scientifiques (Lafortune et Landry, à paraître), du rôle des personnels scolaires (Lafortune, 2006) et du rôle des jeunes (Lafortune et Solar, 2003) quant à la perpétuation des idées préconçues, des préjugés et des stéréotypes.

Keywords: women in STEM, leadership, preconceived ideas, bias, stereotypes

CV :

Louise Lafortune Ph.D. est professeure titulaire (didactique des mathématiques) au département des sciences de l'éducation de l'université du Québec à Trois-Rivières. Louise Lafortune a été membre du comité fondateur d'AFFESTIM (2003) et est membre du conseil d'administration de cette association. A propos des femmes en mathématiques, sciences et technologies, elle a codirigé Femmes et mathématique (Remue-Ménages, 1986), Quelles différences? Les femmes et l'enseignement des mathématiques (Remue-Ménages, 1989), Les femmes font des maths (Remue-Ménages, 1992), Des mathématiques autrement (Remue-Ménages, 1994) et Femmes et maths, sciences et techno (PUQ, 2003). Elle a été présidente ou membre du conseil d'administration de MOIFEM (Mouvement international pour les femmes et l'enseignement des mathématiques) de 1986 (année de sa fondation) à 2003 (année de fin de cette association pour s'intégrer à AFFESTIM). Elle est actuellement engagée dans une recherche portant sur la réforme de l'école québécoise : Accompagnement-recherche-formation de la mise en œuvre du Programme de formation de l'école québécoise (MELS-UQTR, 2002-2008).

BREAKING THE CYCLE OF PROGRESS AND RETRENCHMENT

Frize Monique

Carleton University and U. of Ottawa

Type of presentation: Oral session

Abstract:

The rights and position of women in Western countries have improved substantially in the last century, but this is not a linear progression. In certain eras, women's access to education and their ability to participate in the public domain improved, but later returned to previous conditions, with minimal educational opportunities or public role. Along with the gains that women have made in academia and science, a critical mass of women has not been reached in many fields of science and engineering, especially in new areas such as nanotechnology and robotics. The gains made in the enrolment of women in engineering programs in the 1980s and 1990s have been lost in three short years, 2003 to 2006. To break the cycle of advancement and retrenchment, efforts must address all aspects of the problem and reach girls and young women, parents, teachers, and guidance counselors, employers, and the leaders of scientific and professional associations. Outreach programs must be tuned to the teen culture of the time and reach adults who may have influence on the teens. Ensuring course choices are a good fit with the students' interests and abilities and providing networking opportunities for students in lower years to meet older students are key strategies for retention. Long-term structural and cultural changes are necessary to make schools and faculties more hospitable to female students. While the environment has improved, demeaning jokes or comments are still made from time to time by students and professors [1]. Student newspapers are more professional, but inappropriate articles and images occasionally appear. A boot-camp mentality is still displayed during frosh week at some institutions. A recent study on communication styles in engineering classrooms show the male-dominated teams tend to bring out the more traditional gender-linked behaviour in both men and women [1]. The teaching style remains traditional [2]; theory is seldom connected to real life applications and tends to value facts rather than intuition, and the rational rather than emotional expression. Tobias [3] suggests massive restructuring of the curriculum and pedagogy of elementary and secondary school science is needed to improve science literacy. Tobias found some bright women and men stay away from science and engineering programs or leave after attending a few classes; others leave even mid-way through their degree. Retaining this type of student could bring positive changes to the culture and make the environment friendlier for everyone. Large classes are usually taught with traditional lectures in large halls, so it is not easy to apply small group self-learning methods. Rosser [4] describes several ways to create a more 'women friendly culture', arguing that these changes will also benefit male students. Attracting more women into graduate programs and hiring more women faculty will have a positive impact. Moody [5] presents some of the frequent myths and easy excuses used to avoid hiring new faculty from under-represented groups; she recommends nineteen practices for university presidents, provosts, deans, and departments; she also offers advice for academic search committees such as avoiding biased decision-making and snap judgments, seizing pretexts; downgrading the institutions from which candidates obtained their degree [5]. It is frequent to hear, in male-dominated departments, a comment such as: "We cannot lower our standards." This suggests that hiring a woman or a person from a visible minority will do this. However, the bar is often raised for these candidates when compared to expectations from candidates from the majority group. Criteria for judging achievement, which affects hiring, tenure, promotion and the awarding of Research Chairs must reflect the quality of publications instead of their number. Universities must also create policies that allow young faculty members — female and male — to balance family and career and looking at the *potential* of candidates versus what they have accomplished by the time of the interview. Biases can be reduced through education and sensitisation programs, ensuring a fair gender representation on decision-making committees, and using proactive methods to find qualified women for positions or awards.

In science or engineering workplaces, employers can develop objective hiring criteria, pro-actively seek women applicants, and sensitise selection committees to recognise appropriate questions and illegal ones. Creating opportunities for women to meet and network and a fast track for women identified with management potential, will lead to progress, provide mentors for younger women, and hopefully see an integration of feminine values into the culture. Instituting flexible hours can help reduce staff turnover and thus the cost of hiring and training new people. Parental leave should be available to mothers and fathers with no negative impact on their career. Access to affordable child care is a major factor in retaining young parents in today's workplace and providing visible assignments to people who need to build their self-confidence and credibility is important.

Progress in scientific and professional associations can be monitored by assessing the proportion of women on important committees; receiving awards and prizes; keynote speakers; panelists

on specialty topics and plenary sessions. Deserving women can be found and recognizing their achievements and expertise will provide women a voice. Until we get rid of stereotypes about people's aptitudes and behaviours, it will be impossible to create an atmosphere of respect and trust. The predominantly male view is not the only way to create new knowledge; the diversity of perspective women can bring will undoubtedly be a benefit. Integrating women's values in a way that permeates all aspects of knowledge will have a positive impact. Effecting a change of attitudes and behaviour takes time. Equity is not just an equal number of women and men; it means equal chances of success and career development; a voice at meetings and for a. If more women feel comfortable in choosing these fields, they will achieve economic independence and have more control over their lives. Women must face challenges fearlessly, discover their talents and skills, and believe in themselves. Men and women should be partners and agents of change, each in their own way.

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Keywords: progress, cycles, outreach, workplaces, associations

CV:

DR. MONIQUE FRIZE is an Electrical Engineer with graduate degrees in biomedical engineering. Dr. Frize joined Carleton University, as a Professor in the Department of Systems and Computer Engineering and the University of Ottawa, as a Professor in the School of Information Technology and Engineering, in July 1997. Monique Frize held the Chair for women in engineering and science nationally between 1989 and 1997, and then the Ontario Chair between 1997 and 2002. She has published over 130 papers in journals and international conferences in the fields of medical instrumentation, clinical decision-support systems applied to obstetric and perinatal care, infrared image processing and analysis for medical applications, ethics for bioengineers, and women in engineering and science. Dr. Frize is a Senior Member of IEEE, inducted as a Member of the Canadian Academy of Engineering (1992), Officer of the Order of Canada (1993) and received five Honorary Degrees from Canadian Universities. Monique Frize is a founding member and president of INWES since 2002.

ECONOMICS VS. BIOLOGY IN THE GLOBAL ECONOMY

Pietra RIVOLI

Professor of Finance and International Business, University of Georgetown

Type of presentation : Oral session

Abstract:

Free trade and globalization have delivered for most countries the promised benefits of increased incomes and improved standards of living. What other improvements in the human condition can trade deliver (and not deliver)?

Much recent work in psychology and biology suggests that people value justice and fair play at least as much as they do increased wealth. Can the study of economics be adapted to account for human preferences for fairness and equality? I will discuss the benefits and costs of rapid globalization in the context of recent research.

CV:

Pietra Rivoli holds a PhD in Finance and International Economics from the University of Florida. She teaches finance and international business in the undergraduate, graduate and executive programs at the University of Georgetown. Professor Rivoli has special interests in social justice issues in international business.

Professor Rivoli's recent book, *The Travels of a T-Shirt in the Global Economy*, has been widely acclaimed by both the popular press and the academic community as a pathbreaking study of globalization. Finally, *Travels of a T-Shirt* was recently designated by the American Association of Publishers as the best scholarly book of 2005 in the category of Finance and Economics. Translation are underway into 12 languages.

TECHNICAL BUT NOT VERY... EMPLOYERS' CONSTRUCTIONS OF THE EMPLOYMENT OF HIGHLY QUALIFIED WOMEN IN INFORMATION TECHNOLOGY, ELECTRONICS AND TELECOMMUNICATIONS

Judith GLOVER

Professor of employment studies, University of Roehampton

Type of presentation : Oral session

Abstract:

A team of researchers in the School of Business and Social Sciences at Roehampton University has recently carried out research on the recruitment of women to employment in the field of Information Technology, Electronics and Telecommunications (ITEC). We interviewed senior Human Resources personnel and hiring managers in both 'developer' firms, mostly trans national corporations, and 'user' organisations, mostly in the public sector. One theme that emerged from the research was the development of 'hybrid' occupations within ITEC. These occupations were presented by the organisations as the means to encourage women into ITEC because a customer-focused industry requires a mixture of technical and 'soft skills', perhaps particularly in the management of outsourced work. The assumption from the companies was that women have these soft skills and that these hybrid jobs present new opportunities for women. We examine this assumption critically, suggesting that this could be construed as essentialist and stereotypical thinking. We also suggest that these jobs may not necessarily be in women's interests, since they have reduced technical requirements, and may not be therefore be particularly well remunerated. There is a long history in women's employment of jobs that incorporate so-called 'natural' skills that are linked to domesticity; these tend to be poorly remunerated, since these skills are not formally recognised.

CV:

Judith Glover holds a PhD in Sociology from the University of Surrey. She is currently a professor of Employment Studies in the School of Business and Social Sciences at the University of Roehampton. She has research interests in women's employment, with particular reference to women and scientific employment. She is also interested in the relationship between women's domestic circumstances and paid work. She is currently leading a research project on the practices of organizations that are recruiting women to positions in Information Technology, Electronics and Communications. She is also part of a European Commission project led by Newcastle University "Women in Innovation, Science and Technology".

WOMEN'S WORK IN ICTS IN EUROPE: HOW TO EXPLAIN DISPARITIES?

Patricia VENDRAMIN

Project manager, Fondation Travail-Université of Namur

Type of presentation: Oral session

Abstract

Why are there so few women among the professionals of information and communication technology (ICT)? What are the barriers to women choosing and developing careers in ICT professions, and what changes are likely to improve their access and position in this labour market? The presentation will start with a short quantitative overview of existing gender disparities in employment in this field, in Europe. The presentation will be based on a European research (Information Society Technologies, 5th Framework Programme, EU, 2002-2004). The research develops an integrated approach to the different aspects of gender disparity in the ICT professions. It combines explanatory factors linked to education and training, with the conditions of work and employment, and with the technical and professional culture of ICT. Research teams in seven countries (Austria, Belgium, France, Italy, Ireland, Portugal and United Kingdom) have carried out in-depth empirical studies.

CV:

Dr. Vendramin holds a PhD in sociology and master degrees in communication sciences and development studies. She is a project manager at the Work & Technology Research Unit of the Fondation Travail-Université in Namur, Belgium. She is involved in the design and implementation of several research projects on social and economic aspects of new information and communication technology in industries and services. Her main research interests are flexible work practices, women's work, evolving forms of labour relations and social bond at work.

Dr Vendramin is co-author of the European report 'Widening Women's Work in Information and Communication Technology', WWW-ICT (IST-2001-34520), European Commission, July 2004

CHALLENGES TO WOMEN IN SCIENCE

Ben Lakhdar Zohra

President of Tunisian Society of Optics - Faculty of Sciences-University Tunis el Manar-

Type of presentation: Oral session

Abstract:

Knowledge & Technology Development seems for developing countries as a north art!

"Creation, mastery and utilization of modern science and technology" is basically what distinguishes the south from the north (Nobel price Abdus Salam).

Cultural values, perceptions of religious thought differ from north and south Mediterranean countries, differ from one region to another one in Africa,... but there is no doubt that women everywhere are discriminated against and women population is out of science.

We lived in a traditional society of man authority, where women duty is to be married, take care of family, and produce boys?

Is then Science & Technology an "universal man" art?

In this XXIth century, things is changing, there is a need to empower women in every domain and particularly in science (concept of the Millenium Development Goals-MDGs-). Development needs Empowerment of women! It is a decision of man again, a decision from & for money!

Development today is based on globalization, on sustainable development, on a work environment sustained more by networks than by individuals. How will operate women to prove themselves time and again before being assumed to be the equal of men, how they will operate to re-educate and mobilize men and women for a human future?

There are many challenges and obstacles to women over the world:

How to change many centuries behavior? How to change the perception of the power?...

Permanent revolution of mind (of women as well as man) is to develop.

CV :

Prof. Ben Lakhdar was educated at the University of Tunis and the University of Paris VI, from where she obtained her PhD (State Doctorate in Atomic Spectroscopy). She has been Head of Spectroscopy Laboratory, supervisor of postgraduate students for Tunisian DEA Diploma as well as co-chairman of molecular spectroscopy group for Master Degree and PhD courses. Zohra Ben Lakhdar has become the 2005 L'Oreal-UNESCO Award Laureate for Africa for her experiments and models on infrared spectroscopy and its applications to pollution detection and medicine.

Furthermore, Prof. Ben Lakhdar is the author of many scientific papers in physics and mathematics and has been a founding member of the Tunisian Physics Society and a founding member of the Tunisian Astronomy Society. She has contributed to over six university textbooks and has had over twenty technical works published.

Prof. Ben Lakhdar lists among her career objectives; (a) Conducting applied research group to meet the national needs, (b) Helping to improve scientific teaching procedures.

At the University of Tunis, where she has been a professor of physics since 1978, she serves as Director of the Spectroscopy Laboratory and supervises graduate and postgraduate students.

MY DETECTOR IS BIGGER THAN YOURS: BIG SCIENCE, PARTICLE PHYSICS AND WOMEN

Pauline Gagnon

Associate scientist at the Physics Department of Indiana University

Type of presentation : Oral session

Abstract:

At CERN, the European Center for Particle Physics located near Geneva, the construction of the largest ever accelerator, the Large Hadron Collider (LHC) is nearing completion. The first proton-proton collisions are expected this summer, marking the beginning of a new era in particle physics. I will talk about the LHC project and the ATLAS detector, one of four gigantic detectors being built to study the many particles that will come out of these collisions. The hope is to find new but theoretically predicted particles, such as the elusive Higgs boson, needed to explain the mechanism by which matter acquires mass. I will describe the field of particle physics and its main challenges today. More than 2200 scientists coming from 37 different countries participate in the ATLAS experiment. With only 17% women, I will examine the role given to women within the ATLAS collaboration in this male-dominated environment.

CV:

Pauline Gagnon holds a PhD in Physics from the University of California and a M.Sc in Physics from the San Francisco State University. She has been an associate scientist at the Physics Department of the Indiana University and a particle physicist for CERN (European Organization for Nuclear Research) since 1999. Pauline Gagnon is also a member of the ATLAS collaboration that gathers more than 3000 physicists, engineers coming from more than 37 countries around the world. In her spare time she is the editor of ATLAS e-news, the internal paper of ATLAS, since 2005 in which she discusses women activities within the sector. Pauline Gagnon is the author of many publications on Physics and particles.

AT A SNAIL'S PACE – INTEGRATING GENDER ASPECTS INTO CLIMATE CHANGE DEBATES

Ulrike ROEHR

Head of Genanet – Focal point gender, environment, sustainability

Type of presentation: Oral session

Abstract

It is undisputed in research and policy making that climate change will hit those, who contributed least to the problem, most. It is the poorest regions of the world, and the most impoverished social groups who will suffer most. It is also well known that a majority of the world's poor are women and that they are especially vulnerable due to cultural, religious and economic factors.

Nevertheless, there is little consideration of gender aspects in the area of adaptation to climate change. This holds true for research as well as for political debates. Climate protection and climate change have been rarely addressed as discrete topics from a gender perspective, and is most significantly absent in international climate negotiations and regional or national measures to prevent climate change and its implications, and undertake the necessary adaptation measures. Only recently some adaptation plans and measures started to incorporate gender, for example in vulnerability assessments.

Regarding mitigation of climate change, gender disaggregated data concerning CO₂ emissions and gendered impacts of measures to reduce these emissions are lacking. Nevertheless, there is a certain amount of data which point to differences in carbon emissions between the sexes, and lead to the assumption that the priorities of women in climate protection may be different from those of men.

The implications of the gender-blind approach to climate change, recommendations to increase women's participation, and strategies for mainstreaming gender into climate change policies will be explicated in the presentation.

CV:

Ulrike Roehr is a engineer and sociologist by background, is head of genanet – focal point gender, environment, sustainability which is aiming to support gender mainstreaming in environmental policy by providing information, organising a network of gender & environment experts, advising environment organisations, carrying out studies and developing statements. genanet is part of the German women's organisation LIFE, seated in Berlin.

Ulrike Roehr has been working on gender issues in planning, Local Agenda 21, environment, and especially in energy and climate policy for many years. In recent years she was committed to mainstream gender into climate policy on local and national levels as well as into the UN climate change debates, and to strengthen women's involvement in the negotiations. Recently she carried out a research review on gender and climate change on behalf of the FAO (Food and Agriculture Organisation of the United Nations, in cooperation with Dr. Minu Hemmati) and is coordinating the international network *gendercc – women for climate justice*.

THE FEMINISATION OF SCIENTIFIC AND TECHNICAL PROFESSIONS: AN ISSUE FOR THE EVOLUTION OF GENDER RELATIONS IN CONTEMPORARY SOCIETIES?

Nicky LE FEUVRE

Professor of Sociology, Université de Toulouse-Le Mirail
Pôle SAGESSE du CERTOP-CNRS (UMR 5044)

Type of presentation: Oral session

Abstract

Given the systematic under-representation of women in scientific and technical occupations across a wide range of national contexts, it is tempting to conclude that the mechanisms which produce this phenomenon must be identical over time and space. In this paper, I will argue that the feminisation of these occupational groups does not necessarily follow a universal model. This process can be achieved through several distinct mechanisms, which may have varying effects on the material and symbolic foundations of the gender relations as a whole.

I will unravel some of the issues at stake in the feminisation process of scientific and technical occupations on the basis of my joint contributions to two recent books on gendered careers in academia (Latour and Le Feuvre 2006; Le Feuvre and Latour 2007) and on research carried out previously on the feminisation of other higher level occupations, including medicine, pharmacy, banking and law (Crompton and Le Feuvre 2003; Lapeyre and Le Feuvre 2005; Le Feuvre 2001; Le Feuvre and Lapeyre 2005).

The paper will analyse the ways in which women's under-representation in scientific occupations has been analysed by sociologists from different theoretical perspectives. This literature review will then enable me to identify the mechanisms that determine women's access to various echelons of scientific and technical occupations in different national contexts. Historical and cross-national variation in the rates of women's access to the most prestigious professional positions within scientific occupations thus leads us to question the impact of societal level "gender arrangements" on women's scientific careers and to analyse the reciprocal effects of the feminisation of scientific and technical occupations on macrolevel gender arrangements.

Is it possible to conclude that the field of science and technology is historically and crossnationally "gendered" in a universal way or do we need to work from the hypothesis that specific social mechanisms operate in different historical and/or national contexts?

In order to elaborate effective policies to attract more women into scientific and technical occupations, and/or to improve the effectiveness of existing measures, I would suggest that it is necessary to more fully understand the precise mechanisms that under-pin the feminisation process in specific national and professional contexts. It is also important to clearly define the model of feminisation that we want to promote, since each of the feminisation processes outlined in this paper has potentially contrasting effects on the degree to which existing gender relations are reproduced, reconfigured or transformed by an increase in women's access to the production and dissemination of "science" in a global perspective.

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CV:

Nicky Le Feuvre was born in the UK and is Professor in gender studies at the Université de Toulouse-Le Mirail, France where she runs a postgraduate course in "Gender and Social Policy". She is Director of the Simone-Sagesse Gender Research Centre that runs and coordinates a series of undergraduate and postgraduate courses in gender studies.

She is also a member of the board of the French National Women's Studies Association (ANEF) and belongs to the Helsinki Group on "Women and Sciences".

Professor Le Feuvre has published a number of books, chapters and articles on women's employment patterns in Europe, the feminisation of the professions, the social policy aspects of gender relations and so on.

IT'S NOT ONLY CATS THAT HAVE NINE LIVES

Diane RIOPEL

Professor of Logistics, Ecole Polytechnique of Montreal

Type of presentation: Oral session

Abstract

The reverse logistics consists of the organization of all any stages of a returned product at different times of its life and how a product can restart again a new life. The reverse logistics may be considered by someone a burden but by others it is a way to gain added value. I will be presenting different research works actually done in industrial engineering and some requests from industrial engineers asked to other specialities. I will talk about a list of contributions that we can work on and some tasks to innovate. How can we calling out as responsible actors of our society?

CV:

Dr. Diane Riopel is a professor of Logistics in the Department of Mathematics and Industrial Engineering at the Ecole Polytechnique of Montreal, Canada. She holds a PhD in industrial engineering from the Ecole Centrale de Paris, France, and is also a member of the "Chaire Marianne-Mareschal" that promotes engineering study for women. She has special interests in the area of facility layout, material handling, warehousing and logistics.

Her articles have appeared in the international Journal of Production Economics, the International Journal of Engineering design and Automation, INFOR and other journals.

WEBSITE COLOUR IN THE FUTURE OF THE INTERNET

Evelyn Ngwu, Lizette de Wet, and Pieter Blignaut

University of FreeState, Bloemfontein, South Africa

Type of presentation: Oral session

Abstract

Internet is a complex electronic network capable of fulfilling the vision of interactive computing. In this era of globalization, the internet which is also the powerful communication medium has emerged as a global platform for information and knowledge distribution. Means of capturing the globally distributed information and knowledge by the intended vast population poses a challenge to the service providers and web users. Currently, a lot of work in the area of internet communication is being executed; growths of bandwidth and internet integration revolution have also a wide coverage. There is dearth of information on the role of colour which is a powerful communication tool that holds significant benefits for the efficient and effective usability of the internet. There is an extensive internet user population which requires a friendly view of the web.

This study provides information on the usability assessment of interfaces specifically the use of colour as a web usability factor. This paper highlights unequivocal role of colour that must be put in place to avoid inaccessibility of the information and knowledge distributed via the internet. Details of the involvement of colour in web design and web usability are extensively covered in the text.

This paper covers an aspect of a larger research work conducted in Bloemfontein South Africa evaluating colour impact on web usability.

The methodology employed involves eye tracking technology and survey. The instruments include usability testing with Tobii eye tracker and retrospective interview. Data collected was qualitatively and quantitatively analysed. The various analyses performed are frequencies, T-test, ANOVA, chi square, heat map, gaze plot, fixation and observation count using SAS 2004 package, Tobii studio, Statistica, and Excel.

Keywords: Globalization, Internet, electronic network, interactive computing, framework, usability, colour, Website, medium, communication

CV:

I am a married woman with children. I am a black African woman from the tribe where women are rarely recognised and where the general belief is that a woman's education ends in the kitchen.

I have obtained a Bachelor of Engineering degree in Computer Engineering B. Eng.

I also obtained a post graduate degree in Computer Information Systems BSc. Hons. Info Sys.

I am currently a Masters student in Computer science and informatics department University of Free State Bloemfontein South Africa.

I was born on 22nd November 1970.

A MASSIVELY PARALLEL FINGERPRINT RECOGNITION SYSTEM FOR PERFORMING MULTI MILLION MATCHES PER SECOND

Fozia noor , Dr. Shoab A. Khan, Huma Afzal janjua
Center for Advanced Studies in Engineering

Type of presentation: Oral session

Abstract

Accurate automatic personal identification is critical in a variety of applications in our electronically interconnected society. Necessitate in personal identification system has increased many folds due to security concerns at national and international level. Biometrics is being increasingly implemented to provide positive identification with a high degree of confidence. Among all the biometric techniques, fingerprint-based identification systems have received the most consideration because of the long history of fingerprints and their extensive use in forensics.

Large volumes of fingerprints are collected and stored everyday in a wide range of applications like access control, driver license registration etc. An automatic recognition of people based on fingerprints requires that the input fingerprint be matched with a large number of fingerprints in a database. Thus the need is of scalable fingerprints system which can support a large and ever growing database with reliability& accuracy. This paper presents a FPGAs-based Fingerprint Recognition System. The system is scaleable and can be upgraded for even higher throughput. The complete system is a software/hardware distributed modular and scalable design enabling the user to support a large and ever growing database. Part of the application software runs on cluster PCs and the computationally intensive modules are implemented on FPGAs. The HW of the project is developed an FPGA-based system. This FPGA-based design is the most critical module of the overall system and performs multi million matches per second. The algorithms and architecture of this system is able to be used in variety of other fingerprint applications independently.

There are several algorithms available to simulate for evaluating accuracy and hardware affinity, but one we have used is based on minutiae extraction technique. In this technique, measurement space (feature) extraction process is the first step in the Identification process. It takes the input fingerprint gray-level image and extracts the features. A critical step in automatic fingerprint matching is to extract from the input fingerprint images. However, the performance of a minutiae extraction algorithm relies heavily on the quality of the input fingerprint images. In order to ensure that the performance of the system is robust with respect to the quality of the fingerprint images, fingerprint enhancement algorithm is integrated in the minutiae extraction module. This module is developed in software and runs on the host processor.

The fingerprint enhancement algorithm consists of four main stages:

- a. Normalization
- b. Orientation estimation
- c. Ridge frequency estimation
- d. Gabor filtering

Authentication system needs two steps: enrollment and verification. For a fingerprint authentication system, the enrollment steps consist of the user submitting multiple fingerprint image samples to the system. Each fingerprint image sample is processed and features are extracted. Then the features collection set is analyzed and combined into a single generalized features collection, which is written to the database. This way, the enrolled features become are more reliable and the fingerprint recognition quality considerably increases. Once a user has been enrolled in the system, verification of the user can take place. This involves the user submitting a fingerprint image sample to be compared with the enrolled sample. If the newly submitted image sample matches the stored template, the user is accepted. Otherwise, the user is rejected. The matching algorithm has been implemented in hardware and run on FPGA.

There are four basic error rates employed in fingerprint authentication systems:

1. False Accept Rate (FAR);
2. False Reject Rate (FRR);
3. Equal Error Rate (EER);
4. Failure to Enroll Rate (FER).

The FAR represents the probability that a false match occurs. For example, an unauthorized user is mistakenly² accepted as an authorized user by the system. Its complement is the FRR, which represents the probability that a false rejection occurs; for example, an authorized user is erroneously mistaken for an unauthorized user. In a given system, only a handful of security settings available, but the error rates from an infinite number of these settings are interpolated to form a continuous FAR/FRR trade-off curve.

The trade-off curve associated with fingerprint authentication systems is known as a Receiver Operating Characteristics (ROC) curve. The ROC curve plots the FAR against the FRR. It can be generated by obtaining FAR and FRR data points under many different security settings on a given system.

The FAR and FRR for the system this paper presents is in the following ranges:

FAR (False Acceptance Rate) = 0.001% ~0.5%

FRR (False Rejection Rate) = 0.005% ~0.5%

The point in the ROC curve where FRR=FAR is the EER (Equal Error Rate). For our system, the EER is 0.5%.

For a system used in airports for identification and registration of passengers, in creating a national database to be used in a host of applications like forensics, driver licenses etc. A software solution will simply fail to execute the computationally intensive task. It requires specialized hardware like we present in this paper to be designed to meet the specifications.

Keywords: Fingerprints recognition, FPGA, minutiae extraction algorithm, authentication systems.

A GENERAL FRAMEWORK FOR ANALYZING NATURE-INSPIRED ROUTING PROTOCOLS

Saira Zahid¹ Muhammad Shahzad² Muddassar Farooq³

College of Electrical and Mechanical Engineering, National University of Sciences and Technology, Rawalpindi, Pakistan^{1,2} Next Generation Intelligent Networks Research Center (NeXGIN-RC), NUCES, Islamabad, Pakistan³

Abstract

Nature-inspired routing protocols have received a significant amount of attention by researchers in Nature-inspired Computing because they provide efficient, scalable, robust, fault-tolerant, dynamic, decentralized and distributed solutions to the traffic engineering within the existing connectionless model of IP. The objectives are achieved through a population of agents, inspired by Natural colony systems i.e ant or bee colony, which have simple learning behavior. As a result, such robust agent based systems can be easily embedded in real world networks because they do not require additional hardware or software resources for their deployment in real world networks. *AntNet*, *BeeHive* and *DGA* are considered to be state-of-the-art routing algorithms for fixed packet switched networks. Researchers in the community follow a well known engineering philosophy: inspire, abstract, design, develop and validate. As a consequence, the protocols are designed on the basis of heuristics and then their performance is evaluated in a network simulator. To the best of our knowledge, virtually no attention has been paid in developing a formal framework that provides an analytical insight into the behavior and performance of such algorithms. This lack of formal treatment of Nature-inspired routing protocols is often criticized in the networking community. In this paper we present a preliminary version of an analytical framework for a Nature-inspired routing protocol, *BeeHive*. A great achievement of this work is that the experimental results found on the basis of this framework are very close to those observed by network simulations. We believe that this work will be instrumental in instigating research on the preparation of comprehensive formal frameworks for Nature-inspired routing protocols and consequently playing its part in the deployment of these protocols on a bigger scale in the real word telecommunication.

Keywords: Nature-inspired computing, routing protocols, formal framework, BeeHive

CV

Saira Zahid is a student of electrical engineering from Pakistan, and an active researcher in the field of nature inspired computing. She has presented a number of research papers in international and national level conferences, including one in IEEE CEC conference singapore 2006 which was short listed for one of the best papers in the conference. She is an active member of WIE IEEE society. She is also an active member of her university's professionals club. Her academic excellence is obvious from her examination record throughout, specially her 2nd position at higher secondary level among 50,000 students in Pakistan. Her personal interests lie in cooking and novel reading. As she belongs to a developing country where women are often deprived of the basic rights she sees ICWES conference as a inspiring platform for women to present their intellectual capabilities and research work. She aims to move another step forward in her life by attending this conference and being a part of this interactive learning experience.

ADVANCED VISUALIZATION AND SIMULATION – AN EMERGING SCIENTIFIC LANGUAGE AND ENGINEERING TOOL FOR TRAFFIC SAFETY PROBLEMS SOLVING IN INFRASTRUCTURE DESIGN

Lidia Zakowska.

Abstract:

The work presents new fascinating perspectives of advanced visualization and simulation in science and technology. This emerging scientific language and engineering tool is becoming a key solution for multi-disciplinary problems in engineering design, especially those involving user behavior, safety and life quality aspects.

It has been well documented that graphics is the only intercultural, universal language of engineers. Visualization was underestimated as a problem solving tool by now, even when technical drawings and drafting were studied for long semesters and the skill of accurate and detailed drawing were assumed as the most important engineering skills. An engineering world has changed dramatically, when time-consuming hand drawings gave way to computer drafting, three-dimensional visualization and simulation. Numerous advanced graphical software are being used in the process of engineering design education and practice. Modern visualization and simulation is becoming a scientific tool, especially in engineering design process which looks for environmental and user-friendly solutions.

One of the most promising applications of advanced visualization and simulation appears in traffic safety problems solving in infrastructure design. Highway engineers could not fully manage the safety and mobility issues after mathematical considerations, while over one million people dies on our planet every year as victims of traffic accidents. The consideration of infrastructure design must involve the behavior of road users, especially drivers. The traditional, existing since 1930th design practice and design criteria are based on mathematical models, which are not satisfactory in current traffic and mobility situation. By now it was no verification instrument for the safety behavior on new designed road, other than accident rates observed after the construction is built. Today the problem is being solved using driving simulation and virtual reality environment, in which drivers safe behavior can be validated in the scientific way, without any risk to life. The state of the art of advanced visualization and simulation, this emerging applied science, together with its potential power in solving life quality problems inbuilt into engineering projects are shown in this presentation. Some examples of the research works involving simulation in highway safety evaluation are also presented and visualized.

DIP BASED INTELLIGENT TRAFFIC SIGNAL CONTROLLING SYSTEM

Huma Afzal Janjua, Fozia Noor, Dr Shoab A. Khan.

CASE, Center for Advanced Studies in Engineering, Islamabad, Pakistan.

Type of presentation: Oral session

Abstract:

Suggested system is cost effective and efficiently designed to minimize wait time and to facilitate smooth traffic flow in a metropolitan traffic network. Proposed system installs cameras to take pictures of roads when traffic lights turn red. Using image processing techniques system estimates number of cars waiting for red light to turn green. Based on density of cars it suggests timing for green signal to remain on. Further to this it communicates traffic density to rest of the crossings on the main road in the direction of flow of traffic. Next signal takes input from previous signal, estimates time for the first car to reach that signal and also calculates the entire time for entire density to reach that signal.

In a typical metropolitan network small roads are also networked into the main road. It is always desirable to deviate the traffic to small roads when traffic density is high. The proposed system suggests a network approach to solve the problem. Cameras are installed in a network environment.

Image captured on the signals is digitally processed, as digital image processing allows use of much more complex algorithms for image processing, therefore offering efficient performance at simple tasks and efficient implementation of required methods.

Once the images are captured by the cameras, the data (pictures) are fed into the system. Once some data is fed into the database the system is initiated and advance operations start. First step is catering for every single detail in the image that may effect the working of the system. Issue is to determine the number of the cars in the image taken. it is imaginable that a single car be identified as two or more cars or the case may be reversed due to distorted light reflection of different parts of the same car at day time. System performs certain steps to improve the image for further processing including background extraction and noise removal that is done by subtraction of original image from background.

Next step is getting binarised image, i.e. an image where each pixel assumes one of two values, on and off. This image can be stored as a logical array of 0's and 1's. As the work environment is Matlab, so image conversion to binary image is easy. Once grey scale image is obtained, the intensity image is converted into pure binary image. This binary image is important as it gives 1's where there are edges and 0's elsewhere. Generally Canny method of edge detection are used for such results, so does this system. Finally we get image with edges defined such that strong as well as true weak edges(weak edges that are connected to strong edges) give true pencil outline sketch of cars.

Noise is always un-required, especially in digital image processing. Digital images are prone to a variety of types of noise. In our case we have used Gaussian filter to create a low-pass result where the low frequencies are preserved.

Real time traffic density calculation determines the traffic control decision, hence the system requires close approximation to the actual scenario. Once ensured that the image taken has been sufficiently enhanced and edited to meet the system's requirements, the next step is to extract the number of vehicles. This extraction involves division of road according to pre-defined contoured grid spacing. Typically, traffic pattern on road is not uniform in terms of geometric standards. Different sizes of vehicles are so dealt that one polygon is assigned to one normal sized vehicle and for bigger vehicles more than one polygon are assigned accordingly. By traversing the grid horizontally and vertically, vehicles are detected this gives an approximation of the traffic density.

Certain threshold is considered for the signal to change its wait time to turn red. i.e. if traffic density exceeds a certain level only then intelligent traffic control lights respond. Similarly the data is transferred accordingly to the signal at next crossing. Next crossing signal is acting as a network node, to which data is transferred from the previous node. So two types of information is being used to determine the time duration for green light to remain on. First is the traffic density calculated at that signal when red light is on, *signal_density*, and the other is the density value received from the previous signal, *signal_density_recieved*. Once the *signal_density* is greater than *thres_denisty*, *timer_green* will be increased. Similarly timer for green light will be increased once *signal_density_recieved* is true.

Traffic flow and control is a serious issue with growing number of road users and the limited resources provided by current infrastructure. The suggested system is cost effective and aims to fight hazardous traffic complaints. The implementation and testing on software has proved that responsiveness of the software at various levels and conditions is equally efficient. The basic conditions were night time and day time responsiveness. For both conditions the overall outcome remained unaffected.

Keywords: Digital Image Processing, Binary Image, Edge Detection.

CV:

Huma Afzal Janjua is married with one daughter and is presently student of PHD. She has done software engineering and MS in Computer Engineering from CASE, Islamabad. Got Talented student award from CASE in 2005. Assisted Dr. Shoab A. Khan (Renowned Educationist and Scientist, Winner of NCR award of Excellence) in Advanced Digital Signal Processing course. Abstract accepted and author presented paper in ICWES13, Seoul Korea.

EMERGING TRENDS IN ICT INDUSTRY: A MOBILE SOFTWARE AGENT PERSPECTIVE

Divina Melomey, Godfried Williams and Chris Imafidon

School of Computing and Technology, Docklands Campus, University of East London

Type of presentation: Oral session

Abstract:

The emergence of Information Communication Technology (ICT) has steadily innovated itself over the years through information and process control concepts, methodologies and applications. ICT is popularly defined as a means of capturing, electronically storing processed information and digitally communicating this information. ICT therefore is an embodiment of the concept of storing, manipulating, retrieving and transmitting data digitally. These technology put together is used by businesses, organizations and individuals to enhance productivity and promote innovations. Usage of ICT has been classified differently by different authors in the area of functional features, business applications and many more. Industries has continually used emerging digital technologies as a tool to unlock large storage of information which are accessible to all including persons with disabilities whose access to information is dependent on good user interface design and adequate access to technologies. Recent specialised ICT tools like the groupware, knowledge management and inter-organizational systems have provided a platform for innovation and creativity in all fields. Over all ICT has been used as an indispensable tool for directing and expressing creativity.

The goal of every industrial sector in both developed and developing economies is to use ICT to boost it productivity in its industry. This has given rise to new areas of study such as e-government, e-learning, e-banking and e-health. This drives innovation and an added benefit of cutting costs and creating new opportunities and improved efficiencies in governance and for development of various industrial sectors of the economy. This is achievable when the industrial manpower at all levels are trained thus acquiring new skill that will reflect the changing needs of the current trends and hence leading to a sustainable development in the industry.

The use of technologies that provides flexibility to work from home is a challenge that needs to be addressed. To achieve this state of working away from office organizations must invest in technology that enable remote access to work. These sophisticated technology ranges from mobile devices and software that provide accessibility to files, data and other corporate information in the organization. Hence, this calls for the design and implementation of software that enable mobility at the work place. This idea of working remotely draws on concepts and principles that underpin distributed systems architecture. In distributed systems architecture, systems and components are geographically distributed but working as one unit y. This work proposes and exploits strategies in designing such solutions. The strategies and tools that we propose in this work is the use of mobile software agents. Mobile software agent can be described as an autonomous agent that has the ability to migrate from one platform to the other characterized by persistency, robustness, security for its migration and fault tolerance. An autonomous agent is a software agent or program which perform task on behalf of the user without the users' intervention, in this case the employees' access to work. The initial investments into this kind of technology though quite costly, its long term benefits to the organization cannot be underestimated. It engages the knowledge and expertise of the employees or workforce who for reasons of immobility, disability, age related issues, childcare issues, paternity and maternity issues cannot make it to the workplace but are happy to work remotely to save cost improve efficiency and automate tasks in most organizations.

The technological solution will exploit distributed systems architecture as a backbone for remote working with the employee optimizing utilities made available via mobile software agent.

Keywords: Information Communication Technology (ICT), Mobile Software Agent, Remote working, Technology

CV:

Divina A. Melomey is a final year PhD student with University of East London, UK. Her research focuses on developing a methodology for modelling mobility in Agent Systems with specific interest in mobile agent as a tool for delivery. She received her MSc in Computer Systems Engineering from University of East London, UK. Her research on modelling mobility in agent systems has led her to give talks and presentations in both conferences and seminars she had attended. She is a tutor in the area of Distributed Systems and Artificial Intelligence with the University of East London. Contact her at School of computing and Technology, Docklands Campus, 4-6 University Way, London, E16 2RD, UK ; divina@uel.ac.uk.

EVALUATION VIDEO TRANSMISSION USING MYEVALVID RTP TOOL IN NETWORK SIMULATOR NS2

Authors: Sabina Glumcevic, Samra Mujacic, Suad Kasapovic

University of Tuzla, Bosnia and Herzegovina

Type of presentation: oral session

Abstract:

To develop an evaluation tool-set which go toward more realistic simulation is always an important topic in video transmission over network. This paper describes multimedia video file transmission using Cygwin program (Cygwin is an environment which provides common unix/linux functionality on a windows host system), network simulator ns2 program and an evaluation tool-set which go toward more realistic simulation and provides real-time network performance implementation-My EvalVid RTP. The simulation is the most accessible and productive way to appreciate efficiency of a network on the stage of its designing and network simulator ns2 is the most popular effective and extensible simulation tool targeted at networking research and educational use. This tool-set can evaluate not only the video delivered quality but also the voice delivered quality.

While we have considerable confidence in ns, ns is not a polished and finished product, but the result of an on-going effort of research and development. In particular, bugs in the software are still being discovered and corrected. Users of ns are responsible for verifying for themselves that their simulations are not invalidated by bugs.

EvalVid is a framework and tool-set for evaluation of the quality of video transmitted over a real or simulated communication network. It is targeted for researchers who want to evaluate their network designs or setups in terms of user perceived video quality. Besides measuring QoS parameters of the underlying network, like loss rates, delays, and jitter, a subjective video quality evaluation of the received video is provided. Currently H.264, MPEG-4 and H.263 are supported.

To integrate Evalvid into NS2 one need to do some modifications of original ns2 files. We combine NS2 with VLC and RTPtools to develop another tool-set which can evaluate the performance of video transmission.

We can use MPEG video files available from network to be input source. When we want to evaluate the performance of video transmission by this new tool-set, we first stream MPEG video file by VLC and extract the information of the video file to obtain the traffic trace file by RTPdump and other program. After obtaining the traffic trace file, we evaluate the performance of the proposed mechanism by using the traffic trace file in NS2 environment. When finishing simulation, we can obtain two trace files: sender trace file and receiver trace file. Next, we can use ET program to analyze sender trace file and receiver trace file to obtain network-level performance metric, such as throughput, delay and delay jitter and so on. In addition, we also can obtain the distorted MPEG video file through RTPplay and VLC. Finally, we can evaluate the end-to-end video quality by MOS.

We take two scenarios, one is for wired networks and the other is for wireless networks, made analysis, and get next conclusions:

1. installation of cygwin doesn't work correctly at PC as part of LAN (host)
2. simulation results for different wired network conditions, bottleneck link:
 - a. throughput depends of bandwidth, almost linear increase
 - b. streaming time doesn't effect to file delay
 - c. delay jitter doesn't depend of streaming time
 - d. quality of transmitted video file depends of bandwidth, for low bandwidth there is distortion of video and voice
3. simulation results for wireless networks, different packet error rate:
 - a. throughput depends of packet error rate, almost linear decrease
 - b. streaming time doesn't effect to file delay
 - c. delay jitter doesn't depend of streaming time
 - d. streaming time doesn't effect to throughput

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Keywords: cygwin, ns2, MyEvalVidRTP

CV:

I am a postgraduate student at University of Tuzla, Faculty of Electrical Engineering, Communications Department.

THE CHANGING WORLD OF PROGRAMMABLE LOGIC

Carol Marsh

Institute for System Level Integration (iSLI), Alba Centre, Alba Campus

Type of presentation: Oral session

Abstract

This paper examines the progress of digital programmable logic since the late 1970s.

Introduction

I started working in the electronics industry in the mid 1980s as a Printed Circuit Board (PCB) designer using fixed-function discrete through hole components such as the 74LS00, quad 2-input NAND gate, see Figure 1. The standard board size then was 8" x 8".

Over the past 25 years, PCBs sizes have shrunk, they now contain surface mount components and more importantly, the discrete components have been replaced with programmable devices, which I began using in 1990. In this paper I have decided to take a nostalgic look back at the introduction and development of programmable devices.



Figure 1 – 74LS00

PLD

Programmable Logic Devices (PLD) were the first programmable devices to be developed in the late 1970s. They were initially one time programmable and there are several variants:-

1. Programmable Array Logic (PAL)
This was the first type of PLD to be developed. It was developed by Monolithic Memories Incorporated (MMI). The PAL has a fuse programmable AND array and a fixed OR array.
2. Programmable Read Only Memory (PROM)
The PROM has a programmable OR array and a fixed AND array.
3. Programmable Logic Array (PLA)
The PLA was developed by Signetics Corporation. It is the most versatile type of PLD because it has a programmable AND array and a programmable OR array.

PLDs can replace up to 10 fixed-function discrete components and languages such as ABEL, CUPL and PALASAM were developed to program the PLDs.

As PLDs progressed registered outputs were added to the devices and they became reprogrammable:- Erasable PLD (EPLD) developed by Altera in 1984, the Electrically Erasable PLD (EEPDL) and finally the Electrically Erasable General Array Logic (GAL) which is manufactured by Lattice Semiconductors. Although there are many different types of PLDs they are all limited by the rigidity of the AND/OR plane and only have densities of up to a few hundred gates. This led to the development of Complex PLDs (CPLD) and Field Programmable Gate Arrays (FPGA).

CPLD

Complex Programmable Logic Devices (CPLD) are basically multiply PLDs in the one package connected together via a switch matrix. Altera, with their MAX5000 devices, was the first company to introduce CPLDs in the late 1980s. Their largest device at that time was the EPM5192, which contained 192 macro cells. Altera stated that the EPM5192 could replace up to 120 discrete components or 24 PLDs. It was also the first device to be available in quad flat pack, see Figure 2.

Altera still sell CPLDs today, along with Xilinx and Lattice Semiconductors. There are several voltage and power variants available, however, the largest device is only 512 macro cells.

CPLDs are very fast, non-volatile, reprogrammable devices, with predictable propagation delays. As such, they are still popular today and can be used to hold boot/FPGA configurations code.

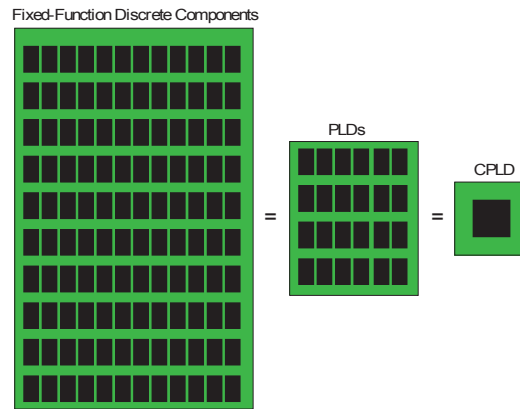


Figure 2 – CPLD Equivalent Circuits

FPGA

Field Programmable Gate Arrays (FPGA), were also introduced in the mid 1980s, however, they did not become popular until the early 1990s. FPGAs have a flexible interconnect technology and the fixed AND/OR plane of the PLD has been replaced by an array of logical building blocks. FPGAs are more flexible than CPLDs and are much larger; however, their main disadvantage due to their routing structure is unpredictable propagation delays, throughout the device.

The original FPGAs had densities of between 2000 and 40000 gates and were sold as glue logic devices, i.e. they were marketed as replacements for discrete components and PLDs. There were 2 main FPGA vendors, at that time: Xilinx who produce volatile, reprogrammable SRAM FPGAs and Actel who produce one-time fuse programmable FPGAs, which were popular with the defense sector. Xilinx remains the largest vendor of FPGAs, closely followed by the Altera SRAM FPGAs. Actel has added FLASH FPGA to its range and Lattice also sells SRAM/FLASH FPGAs.

The original FPGAs were designed using schematic capture, but, as the density of the FPGAs grew, this method was no longer viable, therefore, two Hardware Description Languages (HDL) were developed, Verilog and VHDL (Very High Speed Integrated Circuit HDL). Verilog is used more widely in the US and VHDL in the UK.

FPGAs today are massive in comparison to the earlier devices. Both Xilinx' Virtex 5 and Altera Stratix III contain over 330, 000 logic cells. FPGAs now contain, memory blocks, multipliers, DSP Blocks, Digital Clock Managers (DCM), PowerPCs, soft processors, like Xilinx' microblazes and Altera's NIOS and transceivers. In fact complete systems can now be built on a single FPGA. An ironic fact is that fixed function logic blocks such as UARTs, PCI Interfaces, Ethernet Interfaces and Security cores are now sold for implementation on FPGAs. These are called IP Cores.

Summary

When FPGAs were first introduced, there were big debates as to their usefulness. On the plus side, they were programmable and could replace multiple discrete components and PLDs and thus reduce board area. On the negative side not only were the devices themselves expensive, but so were their development tools. Because FPGAs were small, the PCB designer would select and design the FPGA as part of the PCB design. Now, FPGAs are so complex that they are designed, by not just one FPGA designer but by a team of FPGA designers.

References

CV:

Carol Marsh is an Engineering Doctorate student at the Institute of System Level Integration in Scotland on a project sponsored by Algotronix Ltd. Her area of research is investigating novel technologies to protect IP cores.

Prior to the EngD, Carol worked for over 20 years as a Digital Design Engineer and in the last 10 years as a Principal FPGA Engineer at BAE Systems.

Carol was announced as the Student Engineer of the Year at the Elektra European Electronics Industry Awards held in London on the 12 December 2007.

GREEN IT FOR SMES

Margaret Ross, Geoff Staples, Pete Bayley

Southampton Solent University and British Computer Society

Type of presentation: Oral session

Abstract:

The paper will discuss the needs for all SME's to consider greening issues, particularly relating to the use of computers. With the growth of the Internet as a means of communication, almost all SMEs need to use computers, whether as stand-alone for clerical purposes or using e-mail and the Internet. It has been recorded that the carbon footprint for computer usage equals or exceeds that for the aircraft industry. Although SMEs are not normally heavy users of computers, compared with major organisations, the SMEs could benefit from considering the Greening issue.

The Business Case for SMEs is based on four major benefits - the pressure from their customers to be able to justify and prove their carbon footprint and green credentials; their ability to reduce their carbon footprint and also their costs by careful choice of purchases and practices; the reduced cost from savings on power, time and transport; and the enhanced reputation of the SME.

The first step on the journey to effective Greening would be raising awareness. The management must be convinced that it is advisable for one senior member to be the "champion" of the Greening Policies and practice. The member of the company responsible for computing should be encouraged to read the latest reports, many freely available from the Internet, and always consider the greener options, many of which are just slight changes of practices. It is necessary to raise the awareness of all staff, and the changes in their practice can provide useful savings for the SMEs. Various researches have been undertaken to show that the same staff have different behaviour patterns, such as 92% of employees switch off their lights when they leave home, but only 66% do so at work; and 85% of people switch off their PCs at home, but only 55% do so at the end of the day or during their lunch breaks at work. (www.uk.logicalis.com/news/green_it_survey.asp)

It would be beneficial for the relevant management and IT staff to be aware of the appropriate sources of information such as the Carbon Trust (<http://www.carbontrust.co.uk/energy/assessyourorganisation>), the Energy Star ratings (<http://www.energystar.gov>) and various other sites including those of Government and professional bodies.

Other possible considerations, though mainly for larger organisations, are concerned with buildings, such as the BREEAM, (BRE Environmental Assessment Method, www.breeam.org.uk) and the generation of power such as by small wind turbines and solar power. There is also the re-use of heat generated by computing equipment for other purposes within the building such as heating and air-conditioning.

There will be discussion of the Waste of Electrical and Electronic Equipment (WEEE) legislation, that applies to both organisations and the general public, for the safe disposal of computing and other electrical equipment. Various relevant standards including the ISO 14001 standard for environmental issues will be considered. The potential for external auditors to address the "greenness" of organisations will be considered.

The paper discusses in detail, the various lower cost activities that can easily be undertaken by SMEs. Some of these can provide savings, both in direct and indirect costs.

These include:

awareness sessions and posters to staff to switch off the lights when not required; lights to automatically switch off when no movement within the room; switching off computers when not required either by the users or automatically; setting printers for double-sided printing as the default option; encourage limited printing only of key pages of documents and of e-mails; use of recycled paper; use of recycled print cartridges; consideration on purchasing goods if there is an equivalent at similar cost, from partial or recycled products; require information from suppliers on the "greenness" of their products and services to include also the implications of transportation; providing separate bins for staff to separate their waste for re-cycling; ensure that there is an Asset Register for all electrical and IT equipment; considerations on appropriate method of disposal of working equipment such as gifts to employees or for refurbishment to local or overseas schools; consideration prior to any computing upgrading if it is really necessary; consideration of the "Green" rating of all replacement purchases; considerations of use of videoing conferencing to minimise travel; and consideration when only a few of the employees are working late,

to utilise the concept of "hot rooming" to reduce the heating and lighting to a limited area and also possibly to improve the physical security of those working late. Alternatives for some unwanted IT equipment could be used to encourage staff to create original art work such as the WEEE man, made of discarded equipment.

The effectiveness of any Greening policy is dependent on the management and employees' commitment. Consideration will be given to creation of a new form of examination designed for the "Green" advisors within the SMEs. This would then enable the managers to provide a number of suitably qualified employees who will be capable of answering questions about the "Greenness" of their own products and services.

The need to seriously address greening issues has now become one of the top priorities for major organisations and as part of their policies. Pressure from these organisations will be placed on SMEs to be able to prove their commitment to the green issues, hence the need for SMEs to seriously consider Greening within their own business.

Keywords: Greening; computing; IT equipment; carbon footprint; SMEs; standards; qualifications

CV:

Margaret Ross is Professor of Software Quality at Southampton Solent University.

Margaret's area of interests are quality, outsourcing and greening within a computing context and addressing the IT and engineering skills shortage, by encouraging women and girls into IT. She has been Conference Director since 1992 of the annual series of Software Quality Management international conferences, aimed at benefits to industry, and since 1995 of the annual series of international educational INSPIRE conferences. She has edited thirty books, and has been actively involved with the Software Quality Journal since its inception.

Margaret is a Freeman of the City of London, Liveryman of the Worshipful Company of Engineers, longstanding independent member of the Parliamentary IT Committee and was awarded an Honorary Doctorate from the University of Stafford and an Honorary Fellowship by the British Computer Society.

Margaret Ross has been and is influential in the British Computer Society (BCS), currently holding various positions including that of nationally elected member of the BCS Council, and Vice Chair of the BCS national Quality Specialist Group, and on the national committee for BCSWomen and the national BCS Greening working party.

SATELLITE TRANSMISSION: A NEW TOOL TO INFORMATION ACCESS FOR RURAL FEMALES IN NIGERIA

Chiemeke, S. C. ; Egbokhare, F. A. & Akwukwuma, V. V. N.

Department of Computer Science, University of Benin, Benin City, Nigeria

Type of presentation: Oral session

Abstract:

Ekwuoma is an isolated Christian Community located in the south-south geo-political zone of Nigeria. The women of this community comprises mainly of peasant farmers. Communication is through the local language of the region (i.e. Ibo). The community is characterized by a high level of poverty, illnesses and conflicts, thus the issue of women trafficking and prostitution is becoming rampant, as it is seen as a solution to their major problem.

Women trafficking and prostitution is a social evil in the society. The traffickers who are usually rich elites in the society take advantage of unsuspecting ignorant females, telling them that they are going to have a better life in the city where they are taken to. Trafficking has become one of the major causes of school drop-outs among young girls in villages. Therefore, it is paramount to view Information Communication Technology as a tool to fight against women trafficking and prostitution. Satellite transmission with picture clips in their local language (through churches) is the most effective communication tool for creating awareness and fighting this ugly trend.

The paper x-rays the gender dimensions and constraints in accessing information through radio and television. This focuses on Satellite transmission with victims' picture clips that could be incorporated into weekly religious programs.

Keywords: satellite transmission, television, rural females, information access and gender dimensions

CV:

Dr.(Mrs.) S. C. Chiemeke is an Associate Professor in the Department of Computer Science, University of Benin, Benin City, Nigeria. Her reserach interest includes Gender issues in ICT, Software Engineering and Information Technology Projects Evaluation. She is a member of INWES, Computer Professional of Nigeria and has published many articles nationally and internationally in computer science.

RADIO PROGRAMS AS A TOOL TO INFORMATION ACCESS FOR RURAL WOMEN FARMERS IN NIGERIA

Chiemeke, S. C.; Akwukwuma, V. V. N and Egbokhare, F. A

Department of Computer Science, University of Benin, Benin City, Nigeria

Type of presentation: Oral session

Abstract:

Rural women, most of whom are farmers speaking only the local language of their region, are among the most isolated groups in Nigeria even though they are in the forefront of the fight against poverty, illness and conflicts. Information and Communication Technology (ICT) has become a potent force for transforming social, economic and political life globally. In an attempt to open access to information for rural women farmers, the three tiers of government in Nigeria (Federal, State and Local Government) have laid emphasis on rural electrification, thus promoting informative education through radio and television as well as licensing of GSM (Global Systems for Mobile Communication) operations. In Edo State of Nigeria, the wife of the former Edo State Governor, Mrs. Eki Igbinedion initiated women centers. In addition, she introduced an interactive 30 minute weekly program on radio for Afuze (a rural community in the state) cassava producers. The Afuze communities are known to produce 80% of cassava products (in two out of the six geographical zones of Nigeria). Recently there has been an attempt to improve the production, distribution, preservation and sales of cassava products in these communities through ICT. According to UNICEF, there were 226 radio sets and 66 television sets per 1000 population in Nigeria in 1977. Thus, a radio program or video produced in the local language will be more effective in the short run, in disseminating requested information in a rural area.

This paper looks into the lifestyle of the Afuze community that promotes community-based ICT. It also looks into the technology of radio program of Afuze community of south-south political groups of Nigeria. The radio programs allow women exchange ideas and share common concerns about the production and marketing of their cassava products. Finally, the paper x-rays access to, and the effectiveness of ICT, as well as social and economic activities through ICT in Afuze community of Edo State of Nigeria.

Key words: Radio, Information Access, Rural Women

CV:

A Computer Science graduate of the University of Benin, Nigeria, Dr. (Mrs) F.A. Egbokhare holds both a Bachelor and Masters Degree in computer Science. She is currently a lecturer in the Computer Science department of the university. She has many academic works to her credit published in both national and international journals. She also has authored and co-authored many books. She has to her credit paper presentations both at local and international conferences.

Dr. (Mrs.) F.A. Egbokhare is married with 3 children.

WOMEN MICROENTREPRENEURS BUSINESS DEVELOPMENT THROUGH ICT IN TUNISIA

Leila Ben-Gacem

Afrimalife

Type of presentation: Oral session

Abstract:

Women micro entrepreneurs, remain the back bone of the economy in rural and regional Tunisia. As men travel to the capital in search of labor or in search of way to immigrate aboard, the women remain at home to care for the family and in many cases become obliged to initiate a home based small business, to support the family and ensure its well being.

On one hand you have the semi-educated informal business managing women, and on the other hand you can find in every region well educated young women from rural and regional Tunisia, that traveled to the capital or other bigger cities to get her university degree and then return to her home-town unemployed due to the lack of job opportunities in her town.

Afrimalife, an NGO with an objective to build the capacity of women entrepreneurial skills, women empowerment as well as create income opportunities for young women; initiated a program in collaboration with Internet Society Tunisia, where the objectives are:

- Decrease the digital divide between women in the rural and semi-rural areas
- Educate the women micro-entrepreneurs on the use of the internet and the business opportunities of the internet
- Coach a young educated women on computer management tools
- Create job opportunities for young women in the rural area; which will become management mentors for women artisans in her region
- Co-ordinate with those young women mentors, in each region, to develop the business of women artisans in her region, and hence creating new source of income and better standard of living
- Develop projects that could ensure a continuous flow of business opportunities through the Afrimalife/OWIT network.

The program is implemented in regions with high concentration of women artisans. The effective use of ICT will created new job opportunities for young women in the rural areas and will help women artisans promote and sell their products beyond their national borders.

Key words: Tunisia, Afrimalife, micro-enterprise, ICT, women

CV:

Leila Ben-Gacem is a biomedical-engineer with 12 years work experience in Hewlett-Packard Medical Products and Philips Medical Systems, where she held several positions in Tunisia, Germany and Libya. Leila started her own consulting company 2 years ago, where she manages World Bank funded projects aimed at developing artisans' capacity and international business development of the Tunisian handicrafts, through entrepreneurship capacity building of small and micro-enterprises owned by artisans and/or women. Leila is also member of the board of directors of the Tunisian Young Entrepreneur's association where she is in charge of enterprise creation and is a member of the board of directors of Afrimalife, an NGO that deals with women entrepreneur development and empowerment.

A BIO-INSPIRED SELF-DEFENDING SECURITY FRAMEWORK FOR IP MULTIMEDIA SUBSYSTEMS (IMS)

Aliya Awais¹, Muddassar Farooq²

Next Generation Intelligent Networks Research Center (neXGIN RC), National University of Computer and Emerging Sciences, Islamabad, Pakistan

Type of presentation: Poster

Abstract:

IP Multimedia Subsystem is an overlay architecture for the provision of Multimedia services, such as Voice over IP (VoIP) and video conferencing on top of globally emerging 3G broadband packet networks. A recent survey concludes that the volume of data exchange is statistically greater than volume of voice exchange in fixed and mobile networks. The maintenance of data network is much cheaper than voice network due to the fact that IP technology is much cheaper in deployment and operations. It is logical to think about relaying all communications on data networks rather than maintaining two networks together. On the other hand there is an increasing demand of Multimedia services that integrates internet applications with telecommunication networks. As the result of these global trends, the mobile communications community has defined within evolution of cellular system, an all-IP network vision which integrates cellular networks and the internet.

The IP Multimedia Subsystem (IMS) is a standardized Next Generation Networking (NGN) architecture for an Internet media-services capability, defined by the European Telecommunications Standards Institute (ETSI) and the 3rd Generation Partnership Project (3GPP). NGN is a broad term to describe some key architectural evolutions in telecommunication core and access networks. The general idea behind NGN is that one network transports all information and services (voice, data, and all sorts of media such as video) by encapsulating these into packets, like it is on the Internet. NGN are commonly built around the Internet Protocol, therefore, the term "all-IP" is also sometimes used to describe the transformation towards NGN.

IMS can be defined as a global, access independent, standards-based IP connectivity and service control architecture that enables various types of multimedia services to end-users, using common internet-based protocols.

IMS is still being defined and there are still many open issues within the IMS architecture. The 3GPP IMS standardization is ongoing, and there is not yet any commercial deployment of IMS within operator's networks. Most of security work for IMS like authentication, encryption, confidentiality and reliability are standardized by 3GPP release 5 and onwards that provide security at the first level in IMS networks. With the advent of new access technologies and devices the probability of malicious attacks and voice service abuse by clever hackers, spammers and intruders have increased significantly together with attack sophistication, attackers can penetrate into the network through security trap doors by breaking the first level of security to misuse network resources and services like VoIP and other real-time IP communication applications. This is harmful as they not only steal the subscriber's confidential information, but it is also dangerous for the network operators because it can damage the network operator's resources and assets. There should be an in built security monitor that can detect and stop the activities of these hackers, intruders and spammers. IMS and Next Generation Mobile Networks are designed and implemented on top of IP protocols and uses wireless links communications. So it is very important to protect network resources, operator's assets and provide security to the users from clever hackers. Today the network operators and telecommunication community are facing the challenges of three serious types of security threats and attacks in the network: "Known Attacks & Threats whose signature are known and can be detected by simply comparing signatures with attack signature or fingerprints." "Unknown Attacks & Threats are launch by attacker by finding out new vulnerability and security weakness and exploit that weakness by launching attack." "Denial-of-Service (DoS) / Distributed DoS threats, is an attempt to make a computer resource unavailable to its intended users. In DoS & DDoS attacks, large number of random or control messages are simultaneously sent from single or multiple malicious nodes to overwhelm IMS network resource so that the legitimate nodes can no longer communicate properly or use network services like Domain Name Server (DNS) or proxy-Call State Control Functions (P-CSCF). Looking in more detail at the potential attacks that may exist in IMS networks, the more prevalent and potentially damaging application level threats that can be used to attack the core infrastructure and take-down the service or used to attack the end-users are: Flood DoS and Distributed Floods, Protocol Fuzzing, Stealth Floods, VoIP spam, Fraud, Rogue Devices. These attacks can be easily launched using publicly available tools.

The aim of this research Project is to develop an intelligent Bio-inspired self-defending/ self-healing security framework for IMS and Next Generation All-IP Networks, which will complement existing authentication and encryption mechanisms to protect infrastructure nodes and subscribers against the attacks launched by malicious nodes in the network. These unique and real-time vulnerabilities which need to be addressed in the IMS network include: IMS framework-related vulnerabilities, Session Initiation Protocol (SIP) vulnerabilities, VoIP/ video/ Push to-talk over cellular (PoC)/ Messaging/ Presence/ Conferencing application vulnerabilities; and voice spam, media plane related vulnerabilities. This framework is expected to become a cardinal component that will protect against the misuse of the network resources of an operator. The reason for utilizing Bio-Inspired paradigm is that, Bio-

Inspired paradigm provides an ideal paradigm for designing, developing, implementing and realizing lightweight security framework which demands no additional resources: fast processors, larger memories or faster network cards. Moreover, bio-inspired paradigm is a passive learning classifier that puts no additional signature bytes in the packet's header or in its payload. IMS network consists of a number of handheld embedded devices like cell phones, PDAs etc and hence this light weight Intrusion Detection & Prevention (IDP) would be an ideal solution which can be hosted on them. The lightweight IDP would be placed at the Home Subscriber Server (HSS), IMS Core (Proxy/Interrogating/Serving -Call State Control Functions (P/I/S-CSCF)), and applications and media servers to monitor the network traffic in real time that is passing through them.

This framework will be integrated into any IMS converged network infrastructure to provide defense against wide varieties of attacks. The goal is that our system will ultimately become integral part of security for IMS and Next Generation All-IP networks.

Keywords: 3rd Generation Partnership Project (3GPP), Bio-inspired Security, Converged telecom networks, IP Multimedia Subsystem (IMS), Self-healing intelligent networks.

CV:

Ms Aliya Awais is a student of computer sciences; she is 30 years old and lives in Islamabad Pakistan. She has done her MS from National University of Sciences and Technology (NUST) in 2007, which is premier university of Pakistan. She is presently pursuing her PhD in computer sciences at same university. She is also working as a Research Engineer at Next Generation Intelligent Networks Research Center (neXGIN RC) at the National University of Computer and Emerging Sciences, (FAST NU) in Islamabad, Pakistan.

AN INFRASTRUCTURE FOR UBIQUITOUS HEALTHCARE CONTEXT AWARE SYSTEM

Hyungjik Lee, Yunkyung Park, Jeunwoo Lee
Electronics and Telecommunications Research Institute

Type of presentation: Poster

Abstract:

We propose an infrastructure for ubiquitous healthcare context aware systems, as seen in Fig.1. Physiological signal sensing devices (wrist type, chest belt type and shirt type) measure the physiological signals of the patient and send the data to the mobile system using ZigBee and Bluetooth. The mobile system can receive the raw data from sensing devices and display them and send to PHR (Personal Healthcare Record) server and HDSS (Healthcare Decision Support System) or ontology server system. HDSS or ontology server systems can inference user state from contexts that is received by mobile system.

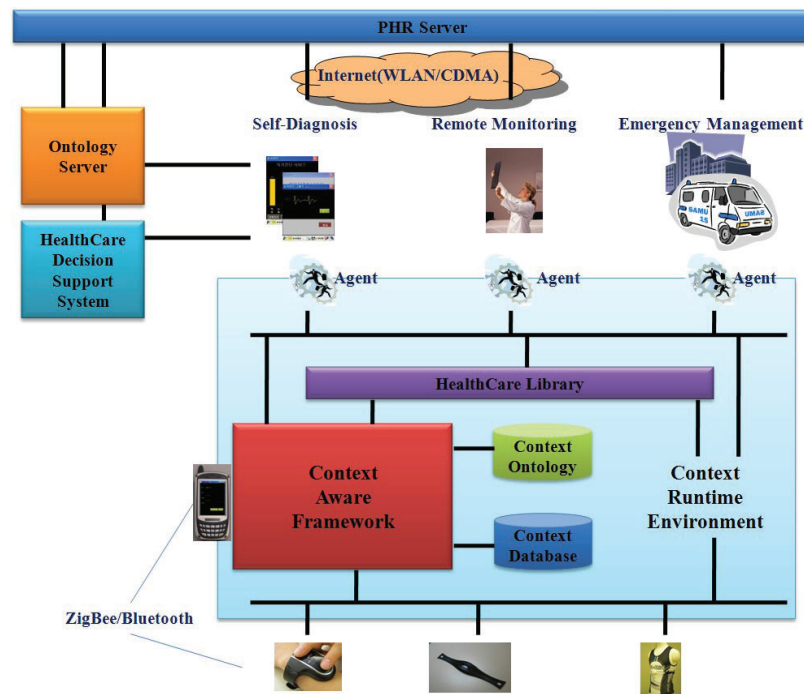


Figure 1. Operation environment and overall architecture

The structure of context aware framework and context runtime environment are shown as Fig.2. The components of the context aware framework are context provider, context interpreter, context integrator, context manager, context database manger, user profile manager and healthcare library. The context provider generates primary context from the raw data received by the physiological signal sensing devices. The context interpreter can generate high level contexts by using inference engine or HDSS or ontology server, so u-healthcare service such as emergence management application uses the emergence context. The context integrator generates the contexts in according to context ontology and manages them. The context database manager stores contexts to context database system and replies with the queries of other components. The user profile manager provides the user contexts through the implementation of CRE listener interface. The context manager manages the overall contexts in according to context ontology, and manages the life cycle of all context aware components. Healthcare library provides simple APIs of context aware framework for application developer and agent developer.

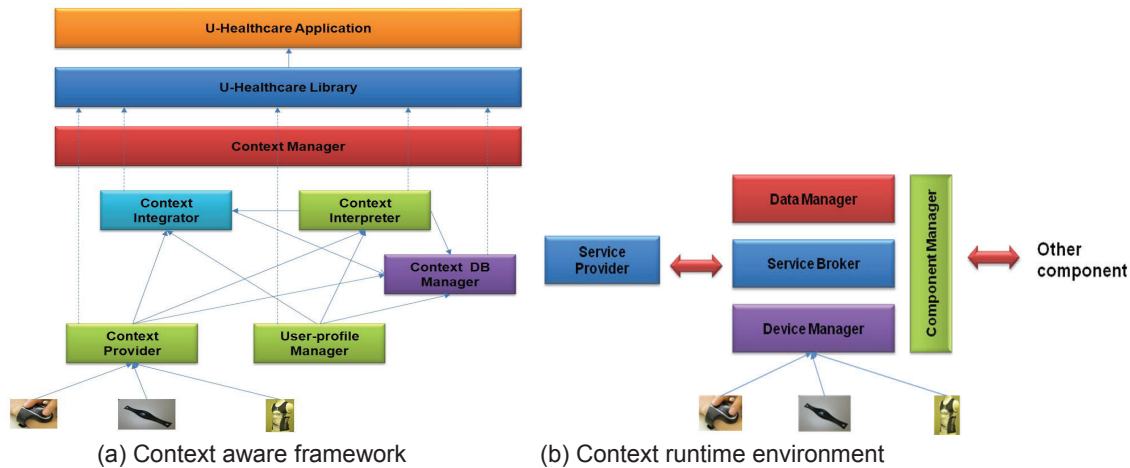


Figure 2. The software architecture of CAF and CRE

The context runtime environment is composed of component manager, device manager, data manager and service broker. The device manager is to support plug-and-play of sensing devices. The data manager normalizes pre-processed signal features generated by a device driver and transmits to an application via push or pull method of instant application runtime interface. The component manager installs software components and invokes a dependency manager to generate instance application runtime.

The u-healthcare applications of our system are self-diagnosis, remote monitoring and emergence management. Each application has own agent that has a role of analysis the meta-data of application component and resolve any dependency such as linked local or remote service object, required feature data and device control connection and etc. The self-diagnosis application is composed of self-diagnosis interpreter, self-diagnosis user interface and self-diagnosis agent. The self-diagnosis interpreter generates the user status contexts by querying to HDSS or ontology server. The self-diagnosis agent manages the life cycle of self-diagnosis application and device status. The initial state of devices is sleep-state and the agent converts the state of device if self-diagnosis user interface is started. The remote monitoring application can gather the user sensing data through the physiological signal sensing device according to the appointed time of a doctor, and the types of data are EKG (electrocardiograph), PPG (Photoplethysmography), SKT (Skin Temperature) and respiration rate. The emergency management application is composed of emergency management interpreter, agent, alarm component, SMS component, data transfer component and TTS component. If the emergency management interpreter generates the emergency context and the emergency management agent calls each component. The alarm component gives the emergency alarm, and SMS component transmits a short emergency message to emergency center and him/her family, and TTS component makes a phone call to emergency center and family, and the data transfer component will transfer a user's physiological data to emergency center.

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- [3] JSR292, Dynamic component framework (OSGi framework), <http://www2.osgi.org/jsr291>

Key Words: Context-Aware, Contexts, Physiological signal, Healthcare

CV:

I am a senior researcher of ETRI (Electronics and Telecommunications Research Institute) which is a non-profit government-funded research organization that has been at the forefront of technological excellence for more than 25 years. Our research institute has successfully developed information technologies such as TDX-Exchange, High Density Semiconductor Microchips, Mini-Super Computer (TiCOM), and Digital Mobile Telecommunication System (CDMA). My department is digital home research division and I have developed many H/W and S/W system such as Home server system, open service gateway framework, home agent service, context-aware framework, u-healthcare service and etc and I have written several papers on the same subject.

EFFICIENT AND RELIABLE WIRELESS COMMUNICATION BETWEEN PHYSIOLOGICAL SIGNAL SENSOR DEVICES AND THE MOBILE SYSTEM

Joonyoung Jung, Yunkyung Park, Jeonwoo Lee
Electronics and Telecommunications Research Institute

Type of presentation: Poster

Abstract

We made a zigbee based wearable physiological signal monitoring system, as seen in figure 1. Physiological signal sensor devices measure the physiological signals of the patient and send the data to the mobile system using ZigBee. The mobile system can display the physiological signal data and send them to a healthcare service provider system by using WLAN or CDMA. The device provider system provides device installation data to the mobile system for plug-and-play function. The healthcare service provider system is the portal server deciding all comprehensive tasks regarding health care. A physician logs in the healthcare service provider system and then can monitor and analysis the patient's physiological signals at the physician system. If emergency situation is happed, the emergency system sends information someone who handles it. The patient logs in the healthcare service provider system and then can monitor own physiological signals at the healthcare personal system. In this system, ZigBee is used to communicate between physiological signal sensor devices and the mobile system.

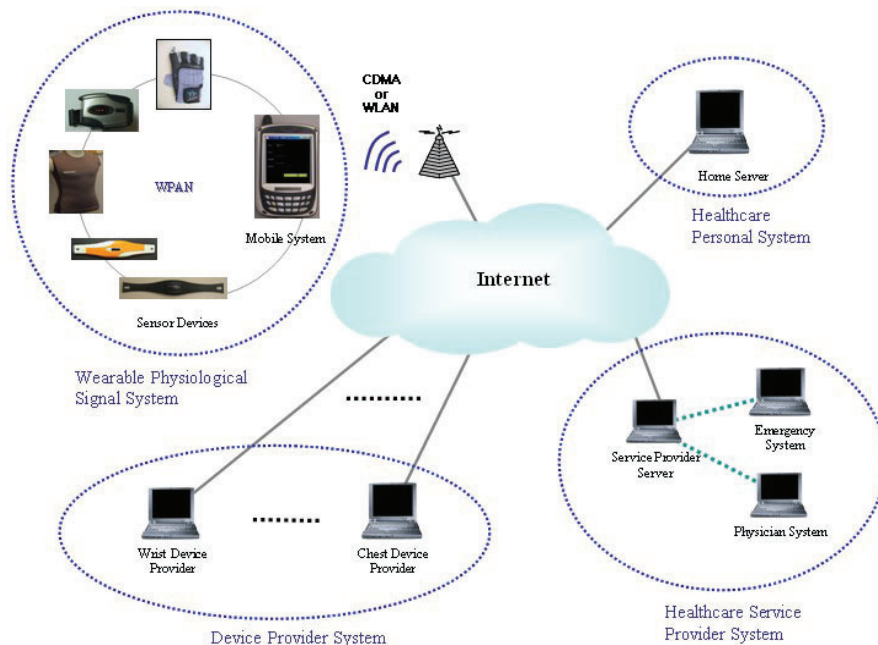
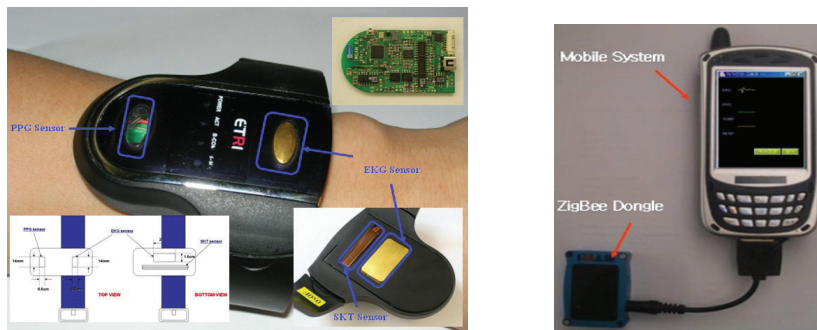


Figure 1. Wearable physiological signal monitoring system

We made a wearable physiological signal sensor device worn on the wrist, as seen figure 2. The wrist type sensor device measures PPG(photoplethysmogram), ECG(electrocardiogram) and SKT(Skin Temperature) and uses CC2430 of Texas Instrument as RF and MCU. The CC2430 is a low price, small size and low power consumption chip for ZigBee communication [1]. It has a RF module, 8-bit MCU module and 128 KB flash memory. We use BIP-5000 of Bluebird as the mobile system. It uses Intel PXA270 520MHz CPU, RAM 64MB, ROM 128MB and Window CE 5.0 [2]. The mobile system connects with a ZigBee dongle, as seen figure 2. The ZigBee dongle uses CC2430. The physiological signal sensor device sends physiological signal data to the ZigBee dongle and then the ZigBee dongle sends them to the mobile system by RS-232 serial communication.

This work was supported by the IT R&D program of MIC, [2005-S-069-02], development of wearable system using physiological signal processing.



(a) Physiological signal sensor device - Wrist type

(b) Mobile system with ZigBee dongle

Figure 2. Wearable physiological signal system

In our system, ZigBee is used between physiological signal devices and the mobile system. We propose connection algorithm, access control, retransmission and dynamic installation method for ZigBee. First of all, we propose the connection algorithm. The physiological signal sensor device may always connect with the same mobile system. Thus, the physiological signal sensor device can know the address of the mobile system by using last or the most recent mobile system connected. However, according to the scanning algorithm of IEEE 802.15.4, the sensor module that wants to connect with a mobile system should scan all channels, even if the sensor module knows the address of the mobile system. Thus, establishing a connection may take a long time in certain situations. In our system, physiological signal sensor devices and the mobile system are personalized. Therefore, physiological signal sensor devices can know the IEEE address and channel selection priority of the mobile system. If the physiological signal sensor devices scan channels using this information, the scanning time can be reduced greatly. Second, we propose the access control using a group ID. Even if there are a lot of physiological signal sensor devices nearby, the communication should be accepted between only one user's physiological signal sensor devices. So, the access control should be implemented. We propose a group ID mechanism to implement an access control. The user of a mobile system inputs and saves the device ID of physiological signal sensor devices at a mobile system. We use the group ID to communicate between the mobile system and physiological signal sensor devices. If the group ID of the physiological signal sensor device is same with it of the mobile system, the physiological signal sensor device can communicate with the mobile system. Third, the physiological signal data must not be lost but a wireless communication such as ZigBee can lose a data. So, we made a reliable data transmission by using a retransmission scheme. The physiological signal sensor device transmits the data with AR(Acknowledgement request). If the physiological signal sensor device doesn't receive an acknowledgement within `apscAckWaitDuration` seconds from the mobile system, the physiological signal sensor device repeats the process of transmitting the frame up to a maximum of `apscMaxFrameRetries` times. If an acknowledgement is not received after `apscMaxFrameRetries` retransmissions, the APS sub-layer shall assume the transmission has failed and notify the next higher layer of the failure [3]. In this case, the next higher layer retransmits the data until the buffer that saves a data is overflowed. The last proposal is about dynamic installation. The physiological signal sensor device should be discovered and installed automatically to implement this system. The physiological signal sensor device sends device description message when it is powered. The mobile system decides whether the device is installed or not. If the device is not installed in mobile system, the mobile system requests the installation data from a device provider system. The device provider system sends installation data to the mobile system and then the mobile system installs the physiological signal sensor device. After installation, if the mobile system does not receive the device description message from the physiological signal sensor device, the mobile system uninstalls it to save the resource of the mobile system. We propose and implement the efficient and reliable wireless communication between physiological signal sensor devices and the mobile system.

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Key Words : Wireless, ZigBee, Physiological signal, Healthcare

CV:

2000.3 : Master of Science of Soongsil University
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EDUCATION

1982 M.S. Department of Mathematics, Université Libre de Bruxelles
1986 Ph.D. in Sciences, Université Libre de Bruxelles

APPOINTMENT

1986 -1989 Research fellow in Econometrics, Department of Applied Economics, Free University of Brussels

1989 -1995 Associate professor, Faculty of mathematics and Social Sciences, University of Lille 3

1995- Professor of Applied Mathematics (Econometrics), Faculty of Mathematics and Social Sciences, University of Lille 3

2000 -2006 Vice President of the Scientific Council. Vice President in charge of Research, University of Lille 3

2005-2008 Head of the Lille Social Sciences and Humanities Research Institute

2008- Member of the Board of the University of Lille 3

She is author of 3 books and more than 30 articles in scientific reviews.

She is member of the *femmes et mathématiques* association's board.

RETURN POLICIES FOR EFFICIENT REVERSE LOGISTICS SYSTEMS

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Type of presentation: Oral session

Abstract:

Pioneered by European governments, companies are nowadays held responsible for disposing a product at the end of its life. For example in Germany, the packaging ordinance of 1991 requires industry to take back all sales packaging materials and imposes a minimum mandatory recycling level that is between 60% and 75% (Fleischmann et al, 1997). In the Netherlands, the automotive industry is responsible of recycling their products at the end of their life cycle (Cairncross, 1992). Companies are now forced to move the products back from customer to their warehouses. Therefore, an efficient forward logistics network is not sufficient. They also need to have an efficient reverse logistics network. Most research works agree that forward logistics and reverse logistics have different characteristics and hence one cannot just simply use their existing logistics network to handle the reverse flow (Rogers and Tibben-Lembke, 2001).

Companies viewed reverse logistics activities as a burden to the business. However, they learned that the returned product is not only designed to be disposed of, but it can also be recycled, reused, or remanufactured which could be profitable (Guide and Jayaraman, 2000, Guide and Wassenhove, 2001). Hence, companies are now realizing that the reverse logistics could become another or a new profit center.

Guide et al (2000), Fleischmann et al (1997), Tibben-Lemke and Rogers (2001), Carter and Ellram (1998), and Dowlatshahi (2000) observed that one of the complicating factors in reverse logistics activities is the uncertainty of supply or in this case the reverse product flow. We expect to see a higher variability in terms of quantity and quality of the used products. In the present work, we develop a Decision Support System (DSS) of reverse logistics for selecting recovery operations of products returned from a customer and/or a retailer. The development of such a tool allows for facilitating the selection of a recovery operation by taking into account the return policy of the company, the physical state of returned product, the technical and financial means available to the company, and environmental regulations. Certainly, a good choice of a processing operation has a big impact on the success of the reverse logistic system, whereas companies are usually not flexible enough to meet the unexpected changes in supply.

These uncertainties are creating problems for remanufacturing and reusing processes. In order to have a profitable business, companies must have enough supply of used products. Their processing plant needs a minimum quantity of used products in order to operate efficiently. It is in the company's interest to ensure enough supply of used products.

Applying an adequate return policy appears to be a means to ensure economies of scale from the reverse operations and an important tool for competitiveness (Rogers and Tibben-Lembke, 1999). A generous return policy is viewed as a proven tool to increase sales revenues by inciting more customers to buy. However, a generous return policy would also increase the cost of business substantially due to higher quantities of returned merchandise.

Our research is particularly interested in determining the optimal return policy. We examine return policies in the case where a manufacturer or a retailer directly sells to customers. We first review the existing literature related to return policies. We consider the continuous return policy as opposed to the two extreme strategies, namely, full or no refund which are generally used in the literature. Our next contribution is the study of the impact of two important decision variables: price and return policy on returned quantities. Our profit function takes into account the revenue of product resale and the processing cost expressed by the proposed decision support system. The advantage of this approach is that we take into account the profit realized after processing and selling products stemming from the reverse logistics system.

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Keywords : Reverse logistics, Supply chains, Return policy, Decision support system.

CV:

Atidel Boubaker Hadj-Alouane was born in Mahdia, Tunisia in 1963. She received the "Principal Engineering" degree in Industrial Engineering from the National School of Engineers of Tunis (ENIT) in 1987, The M.S.E. and Ph.D. degrees in Industrial and Operations Engineering, from the University of Michigan, in Ann Arbor, in 1992 and 1994, respectively.

In 1995, she held a post-doctoral position at the Intelligent Transportation Systems laboratory of the University of Michigan. Between 1996 and 1997 she was an Assistant Research Scientist at the same laboratory. She is currently an associate professor at the department of Industrial Engineering of the National School of Engineers of Tunis. She is the head of the Master's Program of Systems Engineering and the director of the Optimization and Analysis of Industrial and Service Systems Laboratory.

Her current research interests include discrete optimization, logistics systems, hospital management, and hybrid systems. She has published in several international journals such as Operations Research, Journal of Scheduling and the International Journal of Production Economics.

HAZARDOUS MATERIALS LOGISTICS: A SURVEY OF FIRMS' PRACTICES IN THE PROVINCE OF QUEBEC

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Type of presentation : Oral session

Abstract

Numerous firms use, store, produce or carry hazardous materials. Risks associated with such logistics activities have triggered many studies in the domain. While technical aspects have been extensively covered, there are still efforts to be made to correctly assess how organisational aspects can influence quantitative risk analysis. We made a first step in this direction when we developed a survey in an attempt to characterise industry practices. The main objectives are to identify the factors underlying logistics decisions and to see how firms manage risks.

The survey covers a wide range of activities within the firm, from transport to risk management, to costs and to outsourcing. Divided into nine sections, the survey includes questions such as transportation means used, formation offered to employees and reasons why firms choose to outsource certain activities. To broaden our views, we did not limit ourselves to one kind of facilities. Therefore, the survey was sent to various firms involved with hazardous materials in the province of Quebec (Canada): from multinationals to small facilities, from massive users to occasional hazardous materials users. This should allow comparisons between different kinds of facilities.

The survey is still ongoing, but had a total of sixty-six respondents as of April 1st 2008. A third of the respondents come directly from the chemicals and petrochemicals industry, while the two thirds come from other industry fields (detergents, cement, manufacturers, etc.). Almost half of these respondents are heavy hazardous materials users and another half is composed of more occasional hazmat users. The sample is also formed of a mix of small facilities (29% have less than 50 employees), medium (35.5% have between 50 and 249 employees) and large facilities (35.4% have more than 250 employees).

Preliminary results show that a wide variety of chemicals can generally be found on a single site. Flammable liquids, corrosives and gases are the most common hazmat classes. Hazardous materials are often temporarily stored on site, with 32.8% of respondents resorting to it often or always. However, storage off site is seldom used. Preliminary results also show that shipments are coming and going almost every week, mostly by truck. To meet their supply needs, 98.3% of the respondents use road transportation, compared to 26.7% for rail transportation, 23.3% for boat, 11.7% for pipeline and 5% for air transportation. Out of the survey's sixty-six respondents, 81.4% admit that they would be unable to change these supply habits.

Most firms have appropriate risk management programs. These programs include: offering risk related information to employees (79.9% of the respondents), hazmat accident prevention programs (68.3%) or assigning employees to risk prevention (64.4%). Firms are aware of the possible impacts of a hazmat accident on employees and populations, but are also aware of the impacts such an event could have on their day to day activities. While direct costs attracts more attention (89.5% of respondents have mentioned it), production loss (68.9%), loss of corporate image (67.2%), raising population concerns (65.1%) and increased insurance costs (56.5%) are also frequently mentioned. Therefore, most firms are ready to invest more in security if needed. However, a certain number of firms (31.5%) cannot afford it.

While on site risk management seems adequate in most cases, results show that many firms tend to overlook critical security aspects of transportation. Firms tend to outsource the transport of dangerous goods due to the costs associated with owning their own vehicle fleet. This outsourcing process is rarely subject to safety audits (42.9% of respondents never considered it), is rarely regulated by long term contracts between parties (26.3% of respondents never have one and 24.6% occasionally have one) and is not closely monitored (48.2% of respondents are well aware of the fact that their carrier outsource part of his assignment). When combined to the fact that many respondents do not believe they would be affected by a hazmat accidents involving their carrier, we can begin to understand the extent of the problem. Cross-analyses have been conducted to assess the differences between types of facilities. Most notably, massive hazardous materials users have put in place more security measures than

occasional users. Only to name a few: they do more risk analyses, are more ready to invest in risk security measures and have more prevention programs.

Key words: Hazardous materials, risks, logistics, transportation.

SUPPLY CHAIN DESIGN IN THE DELOCALIZATION CONTEXT: A MATHEMATICAL MODEL AND A CASE STUDY

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Type of presentation: Oral session

Abstract:

In today's very challenging world, most companies face the obligation to configure and globally manage their operations in order to provide the desired customer service at the lowest cost while maximizing their after tax profit. One way to reach this goal is to delocalize the production activities in low cost countries. From a logistic view, delocalizing consists in redesigning the company's supply chain to determine where each process should be located while accounting for trade-offs between financial incentives, lower labor costs, access to new suppliers, longer lead times, technological constraints, etc. Hence, it requires decomposing and then recomposing the firm's value chain in the aim to locate each activity where it provides the biggest value while taking into account the different characteristics of the delocalization problem. In this work, we deal with the supply chain design in the delocalization context. We first highlight the supply chain key elements that characterize the delocalization problem. Then, we propose a mathematical model for the design of supply chains which is adapted to the delocalization problem.

In the light of the economical theories and the definition of delocalization as well as several cases studies, we identify five essential factors that have a major importance in the delocalization context:

- the non-homogenous location spaces, which refers to the differences between origin (developed) and host (developing) countries in terms of labor costs, technological capabilities, etc.,
- the international facility location, which means that the company operates in an international environment,
- the high integration level, which reflects the centralized decision making and the high dependencies between the units of the company,
- the initial situation specificities, which include all the initial conditions that impact the redesign of the supply chain,
- the product characteristics, essentially in reference to the product life cycle which may have a significant impact on the profitability of a delocalization project.

Based on the above aspects, we identify the key components that must be included in a supply chain design model to reflect and take into account the delocalization features. Basically, these components are:

- Decisions: activity location, transfer pricing, technology selection, capacity relocation and acquisition, supplier selection, intermediate products flows, etc.,
- Cost factors: facility closing/opening cost, labor cost, technological cost, transportation cost, etc.,
- Constraints: bill of material constraints, suppliers capacities, technological constraints, etc.
- International factors: exchange rate, income taxation.

Despite the strategic nature of the delocalization problem, we notice that a complete description of the manufacturing system (processes, technologies, products, etc.) in each facility must be considered. To achieve this, we adopt the activity-based approach which is articulated around the concept of activity. An activity can be defined as the process that converts a set of input products into a set of output products by the means of a certain technology and using a set of resources. The relationship between the activity and the technology is bijective. In other words, to each activity is associated a unique technology and vice-versa.

Hence, we decompose the initial production process of the firm into different geographically independent activities to obtain the set of potential activities. Other potential activities may be obtained by considering appropriate technologies for developing countries instead of the technologies used by the firm in its unit of origin. For instance, the firm may be interested in evaluating the possibility of replacing the technology employed by a given activity with a less automated one which may be easier to set up in developing countries. This leads to consider a new potential activity. The production process must then be recomposed by selecting the activities that

must be used as well as their locations and undertaking the other decisions. Clearly, by doing so, we also make the selection of the manufacturing technologies.

We formulate the supply chain design model for the delocalization problem as a mixed integer linear programming model. The proposed model is deterministic, multi-product, multi-echelon, and multi-period. The objective of the model is to maximize the global after tax profit of the company which is the sum of before tax profit in each facility multiplied by the corresponding taxation function and exchange rate. The before tax profit of each facility at a given time period is expressed as the difference between the revenues and the expenses. Revenues are generated from selling products to customers and to others facilities of the company, whereas expenses include all operating and investment costs imputed to the facility at that period.

The before tax profit of site j at period t = selling revenue of final products + selling revenue of intermediate products (to the other sites) - purchase cost of raw materials - purchase cost of intermediate products (from the other sites) - suppliers fixed cost (imputed to site j at period t) - transportation cost (allocated to site j) - capacity acquisition cost (charged to period t) - capacity relocation cost - labor cost - production cost - technology implementing cost (for delocalized sites) - opening facility cost (for delocalized sites) - closing facility cost (for sites of origin).

The main constraints of the model are the flow conservation constraints, the constraints that define the capacity of each activity, and the opening/closing sites constraints. Flow conservation conditions must hold for each activity to ensure that the outputs of the activity correspond to its production and the inputs correspond to its needs according to the bill of material constraints. The capacity of an activity in a given plant is constituted of the initial existing capacity (only for the original facilities), the capacity bought from external sources, and the capacity transferred from another facility. The opening/closing sites constraints are required to determine when an alternative facility is opened and when an original facility is closed.

The feasibility and the pertinence of proposed model are validated through a real case study from the automotive sector corresponding to the electrical harnesses division of a French multinational company.

Keywords: Supply chains, Delocalization, Facility location, Mathematical programming

CV:

Atidel Boubaker Hadj-Alouane was born in Mahdia, Tunisia in 1963. She received the "Principal Engineering" degree in Industrial Engineering from the National School of Engineers of Tunis (ENIT) in 1987, The M.S.E. and Ph.D. degrees in Industrial and Operations Engineering, from the University of Michigan, in Ann Arbor, in 1992 and 1994, respectively.

In 1995, she held a post-doctoral position at the Intelligent Transportation Systems laboratory of the University of Michigan. Between 1996 and 1997 she was an Assistant Research Scientist at the same laboratory. She is currently an associate professor at the department of Industrial Engineering of the National School of Engineers of Tunis. She is the head of the Master's Program of Systems Engineering and the director of the Optimization and Analysis of Industrial and Service Systems Laboratory.

Her current research interests include discrete optimization, logistics systems, hospital management, and hybrid systems. She has published in several international journals such as Operations Research, Journal of Scheduling and the International Journal of Production Economics.

REVERSE LOGISTICS OF COMPUTER HARDWARE: MANAGEMENT COMPLEXITY AND STRATEGY

Suzanne Marcotte, Marie-Eve Hallé

Management and technology, Université du Québec à Montréal, Canada
CIRRELT (Interuniversity Research Centre on Enterprise Network, Logistics and Transportation)

Type of presentation: Oral session

Abstract:

Increase in the number of computers discarded each year, as well as the many other short life time products, increases the problem of waste management. It would be unbearable in an environmental perspective that these computers end-up in a landfill. This problem pushes firms to become more responsible in the role they have to play towards these products at their end of their use. New specialized players come into being in the flow management of discarded computers. Some aim for environmental protection; others aim for profitability and computer secondary market. This presentation tackles the flow management problems of these facilities by highlighting the particularities of each type according to their mission and their strategies deployed such to manage the flow and operational complexities. It will thus become clearer that the flow management is a key competence for facilities in the computer reprocessing industry.

The reverse logistics can be characterized by five aspects: inventory management and production planning, time, quantity, price, and network. Indeed, even if the network might simply looks like the “reverse” of a forward logistics system, its players role is less obvious, operations are more complex due to the uncertainty of several aspects of it. For example, the quantity and arrival time of discarded computer is usually unknown and hard to predict. Also, the value of the recuperated computer or of its parts, or of raw materials, that can be recycled is hard to establish and is highly related to its lifetime. Thus, it becomes harder to manage inventory of items with high obsolescence rate such as recuperated computer parts.

Since the reverse logistics imposes high complexity and uncertainty, the research aims to see what are the strategies facilities deploy to cope with, such to reduce the difficulties to manage the operational system. Thus we first depicted this industry in the eastern part of Canada by analysing operational functions of 18 players in the reverse logistics network. To give a global perspective of the supply chain of computer recycling, players which have different roles in this supply chain have been visited. Among these, some are suppliers, no-profit organizations or players on the international computer secondary markets. This industry is depicted using the framework proposed by De Brito, (why, how, where, who, what) which might appear simple, but helps to clearly analyze the particularity of this industry. For example, why are computers (and other electronic equipment) recycled, does it come from people awareness of pollution problems or by law enforcement? How and where are computers collected? Who recycles them, the original manufacturers, a government, profit based or non-profitable organizations? Are they repaired, do they have parts reused, or are they recycled?

These answers will help to depict the reverse logistics network and the roles of each player. This presentation will make possible a better understanding of suppliers and competitor relationships' and the complexity it adds to the network management. This network is complex due to the fact that many players have several roles in the supply chain. The typical roles are: user, computer stock management, computer restoring, scrap merchant, selling of used material, parts recycling, raw material transformer and shipper. These roles are compared according to the input, recycling facility process and output related characteristics. For example, input characteristics include supplier type (individual, government, business), collection point and system, input type used (computer processor type, brand), forecast. Among the recycling facility process includes sorting activities, dismantling and storing computers or computer parts as well as inventory management. Issues are addressed such as material flow, process automation and profitability of value added activities. The output characteristics include sale forecasts of parts and of computers, distribution network, client type and location throughout the world.

In analyzing the different method used by the players that were met, we are able to determine how their methods used make it possible to manage the operational complexity characterized as the recycling

industry. In addition, this will also demonstrate more clearly the complexity of the reverse logistics network in comparison to the electronic recycling operations and its particularities.

Keywords: Reverse Logistics, Computer, Waste management, Operation management, Network

CV:

Suzanne Marcotte is a Professor of Operations Management in department of Management and Technology, University of Québec in Montréal (Canada). Her Ph. D. is from Laval University (Canada) on Holographic Layout Design of Facilities. Beside reverse logistics, her research interests are facilities layout, design and operations management, robustness evaluation and analysis and operations research.

CLUSTERING OF AUTONOMOUSLY COOPERATING LOGISTIC ENTITIES USING AGENT-BASED FRAMEWORK

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Abstract:

Transportation of logistics plays a vital role in the success of an organization. The ability to transport goods quickly and cost effectively is seen as a vital factor for an organization. In transportation logistics, atomization of transport processes along with congested traffic infrastructure lead to highly dynamic and complex logistic processes. Additionally these complexities and dynamics can also be caused by the changes in orders, information shared, etc. The arising complexity and dynamics in logistic networks put forward a great challenge for the organizations.

The vision of the Collaborative Research Centre (CRC 637) Cooperating Logistic Processes is to equip logistic processes and logistic objects with the capability to take decisions autonomously [1]. Within the CRC 637 the paradigm of Autonomous Cooperation was introduced by the research group of Prof. B. Scholz Reiter few years ago. To handle the increasing complexity in logistic processes together with the rising dynamics by autonomous cooperation, information and communication technologies like RFID, agent technology, communication networks' paradigms are integrated in the logistics networks to bring better planning and management solutions [2]. The idea of making use of these technologies is to move the decision making down to the level of an individual item in the logistic chain i.e., a vehicle, container or even a package. This requires that every item in the logistical network be autonomous, reactive and communicative to participate in the intelligent negotiation and decision-making process. This leads to knowledge and decision being distributed to the individual autonomous entities. Vehicles and goods become intelligent, interactive and capable of deciding to achieve their respective goals.

In current logistic networks, routing and assignment of transport orders to vehicles are done by a dispatching system or a human dispatcher. Until now, more of research on this is done using some heuristic approaches e.g. evolutionary algorithms or Tabu search methods etc. Agent-based routing has been introduced by the researchers at the University of Bremen. But, routing results in substantial communication traffic as a result of messages exchanged for route discovery between individual goods and vehicles. In this work, the concept of clustering logistic items based on the common attributes they share is presented using the software agent framework. Various parameters based on which logistic items can be clustered are, for example, destination, origin, geographical region, route, price, type of goods like temperature dependent or prioritized with respect to life time of delivery etc. For example, in case there are large numbers of components to be distributed to various regions and if the entities form clusters based on the destination, then the cluster-head on behalf of all other logistic entities can negotiate with the vehicle depending on the number of goods and availability of the space in the vehicle for its transportation. Thereby, the required communication between the autonomously cooperating logistic components can be optimized along with efficient negotiation capabilities. Additionally the vehicle can decide which route they need to travel on the information available of the clustered entities. This paradigm can reduce the cost expenses in transportation of goods such that the vehicles can in advance decide upon the most feasible route to travel. This will in turn maximize the truck utilization in addition to the better routing efficiency of the vehicle.

[1] Windt K, Hülsmann M. (2007): *Changing paradigms in Logistics – Understanding the Shift from Conventional Control to Autonomous Cooperation and Control*. In: Understanding Autonomous Cooperation and Control in Logistics, p.1-16

[2] Scholz-Reiter B, Windt K, Freitag M. (2004) *Autonomous Logistic Processes – New Demands and First Approaches*. In: Proc. 37th CIRP International Seminar on Manufacturing Systems, Budapest, Hungary, pp 357-362

Keywords: Clustering, Routing, Autonomous, Logistics, Software agents

Cv:

Gulshanara Singh, B. Eng, Msc, received her Master of Science in Information and Communication Technology in December 2005, at the University of Bremen, Germany. In 2006, she joined the International Graduate School for Dynamics in Logistics, University of Bremen from Communication networks group, University of Bremen as a PhD student. Her field of interests includes communication networks, sensor networks, software agents and its application in logistics.

ROAD PROJECT MANAGEMENT AT THE MTQ: A NEW INTERNATIONALLY RECOGNIZED PROJECT ADAPTED TO ROAD PROJECTS

Josée Gagnon, P. Eng.

Type of presentation : Oral session

Abstract:

Summary

In an effort to gain a better understanding of the content, the cost, and the completion deadlines involved in road projects, the Ministère des transports du Québec (MTQ) decided to adopt an updated and results-oriented road project management approach starting in 2001. Following a diagnosis and analysis of its work methods, the MTQ recommended a structure for implementing various projects related to the processes, vision, and developments associated with a number of computer tools. From this, in 2005, it adopted a departmental procedure aimed at improving its road project management (RPM) by focusing on actions related to implementing internationally recognized project management principles, as taken from the PMBOK® that was developed by the Project Management Institute, and adapted to the realities of the Québec road environment.

Among the tools that are made available to the territorial branches are two complementary guides that define major management principles, concepts, and steps associated with road projects. First, the *Guide de référence du cheminement ministériel de réalisation de projets routiers* (Reference guide to the departmental process for carrying out road projects – French only) presents the departmental process, along with specific control points, stages, phases, steps, and deliverables, rather than activities. This guide makes it possible to link the technical production elements of a road project to the road project management process. The road project management cycle is described in a document entitled *Guide de gestion de projets routiers* (Guide to road project management – French only), which defines the management areas and the various stages and management processes. More specifically, it specifies the appropriate time to apply these processes and the typical deliverables related to each area of project management. In addition, a number of tools for supporting the application of these processes are recommended, including management plans and a project charter.

Background

The Ministère des Transports du Québec is the largest supplier of work among government departments. In recent years, the number, size, and complexity of road projects have increased significantly. In addition, there is a smaller workforce available in terms of managing projects involving road infrastructures.

The five-year MTQ plan lists more than 4,000 road projects at various stages of preparation, representing some \$1.7 billion in road projects for 2007-2008, and even more for the following years. On average, approximately 700 contracts are awarded each year for construction projects alone.

The portfolio of road projects is diversified, and includes projects related to the preservation of roadways, the conservation of structures, and the improvement and development of the road system. Geographically, these road projects are equally divided among the 14 territorial branches that serve the province. The number of activities varies from one road project to the next, but generally ranges between 50 and 150 per project.

A combination of internal and external resources are used to carry out the activities associated with the management and execution of road projects (professional service firms, consulting-engineering firms, building contractors, etc.).

Road project management guides

- ***Guide de référence du cheminement ministériel de réalisation de projets routiers*** (Reference guide to the departmental process for carrying out road projects)

For several years, stakeholders at the MTQ who are involved in the preparation and execution of road projects have used a variety of technical guides that cover all aspects of the typical process for executing road projects. With the publication of the *Guide de référence du Cheminement ministériel de réalisation de*

projets routiers, the MTQ hopes to provide the various stakeholders with rapid access to all of the information related to the elements of the departmental process.

The *departmental process for carrying out road projects* must be considered to be the basic reference for all initiatives aimed at supporting or guiding the execution of road projects by the MTQ and at describing the subsequent levels of activity. As such, the departmental process identifies and describes the approved and recognized steps in the process of carrying out road projects at the MTQ. It places the emphasis on deliverables to be produced instead of activities to be carried out. By specifying the deliverables associated with each phase, it gives the project manager an opportunity to select those deliverables that are relevant to the project and that must be completed, and to plan the production of these deliverables.

There are five phases involved in the execution of a road project: feasibility study, design, preparation of plans and specifications and the clearing of rights-of-way, construction, and assessment. Some of the phases are further divided into multiple steps. The feasibility study phase includes the Requirements study step and the Solutions study step. The design phase includes the Preliminary pre-project step and the Final post-project step. The preparation of plans and specifications phase is divided into a preliminary step and a final step. And finally, the construction phase includes the awarding of the contract, authorizing the work, carrying out the work, and transferring operations.

■ ***Guide de gestion de projets routiers*** (*Guide to road project management*)

As previously mentioned, the MTQ awards hundreds of preparation and construction contracts for the repair and improvement of the Québec road network every year. Its five-year plan contains several thousands of preparation projects divided among the 14 territorial branches.

Faced with an increasing number of projects to be carried out, MTQ officials decided to implement a modern project management approach that focuses on results and targets the implementation of processes, resulting in better control of the content, cost, and production timeframes for each project. To this end, the primary objective of the *Guide de gestion de projets routiers* is to present a management cycle aimed at improving the departmental process for executing road projects.

The escalation of expertise and knowledge has resulted in increasingly complex projects. Thirty years ago, the construction of a road was a relatively simple project. Over the years, new obligations that had to be integrated have been added in order to respond to concerns related to the development of society. Obligations ranging from authorizations that must be obtained, stakeholders that must be consulted, the minimization of impacts on users, worksite safety, the hiring of agents, the increasing number of public services that require relocation, and the obligation to integrate road projects into a built environment, among others, make the production of road projects increasingly complex. Project management appears to be a simple and realistic means of satisfying production objectives while making it possible to integrate new issues into the process.

The MTQ wanted to draw its inspiration from best practices in project management, and to this end, it chose the Project Management Body of Knowledge (PMBOK® Guide), produced by the PMI (Project Management Institute), because it is internationally recognized and is constantly evolving at the hands of its community of practice, which is active throughout the world.

Founded in the United States in 1969, the PMI was initially developed to satisfy the construction requirements of the US Department of Defence. The PMI is constantly evolving and penetrating into every area of activity. There is no question that the rapid growth of the PMI is the best indicator for the development of project management and the interest that it evokes. The PMI currently boasts more than 260,000 members in 171 countries. The Project Management Body of Knowledge (or PMBOK® Guide) has been updated and published every four years since 1996. It comprises all of the knowledge in the field of professional project management. The PMBOK® Guide also includes a common lexicon that is useful for debates and the drafting of documents used for project management and its application. This type of standardized lexicon is an essential element for any profession.

Therefore, by adding certain project management concepts, specifically project structure, the roles and responsibilities of the various players and stakeholders, and a project management cycle, the *Guide de gestion des projets routiers* enriches the framework of the *Guide de cheminement ministériel de réalisation des projets routiers*. All of these elements are perfectly in keeping with the PMBOK®, and are integrated into the departmental process.

The project management process includes the integration of two dimensions: the technical dimension and the socio-cultural dimension. The technical aspect of management includes the organization and logic behind the process, namely project planning, scheduling, and control, as well as clarification of the contents of the project, which makes it possible to establish a direct link between the client and the project, thus facilitating planning and control. Thanks to the integration links, it is possible to identify the source of the most minor change affecting any section of the project, and to provide all project stakeholders with the information they require in order to make decisions. The second dimension involves the socio-cultural environment. Unlike the orderly world of project management, the socio-cultural aspect adds confusion and disorder to the project environment, and the impacts of this aspect on projects are generally underestimated and rarely documented. Project management makes it possible to ensure that all of the concerns and issues related to each project are taken into consideration. It is also the responsibility of the project team to determine what is appropriate for each project, both in terms of the deliverables to be produced pursuant to the departmental process and in terms of integrated project management.

For the MTQ, a road project begins as soon as the need is recognized and it is understood that the MTQ will head it, and ends only after the constructed structure has been assessed, the management balance sheet has been produced, and the transfer of operations has been completed. Therefore, by implementing the project management process, the MTQ is striving to "apply a cycle that ensures continuity and quality in terms of the management of resources, content, and information related to the project, from the moment when it is received until the final assessment has been carried out."

The road project management cycle focuses on five process groups (called management cycle stages) and nine areas of knowledge (called road project management areas). The five management cycle stages for road projects are: start-up, planning, supervision, control, and closing. The nine management areas are: project integration, content, timeframes, cost, quality, human resources, communications, risk, and supplies.

At the beginning of each phase of the *departmental process for carrying out road projects*, the Project management plan is updated in order to incorporate any elements of information that have recently been obtained or produced. As a result, the entire project is planned with greater accuracy at each phase. The transition from one phase to the next is marked by a control point, which becomes the preferred mechanism for establishing a solid link between the concerns related to the execution and the management of a road project.

Integration of guides and tools

As previously mentioned, the two MTQ guides are integrated:

- The *Guide de référence du cheminement ministériel de réalisation de projets routiers* presents the list of the required deliverables and the delivery sequence;
- The *Guide de gestion de projets routiers* presents the management framework that is required in order to complete a project while respecting the content, timeframes, and cost.

A solid understanding of both guides makes it possible to plan road projects better by providing a flexible breakdown of deliverables (thorough but not rigid), the structure of this breakdown as adapted to each project, and a project management structure inspired by best practices. The integration of the two guides or processes creates a gauge of success. Specific training related to each of the guides and processes will be offered in order to facilitate improved integration.

In addition, the introduction of computer tools to support the processes, deliverables, and concepts presented in both guides is another lever and catalyst for the integration of the objectives of the road project management improvement process.

The MTQ decided to install the MSPProject software application after taking into account the technological environment, the training opportunities that are available across the province, the university training that is received by new graduates, the increasing use of this tool by the MTQ, and the constant improvements made to this tool, including multi-project management.

The implementation strategy for this software application is based on a decentralized organization, with one territorial branch acting in partnership with two other territorial branches for the pilot project, which will make it possible to adjust to the needs of users before the application is launched in all territorial branches. The clientele targeted by this project is composed of project managers and account executives. During the initial phase, the project will be launched with no computer development, but with parameterization. During the second phase, links to other systems operated by the MTQ will make it possible to avoid the duplication of data entry, and will allow it to take existing data into consideration.

Other computer tools are also being developed. A departmental project management results scoreboard is currently at the stage where it is expanding on the needs of a target clientele that consists of directors, general managers, and deputy ministers. This scoreboard is integrated into the work of the corporate information bank (CIB). The final project involves the development of a project estimate method for control points 1 and 2. This project has reached the business file stage.

Conclusion

The MTQ has committed itself to a series of coordinated initiatives aimed at improving road project management. The execution and implementation of the two processes, which are defined in the guides, constitute one of the major keys that will make it possible to achieve this objective. Another key is the implementation of information technology tools to support the various processes.

In addition, the adaptation of the internationally recognized Project Management Body of Knowledge (PMBOK® Guide) produced by the PMI (Project Management Institute) allows the MTQ to draw its inspiration from best practices in project management, and to benefit from these practices in order to remain a forerunner in the area of road systems management. Each project team is responsible for determining what is appropriate for each specific project. Furthermore, each territorial branch remains autonomous in terms of its use of the various guides, tools, and requests for support, and their respective local improvement plans target priority elements in the road project management improvement process.



Marcelle Rey-Campagnolle
D.Sc-physics
CNRS honorary director of research

After her Doctorat d'Etat (highest level of Doctorate in France) in 1972 she entered a career of researcher at CNRS up to her retirement in 2000. Experimental nuclear physicist, she worked on pioneer and exciting subjects, developing new methods: analysis of the first Moon samples; search for super heavy elements, exotic nuclei, charmed particles; study of strangeness...Physics has its poetic side! Starting with experiments which could be performed by a small team in her home laboratory of Orsay (at Paris XI University) or in some other labs in Europe, in the 60-70's, she gradually moved to experiments requiring more and more resources, i.e. large international collaborations. She spent almost 20 years, completely devoted to research and student training at CERN, the European high energy physics laboratory close to Geneva. These years made her a convinced European.

She is author of more than 50 articles published in scientific journals

Engaged in science outreach, she created in 1994, with the support of CERN and of a European Network of Universities, the 1st European graduate courses on the Physics, Technology and Applications of Particle Accelerators –JUAS- She run it for 7 years.

Vice-president of Euroscience-Léman (1999-2004), regional section of the European association Euroscience. she set up "Science Cafés" at the high school and the annual Science Festival in Pays de Gex (French Geneva border); a way to follow one aim of the association "to strengthen the links between science and society".

Since her retirement, her activity has mainly been directed towards the promotion of equal opportunities between women and men in scientific careers. She gives conferences on many occasions; was chairperson for the organisation in Paris of the 1st International conference on Women in Physics of the international Union of Pure and Applied Physics – IUPAP. (2002).

Member of the first Board of Administration of the French association Women and Sciences in 2001, she was re-elected in 2007. She was a member of the organising committee of several Femmes et Sciences yearly conferences.

She has enjoyed being a grand mother for 19 years, and now lives in Paris.



Monique MOUTAUD's BIOGRAPHY

Monique Moutaud spent her whole career at the international bank Societe Generale during 36 years. During her most recent position, she was in charge of the Information System Strategic research at the corporate level after carrying out duties in International export finance, Information system management on strategic data bases of the bank.

She is an alumna of the Ecole Polytechnique Feminine (EPF), a famous French engineering school which hosted only women until 1995.

In parallel to her career, she has always been active in the promotion of women engineers in the society and she had different responsibilities in the French Engineering World:

- she was President of the association of EPF alumnae from 1992 to 1996 and was involved in the board of this engineering school during this period ; from 1998 to 2006, she was an executive member of the EPF board.
- she was member of the board of CNISF (Conseil National des Ingenieurs et des Scientifiques de France) which is the Federation of all associations of engineering school alumnae at the national level from 1995 to 2001
- In 2001, she became President of the French Association of Women engineers named FI until 2007
- In 2005, she was nominated by INWES (International Network of women engineers and scientists) as the Chair of the 14th international conference of ICWES which will be held in France in 2008.

During her whole professional life, she has been investing a lot of time to promote the engineering careers in high schools and to develop more women engineers in decision making positions in different organizations.

Her motto is: "to be present each time the women engineers community appear as a minority" in engineers communities as well as in the professional world.

MODELING DYNAMICS OF GLOBAL VEGETATION PATTERN: PREDICTING PATCHINESS IN DISTRIBUTIONS OF DIFFERENT VEGETATION TYPES

Nelli Ajabyan

Institute for Informatics and Automation Problems of NAS RA, Armenia

Type of presentation: Oral session

Abstract:

We analyze the problem of structure formation for the Lotka-Volterra model describing the dynamics of global vegetation pattern under the climate change. The conditions for a fractal structure existence with a mosaic of different vegetation patterns are defined. In particular, irregular behavior of solutions bifurcating from the steady state in a two-species model with inclusion of random disturbance events is derived. The latter presents the theoretical evidence for potential of complex structures arising corresponding a continuous change of model parameters. The model is obtained from a special class of Lotka-Volterra competition models originally explored in [1]. The results are used for description of transition zones between taiga-steppe in the Central Siberia under the climate change (CO₂ doubling scenario).

The state variables are interpreted as different types of vegetation which correspond to the density of living biomass of a selected type at some geographical point (x, y). We study the change of dynamics of model with respect to discrete values of parameters with further analysis of stability under continuous in some vicinity of a selected value. Under this condition the model can be described by ordinary differential equations. A movement in the transition zone between types of vegetation then is determined in parametric space rather than considering solutions of partial differential equation system. The most important is GVP map, which represents a geographical distribution of different types of vegetation. As it is indicated in [1], the map is a space of discrete structure. To interpret the results we will use the approach developed for the original model, based on definition of a mapping from parameter space to geographical points.

The complex behavior is formally determined in the general dynamic model with three species when unperturbed system can itself possess chaotic orbits. The third component is included in the model as a pseudo-type designed to integrate different disturbances in the system, examples of which present seasonal growth of parasite insects or insect invasion, consequences of fires that cause a relatively long term impact on the change of dynamics. The resulting system hence is a dynamic system of one predator with two competing species as a resource type. In this model free spaces which occur after some events can be later occupied by the species with faster response to occurrence of fruiting conditions. In a long term scale later it can be replaced by the second competitor, thus moving the border between species. The latter is not necessarily a straight line on a specific spot but could be a line of wavelike form.

Vandermeer [2] provided examples demonstrating complicated patterns in tree species distribution of tropical rain forests. He proposed that transient dynamics represents the continual shuffling among various basins of attraction under perturbation caused by disturbance events repeatedly affecting the forest. The most interesting point here is finding empirical evidence since the recruitment limitation (defined as the failure of species to colonize a suitable vacant site) is acute in forests when generation times are many decades.

The method of investigation is based on identifying invariant sets of the dynamical system. The smallest of them are the equilibriums. The stability of equilibrium can change in result of bifurcations as parameters of the system change.

New invariant sets defined in result through a prescribed tuning of multiple parameters in the system. These sets are idealizations but are associated with a range of definite behavior in case of slightly weaker assumptions on parameters than the tuned ones. In more than two-dimensional case the invariant sets are destroyed by local or global bifurcations. Local bifurcations may generate periodic solutions or new homoclinic or heteroclinic cycles, while global destroy links between two invariant sets. It has been recognized recently (see, for example, [3], [4]) that heteroclinic cycles are associated with bursting and intermittent behavior, as well as give rise to chaotic dynamics. In general the trajectories escape from the invariant sets when small symmetry-breaking terms are considered or under stochastic perturbations. A weakly broken symmetry gives rise to intermittent dynamics in some nearby invariant region, while noise may allow the trajectories to jump across the invariant space. Due this process of potential random switching the partition of phase space and definition of transitions through it is very important for predicting the behavior of the system

We have shown analytically that GVP dynamics could demonstrate complex behavior with multiple equilibriums, chaotic dynamics associated with them as well as transition zones between two consequent states. The main parameter of the model is defined by distinct values of productivity function. A new variable has been integrated to the system; only general assumptions are made with respect to this function characterization. We model the competition between the destabilizing effects caused by some event with stabilizing potential of the two-species system. We illustrate that in case the strength of destabilization is weak (with respect to existing resource, i.e. biomasses and their potential to renew and survive) and then damping takes place the chaotic dynamics is revealed that can provide a distortion of the borderline or an essential shift, which however will not bring the system to the origin with corresponding dead space in the model.

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Key words: global vegetation pattern, competition models, transient dynamics, complex behavior

CV:

I participated in ICWES13, held in Seoul. i am a member of the Center for Development of Civil society and we participated in programmes directed to education of young women from vulnerable families. I am also a lecturer and deliver the course "Operations Research in Economics". However this work was elaborated when I was in Potsdam Institute for Climate Research, Germany, in fact it was done in coauthorship with Yu. M. Svirezhev, who died last year which was a great loss. I have to present it only from my name. I am a candidate of physical mathematical sciences and highly eager to come to the conference.

IMPROVING LIVELIHOODS AND ENVIRONMENTAL SUSTAINABILITY THROUGH HORTICULTURE-FISH INTEGRATION IN KISII AND KURIA REGIONS OF THE LAKE VICTORIA BASIN

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Type of presentation: Oral session

Abstract:

The majority of the population in the Lake Victoria basin is composed of poor small-scale farmers whose livelihoods depend on seasonal rain-fed agriculture. Overall farm production is low due to fragile socio-economic and environmental conditions. Integration of aquaculture into overall farm activities has the potential to increase incomes and food security and to rehabilitate water resources and soils.

55 farmers from Kuria and Kisii were interviewed in a reconnaissance study to gather socio-economic information as well as status of fish farming and level of integration of horticulture and fish farming. The farmers underwent training on Integrated Aquaculture-Agriculture. They were exposed to alternative resource use techniques and their adoption and provided with protocols on how to make fish ponds, water management, predator control, integration of fish farming with horticulture, fish feed preparation and feeding, disease control and methods of fish harvesting, collecting data on production and marketing of farm produce.

Fish ponds (average 200 - 300 m² and 1 – 1.5 m depth) were thereafter prepared anew (from land used for eucalyptus growing and also open pits once used for making bricks) or renovated and stocked with *Oreochromis niloticus* of 10-12 cm TL at density of 4 fish m⁻². The pond inter-banks and adjacent land were used to raise horticulture crops for human food as well as fish feed and for sale. The type of vegetables included indigenous leafy vegetables (*Amaranthus* sp, *Vigna unguiculata*, *Solanum nigrum*, *Crotalaria* sp, *Gynadropsis gynandra*, *Corchorus olitorius*) and kales. They were interspersed with bananas and avocados. The fences around the fish farms were planted with climbing vegetables and fruits; passion fruits, *Basella alba* and *Cucurbita pepo*.

Normal aquaculture practices were followed in the establishment, management of the fish ponds, feeding and harvesting. Vegetable from the integration were used to supplement the artificial feed. Fish were harvested after eight months. Records were kept of the quantities of vegetables, fruits and fish harvested, how much of each was used at home, how much was used as feed and how much was sold.

The reconnaissance showed that 55% of the farmers grew vegetables but not for integration. Vegetables were mainly grown for home consumption with only 3.4% selling for cash among individual farmers and only 1.7% among group farmers. Consequently only 2% indicated that they obtained profit from vegetable sales. The mean area of the pond and the integrated vegetable plots around the pond was 0.025 – 0.035 ha. The mean value of fish harvested per farmer practicing integrated aquaculture – agriculture was USD 103 ± 41 from a mean pond area of 148.85±10.74 m² (0.015 ha), of which the value of fish sold was USD 86± 42, while the value of fish used as food at home was USD 33 ± 11. One farmer obtained a much higher harvest than the rest due to moderate and large quantities of fish and vegetable harvested. His harvests have not been used in the calculations. If they are included, then the mean value of fish harvested per farmer was USD 184 ± 85, of which the value of those sold was USD 155 ± 73, while that of fish consumed at home was USD 48 ± 19.

The mean value of vegetable harvested per farmer was USD 35 ± 10 of which the mean value of vegetable sold was USD 28 ± 11, while the value of those consumed at home was USD 17 ± 4 per farmer. If the yields of the farmer mentioned above are included in the calculations, then the mean value of vegetable harvested per farmer was USD 211 ± 116, of which the value of those sold was USD 160 ± 87, while that of those consumed at home was USD 91 ± 43. The mean overall income from the aquaculture – vegetable integration per farmer was USD 132± 50 otherwise it becomes USD 369 ± 176 when yields of the farmer mentioned above are considered

The current experiment is being undertaken on the use of pond water in growing vegetable under IAH. Since the pond is fertilized with manure, vegetable and farm organic wastes, the water from the drainage used is rich in nutrients which are necessary for vegetable growth. Farmers are advised to finely chop the green vegetable into small sizes which can be eaten by fish. They have also been advised them to tie the vegetables in bundles and suspended in the water column for fish to bite off bits as food. The green vegetable not utilized by fish decomposes and encourages the proliferation of fish food in the pond. The additions of organic manure and remnant vegetables after fish have fed decay in the pond, releasing nutrients, which stimulate production of natural fish foods. These can be used to fertilize the nutrient poor soils.

Integration of aquaculture-horticulture into overall farm activities increases overall yields and income among small-scale rural farmers and rehabilitates exhausted lands. Supplementation of fish feed with vegetables reduces costs of inputs. The reclamation of the idle land once used for brick making and rehabilitating it for fish culture improved environmental quality as well as contributing towards mosquito larvae control.

The Integrated aquaculture system provided fish and vegetable to the farmers during the dry season. They did not purchase any vegetable from the market as was the practice before. They also sold some of the fish and vegetables and used it for paying fees and settling debts. The portion of farms dedicated to IAH were initially small but the farmers have increased pond sizes, the number of traditional and exotic vegetables on their farms in order to increase yields.

Integrated Aquaculture-horticulture further transforms farm activities. The farmers moved the cultivation of vegetables from upland near the homestead to the area around the fishponds and used the later to cultivate other crops such as maize, beans and bananas. IAH ensures recycling of farm wastes and nutrients in the farm. This was through the use of vegetable and other farm wastes, kitchen remains and weeds as fish feeds.

Key words: Integrated-Aquaculture-Horticulture, food security, livelihoods sustainability, yields

CV:

DR. GENEVIEVE A. MWAYULI

Educationist and science researcher, Senior Lecturer in Biology, Chairs the Department of Natural Sciences. Teaches and supervises students at both undergraduate and graduate level. Research areas engaged in for improving livelihoods and environmental sustainability include Ethnobotany and use of plant products, Integrated aquaculture-agriculture, seaweed; science and mathematics education and environmental education. PhD in Environmental studies (Biology) obtained from School of Environmental Studies, Moi University.

An active participant in national and international seminars, workshops and conferences addressing challenges of contemporary significance e.g science and technology policy issues, environment, poverty, HIV-AIDS, Gender. Has strengths in skills and knowledge in collaborative process, brainstorming, Community-Based Instruction, Mentoring/Apprenticeship, Participatory research, Project assessment and appraisal. Able to cope with wide range of subject matter in environmental science research and pedagogy but particularly interested in evaluation of marine aquatic ecosystems.

Involved in four professional bodies, The Western Indian Ocean Marine Science Association; the African Women in Science and Engineering; the International Network of Women Engineers and Scientists; the Association for the Conservation of Environment and Nature. Also involved in the SIDA-Sarec funded Inter-University Council of East Africa Lake Victoria Research Project and Commission of Higher Education Research Project in researching in integrated aquaculture.

SUSTAINABLE PRODUCTION ENGINEERING FOR GREEN COMPOSITES USING BAMBOO FIBERS

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Type of presentation: Oral session

Abstract:

Recently, industrial products made of glass fiber-reinforced plastic (GFRP) have been used extensively because this material is light and has a specific tensile strength as high as that of steel. However, use of such materials may have a negative impact on the environment because of problems associated with their disposal or destruction. Conversely, use of unused forest products is beneficial to the environment, and therefore the application of natural fibers in FRP products has been proposed. Bamboo fibers, in particular, have attracted attention as sustainable materials because bamboo has the fastest growth rate among the various types of renewable natural fibers. Moreover, bamboo fibers have high specific strength and stiffness, at suitable levels for structural materials. Bamboo fibers are typically obtained from the bamboo pipe through various methods, such as crushing, heat steaming, or shearing after swelling the bamboo stems. Using these conventional methods, however, it is difficult to obtain large quantities that have the consistently uniform shape necessary for high-quality fiber components in industrial materials. This non-uniformity complicates obtaining uniform-sized fibers from natural bamboo. Therefore, this paper proposes a new mechanical method for obtaining bamboo fibers using a machining center (MC). As a result, the desired bamboo fibers could be obtained with high quality and accuracy using end-milling with an MC. Moreover, good formability was obtained as industrial products.

Key word: Bamboo Fiber, Sustainable, Green Composites, Natural Material, Production Engineering, Machining Center

THE IMPORTANCE OF SEISMIC STRENGTHENING IN ADOBE HOUSES IN RURAL PERU

Karym Perez Cueva,
Civil Engineer, Road Engineering Master.

Type of presentation: Oral session

Abstract:

The Coast, The Andes and The Jungle are the three natural regions of my country, each defined by altitude, climate and diversity of traditions and customs; in The Andes region which is the poorest, is where the greatest number of people do not know the constructive process to strengthen their houses which are mostly adobe, in Peru is known that to make a house with brick is three times more expensive than to make a house of adobe.

The failures occur because the seismic loads perpendicular to the plane of the wall produce flexion in its core higher, which becomes criticized before the absence of a solera beam, and the tracciones present at the wall are not properly transmitted to the wall cross by the weak connection between them, even when the connection is jagged.

There is a lot of information about this subject, the principal idea of this document is to be specific to know the proper materials and constructive process to follow; The National Institute of Civil Defense (INDECI) reported that the earthquake on August 15, 2007 in Peru at least 330 people have lost their lives, Chinchipe city disappeared to collapse adobe houses that did not present additional material to provide resistance to a phenomenon such as happened, my country has pretty seismic zones and natural disasters can occur at any time, leaving thousands of families without a place to live.

Adobe is known throughout our history because it is a material that allows easy access and creates acoustic environments and temperate in areas of extreme cold or heat.

We need to educate people to build their adobe houses taking the following basic reasons for the constructive process, knowledge about technical aspects, scientific and practical.

- No built adobe houses in loose granular soils, in cohesive soils soft or in expansive clays, nor in areas prone to flooding, channels of avalanches, alluvium or huaycos, or soils with geological instability.

- Using suitable land for making adobes, adding bagasse to make them more durable and resistant.

- Foundations must have a minimum depth of 60cm. and a minimum width of 40 cm.

- Build foundation and on foundation of cyclopean concrete, wetting the adobes to settle them, use divisions fixtures on the boards and soleras beam with 02 rods of iron 3/8".

- Strengthen the walls with vertical and horizontal stripes mesh electro welded wire from 1mm diameter and spacing of 3/4" cover with cement mortar sand 1:4, which reaches a tensile strength equal to 1825 kg. and can put it directly to the wall without danger of corrosion.

- Strengthen the corners or encounters between walls and in the top of the walls on both sides, in the case of a second floor strengthen with electro welded mesh to interconnect with No. 8 wire that surpasses the walls by drilling every 50 cm., the wire is bent 90 degrees and this bend nails against the mesh and the wall, using staples 3/4", then cover with cement mortar sand 1:4 of 2cm thick.

The vertical strengthening serves to maintain the integrity of the walls fixing to foundation and the solera beam and restricts the perpendicular flexion to the plane.

The horizontal strengthening helps to convey flexion and the inertia forces in the transverse walls, minimizes the spread of vertical cracks, this strengthens connect the foundations, the soleras beams and the roof.

The constructive process for the strengthening of the roof and adobe walls should be made with wall clean, free of loose particles we must be reviewed if there is any crack or fissure no more than 1cm this should heal and then proceed to delineate where place the horizontal and vertical meshes, first considering the location of the wire connectors No. 8, the first point is 25 cm from the edge of the wall, the electro welded mesh must be nailed directly to the wall, the vertical mesh is installed before horizontal mesh, the overlap should never be made at the middle or at the corners of the walls, then cover with cement-sand mortar 1:4.

The main recommendations to build adobe houses should be from only one floor, using lightweight roof, build on firm foundations, the height of the wall should be no more than eight times the thickness of the wall.

I am sure it is necessary to publicize the importance of affordable housing, convenient, easy and safe to live with seismic strengthen.

The main idea is to improve housing and make them anti seismic, the earthquake often occurs when people sleep and they do not have enough time to evacuate from their homes and die crushed by the collapsing walls and because the roof falling over them.

Exchange information about these needs and as engineers promote an opportunity to change in the world, to improve the lifestyles of the areas of greatest need, starting from universities, teaching students must be build adobe houses for people from remote villages and less economic resources, we must not stop science, it must be used with ethical approach, prevention is a correct action.

Keywords: seismic strengthening, adobe houses, rural, Peru.

CV:

My name is Karym Perez Cueva, I am from Peru , I was born in 1975, now I am 32 years old.

I am Civil Engineer and Road Engineering Master from Piura University. Currently I am working as a consultant on rural projects independently and also worked as Adviser Works in a Storage Warehouse in Lima.

I am a member of the Institute of Construction and Management since 2006. I worked for 6 consecutive years in Cartavio Sugar Factory as Supervisor in Maintenance Services and then as Civil Engineer Supervisor, my job was to improve the infrastructure of the Sugar Factory and had a staff who worked as a General Services of the Factory.

Three years ago I was Travel Award recipient for 13th International Conference of Women Engineers and Scientists in Korea on August 2005; I watched closely the work of INWES to achieve the exchange of knowledge and analyze how we can improve the world in which we live; ICWES13 provide me with a room at the student dormitory of Ewha Womans University and it was an excellent opportunity in which I learned a lot about life style in a culture so progressive and admirable as Korean Culture, I presented my master thesis about the use of foaming asphalt to improve routes in the rural areas of my country, because it is important for trade and improving the quality life.

Some time ago when I worked in Cartavio, I watched closely the infrastructure of their adobe houses, some of them very old, the need for people and the lack of economic solvency made me worry about studying to how improve the structuring of adobe houses, I analysed and learned more about to build adobe houses with seismic strengthening using adequate structural system in adobe houses, which do not increase the cost for this reason I am introducing my topic THE IMPORTANCE OF SEISMIC STRENGTHENING IN ADOBE HOUSES IN RURAL PERU, there are different kinds of information regarding this subject, the important is that people should know more about the constructive process to follow in simple words and easy access to all population.

IMPACT OF TECHNOLOGY ON THE ENVIRONMENT AND ON LIVING CONDITION

Regina Stella Quintas Fittipaldi

Architecte et Urbaniste – Brésil

Type of presentation : Oral session

Abstract

Aujourd'hui on assiste à une clameur mondiale qui vient de différentes directions. Cette clameur demande la meilleure attention.

Les actions humaines qui concernent la recherche et l'application des technologies, qui auraient comme objectifs d'assurer la qualité de la vie humaine, en réalité s'appuient sur des modèles, des paradigmes, qu'il faut absolument reconsidérer devant les conséquences néfastes des actions anthropiques partout sur notre planète.

En fait, les chercheurs, les penseurs, les réflexions qui circulent dans le cadre académique et de la pratique professionnelle nous présentent de nouvelles perspectives sur lesquelles il faut discuter et débattre, afin d'engendrer d'autres postures personnelles et professionnelles. La question que l'on se pose c'est: comment intégrer notre connaissance actuelle afin d'aboutir aux changements urgents et nécessaires pour établir de nouvelles relations adéquates avec tous les écosystèmes de la Terre? Ceci pour promouvoir un avenir harmonieux pour tous.

Je vais vous présenter en exemple un cas particulier. C'est un projet d'architecture en étude, que nous réalisons dans nos bureaux. Le projet s'appelle "Cité Digital", à Brasília.

C'est une expérience de construction de 100.000 m², représentée par un ensemble de bâtiments ornés de jardins, dans un Parc Technologique.

Ces bâtiments abriteront les activités relatives aux entreprises de technologies d'informations digitales. La conception du projet intégrera les espaces vides des jardins, avec les espaces édifiés. La définition du langage architectural sera le reflet d'une étude approfondie sous la forme du développement durable. En résumé, l'emploi de toutes les techniques contemporaines disponibles dans le cadre le plus écologique possible, comme celui des technologies et des matériaux de constructions et de finitions qui réduisent l'inévitable impact que les actions anthropiques engendrent. De même pour la question de la réutilisation et le traitement des eaux usées, et des différents types d'énergies, comme par exemple l'énergie solaire.

Je propose un temps, dans ma conférence, d'échanges d'idées et d'ouverture de futurs débats, relatif à chaque communauté présente, afin de progresser sur le chemin commun de la préservation de notre Terre.

SOIL DECONTAMINATION: HOW CAN WE AFFECT METAL PHYTOEXTRACTION FROM CONTAMINATED SOILS

Irina Shtangeeva

St. Petersburg University, St. Petersburg, Russia

Abstract:

Industrial revolution and deficient waste disposal practices have led to significant pollution of soils all over the world. Hazardous pollutants range from various organic compounds to different metals and metalloids. Moreover, it is clear that with time new pollutants will be added to the list of well-known toxic substances. In all cases, these pollutants will represent a potential risk to soils that, in turn, will affect public health. To improve current situation it is necessary to develop and apply remediation technologies that would be effective both in decontaminating and in preserving soil quality and functions.

Soil remediation has rather short history. In recent years, biological remediation has emerged as a promising *in situ* remediation practice. This method is based on the ability of living organisms (first of all, plants and microorganisms) and their enzymes to destroy or accumulate various pollutants, thus cleaning/rehabilitating contaminated sites. This method is cost-effective and environmentally friendly since it keeps soil in their natural state. Despite many advantages of this technology, so far it has not found wide practical use. Especially this concerns phytoextraction of metals from contaminated soils. The applicability of the technique might be limited and practical implications might not be so evident as it looks from the first glance. There has been a great deal of speculative publications about phytoremediation, but just few successful examples of application of the technology that has resulted in sustainable, long-term solutions. At present, the technology is limited by the long time period required for soil clean up and problems in the producing a large biomass crops capable of accumulating not just one metal, but several metals simultaneously because multimetal soil pollution is a common problem. It seems that initial idea of the phytoremediation method – application of so-called plants-hyperaccumulators of certain metals - hardly may be practically feasible at the present state of knowledge. This certainly does not mean that we need to completely forget about the idea of using plants and micro-organisms to improve soil quality. We just can state that till now many questions remain about mechanisms of metal transformation in soil and metal availability to plants.

The main aim of the paper is to discuss why so far phytoextraction of metals and metalloids cannot effectively work. What are the main reasons of low effectiveness of metal phytoextraction from contaminated soils. What are the risks associated with different phytoremediation strategies. How sustainable/economically viable are proposed now phytoremediation techniques. What may be done to achieve success in this approach and facilitate transfer of the technology from well-tested ideas into practical implementation: understanding the key processes affecting metal phytoextraction from soil, metal uptake and translocation, metal/soil/plant/microbe interactions; selection of promising plant species capable of accumulating several metals simultaneously with insignificant harmful effects; application of well-tested agricultural practices for specific aims of soil remediation (amendments and treatments of soil and plants which would be able to affect both the plant yield and mobility/bioavailability of various metals). Special cases will also be discussed, including successful and unsuccessful examples of phytoremediation projects: combined organic/inorganic pollution (rehabilitation potential of the soils), remediation of radioactive contaminated soils, bioavailability of metals from different soil types.

Key Words: soil remediation, metal phytoextraction, soil/plant treatments

CV:

My main research interests are biogeochemistry of trace elements and development and application of novel techniques of remediation of contaminated soils using cost-effective and environmentally friendly methods. I am author and co-author of more than 40 publications in scientific Journals.

IMPORTANCE OF WOMEN CONTRIBUTION TO BIOTECHNOLOGY: PERSPECTIVES FROM UZBEKISTAN

Egamberdieva Dिल्фуза¹ and Gafurova Laziza²

¹Department of Biotechnology, National University of Uzbekistan, ²Tashkent State University of Agriculture, Uzbekistan, *UNESCO L'OREAL-“Women in Science” 2006 Fellow*

Type of presentation: Oral session

Abstract:

Severe degradation of the Aral Sea, and its implications on environment, which have been most adverse for the population inhabiting its coastal regions, has presented one of the major ecological catastrophes of the 20th century. Heavy metals along with pesticides are considered to be one of the most harmful pollutants are concentrating in the water and sediments of the seabed. This increased such social, economic, and environmental problems as early infant mortality, increased immunological, oncological and hereditary diseases, and serious unemployment, degradation of soil and water quality, and gradual abandon of agricultural activities. In response to environmental degradation, appropriate measures to improve soil and water quality are needed by using and/or adapting sustainable use of natural resources that reduce the risks to human health. To develop biotechnological approaches based on natural resources for the remediation of heavy metals and persistent pesticides and/or creation of new biofertilizers for rehabilitation of lands will ensure preservation and improvement of nature. In such countries the national interest need the critical development of a science, and technology, personnel that includes all gender groups, to ensure the future availability of skilled, educated and experienced workers. In developing countries men poorly involved in science, because they have to provide families basic sustainable needs, such as food and shelter, and forced to work in higher earning places. Women are underrepresented in scientific careers that support economic stability and growth and are poorly involved into decision making processes most luckily of cultural complexity. In such situation national and international science organizations play a conscious role in research planning and its development. If the national women science organizations acquire legitimacy to train of women in natural resource management and environmental protection, whereas international scientific organisations funds women engagement in science related activities, which will boost their interest into research. The laboratory of Biotechnology one of the best research group in the country can be presented as model group and it includes all women professionals and girls. The group has been established with great support of Society of Women scientist of Uzbekistan and research projects financed by UNESCO, NATO, and EU Foundations. The research project resulted in finding new low cost biotechnological approach such biological control agents and biofertilizers, which will help to solve important issues of soil pollution and produce ecological save crops in the salinated and contaminated soils. The proposed technology, over time, will help us to improve socio-economic quality of people's life through improvement and/or preservation of natural resources. Additionally the laboratory provides new advanced methods, literature, organise seminars for students in biotechnology and motivates other girls and women to find their happy life in science. Question is WHY it is important to inspire girls or women to do science in biotechnology? There are several reasons; environmental and biotechnological education is lacking in developing countries, malnutrition, new and re-emerging diseases spread, safe drinking water and agricultural contaminants is problem which has great negative impact on health. Women in the developing countries need to understand all related issues and the importance to family health of basic sanitation while living n rural areas. It will help to create a better social and political understanding of current biotechnological research.

Keywords: environmental contamination, Biotechnology, sustainability

CV:

Dिल्фуза Egamberdieva working as group leader of laboratory "Soil, Plant, Microbe Interactions" at the National University of Uzbekistan. She completed her PhD from Humboldt University of Berlin, Germany and conducted her PostDoctoral research work from various Universities of Europe. She has been awarded with UNESCO L'OREAL Fellowship for Women in Science in 2006, and MORRISON ROGOSA Award from American Society of Microbiology. She is member of National Women in Science Society of Uzbekistan and engaged mentoring students girls in Biotechnological research. Her work focused on development of biological control agents for protecting plants from disease, biofertilizers which can be applied for land rehabilitation and phytoremediation of polluted soils.

PREDICTION OF OZONE CONCENTRATIONS USING FUZZY LOGIC BASED METHOD

Biljana Mileva-Boshkoska, Vesna Ojleska, Tatjana Kolemishevska-Gugulovska
Institute of Automatics and System Engineering, Faculty of Electrical Engineering and Information Technologies

Type of presentation: Oral session

Abstract:

Air pollution is one of the primary environmental concerns in Macedonia due to the public health question. In the urban environment, the levels of ozone pollution are becoming more significant. Therefore, the first automatic measurement station of ozone in the country was installed even more than ten years ago. Nowadays in the process of EU integration, Republic of Macedonia has to harmonize environmental legislation with European one. According to the new Macedonian legislation for air quality (Law on ambient air quality, Official Gazette of Republic of Macedonia, no 67/2004) the country is obliged to perform continuous monitoring of the ambient air throughout the whole territory of the country. For that reason, the national measuring network increased up to fifteen installed automatic monitoring stations for gathering data for the air quality. They presently cover regions where highest values are expected throughout the whole territory of the country. According to the EU Directives there is a need for public information on the air pollution level in real time and to warn the general public in advance about the air pollution episodes.

In order to achieve prediction of ozone pollution we need to use effective mathematical prediction and modelling tools. Due to the universal approximation property, fuzzy systems represent a good framework for modelling complex and highly nonlinear systems. The objective of our study is to research the fuzzy identification model allowing us to predict the future hourly values of ozone concentration from past and present data. In this paper we present a fuzzy logic identified model for prediction of ozone concentrations. The advantage of prediction methods based on fuzzy set theory is the ability to express the models obtained in the form of fuzzy rules. The fuzzy rules are very close to human language which allows one to easily explain and justify the predictions made by the model. The main emphasize is adjusting the type of membership function that we choose as it has a significant impact on the ultimate accuracy of the produced approximator. We have also compared our results with the model obtained by Support Vector Machines for prediction of ozone concentrations.

For the start of the research we concentrate on the problem of hourly value of ozone concentration that would appear in the following hours. This value should be calculated on the basis of the measurements available from the local automatic station. Our data are measured by the Ministry of Environment and Physical Planning (MoEPP) at one measurement point in the municipality of Karposh III, Skopje, Republic of Macedonia. Our data base contains continuous data for the year 2005. Each measurement data is taken every second by the automatic monitoring station. The data are then averaged each hour and sent to the data base situated in MoEPP. That way we obtain 24 hourly data per day per measured parameter. Our measurement point measures the following parameters: nitrogen monoxide (NO), nitrogen dioxide (NO₂), carbon monoxide (CO), ozone (O₃); particular matters (PM₁₀), sulphur dioxide (SO₂) and information on the meteorology, such as wind speed (WS), direction (WD), atmospheric pressure (hPa), air temperature (T), humidity (h), radiation (S) and precipitation (mm). However, mainly due to financial and maintaining problems, the data include many zeros which indicate that either the measured data was not validated or that there was no measurement at that particular hour of the day. Therefore we picked a small period of time in the summer and winter season for which we have sufficient data for the air pollution parameters. We use the past and present values of the following parameters: NO₂, O₃, humidity and temperature. Thus, we have a set of values of four parameters for each record. In total we have measurements for 17 days in each season. Currently, the prediction system is considered to be a MISO (multiple input single output); the output will be the level of ozone (O₃) which is also the main indicator of pollution. We have split our database into two parts: the training set (first ten days) and the test set (last seven days). The period for which we perform the modelling is 1 - 17 August, and 1 - 17 December, 2005.

This is the first attempt to perform modelling of ozone pollution using the fuzzy logic technique in Republic of Macedonia.

Keywords: ozone prediction, modelling, fuzzy identification

CV:

I am born on 11.01.1979 in Skopje, Republic of Macedonia. I work as a teaching and research assistant at the Institute for Automation and System Engineering at the Faculty of Electrical Engineering and Information Technologies in Skopje, Republic of Macedonia. During my work on my master thesis "Comparison of SVM regression models for prediction of air parameters in the ambient air", the corresponding co-authors and I, have

published the following papers in the field of air pollution: "Prediction of ozone levels in ambient air in Skopje", "Modeling of concentration of NO₂, using support vector machines", "Comparison of support vector machines and radial basis function models for prediction of NO₂ concentration levels" and the journal paper "Prediction of missing data for Ozone concentrations using support vector machines and radial basis neural networks".

MOUNT MERAPI ACTIVITY 2006: ITS IMPACT ON GROUNDWATER ENVIRONMENT

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Type of presentation: Oral session

Abstract

Mt. Merapi is one of the most active volcanoes in Indonesia, located in Sleman Region of Yogyakarta Special Province and Magelang, Boyolali, Klaten regions of Central Java (Figure 1). Its activities along 2006 period mostly pour its eruption products to the south direction. Of course, some areas in the Sleman Region, Yogyakarta Special Territory, were affected. As we may know, so far, groundwater still roles as the main source of domestic water supply, especially drinking water, in the south flank area of Merapi. The existence of groundwater is influenced by the hydrogeologic system, and it is very vulnerable to environmental changes. When Mt. Merapi intensively erupted in the year 2006, some places were subjected to geo-physic environmental alteration, such as covered by volcanic ash, buried by pyroclastic deposits and lahar. This phenomenon finally caused hydrogeologic potency disturbance in the surrounding areas, such as the disappear of some springs and the decrease of groundwater quality. In this study, such a field works, petrologic and groundwater chemistry testing were done.

Introduction

Mount Merapi, the volcano of where the research was done, administratively belongs to the Central Java Province and Yogyakarta Special Province. It is located 30 km northern of Yogyakarta city, and about 30 km western of Magelang town (Figure 1). Mount Merapi is classified to be the most active volcano of Indonesia, and one of the most attractive volcanoes on the world. Once in almost every 2 to 5 years Merapi increases its activity threatening surrounding environment with its phenomenal nuee ardentes and glowing clouds.

This paper reports the result of study on 2006 Merapi activity and how this change some environmental aspects especially for groundwater on Merapi shouthern footslopes. Methods applied to enravel the problem were field surveying, mapping, and groundwater chemistry analysis

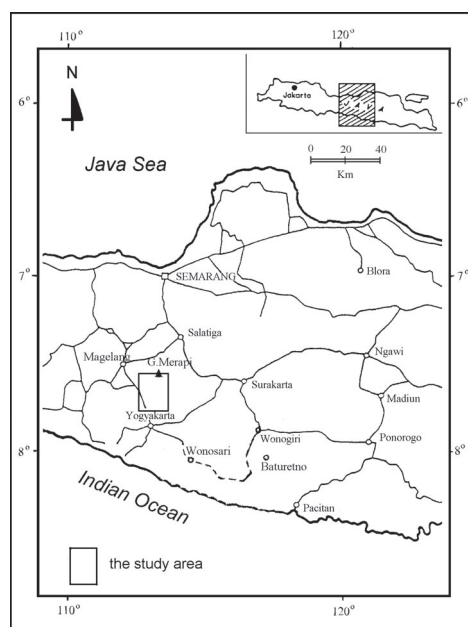


Figure 1. Map showing the location of the study area

Geology and Tectonic Setting

Tectonic setting controls the existence of Mount Merapi is the convergen of Eurasia Plate in the north and Indo-Australi Plate in the south since upper Pleistocene. The volcanic evolution of Merapi brought about structures that controlled the hydrogeologic system of areas located on the slopes of Mt. Merapi, including the Muntilan area and surrounding that is sited on the southwestern slope, and the Yogyakarta area and surrounding that is situated on the southern slope. At least there were four episodes of volcanic activities, i.e. Proto Merapi, Ancient Merapi, Middle Merapi, and Recent Merapi.

Mount Merapi produces andesitic composition of volcanic rocks. The chemical content of Merapy deposits especially the pyroclastics, is shown in Table 1.

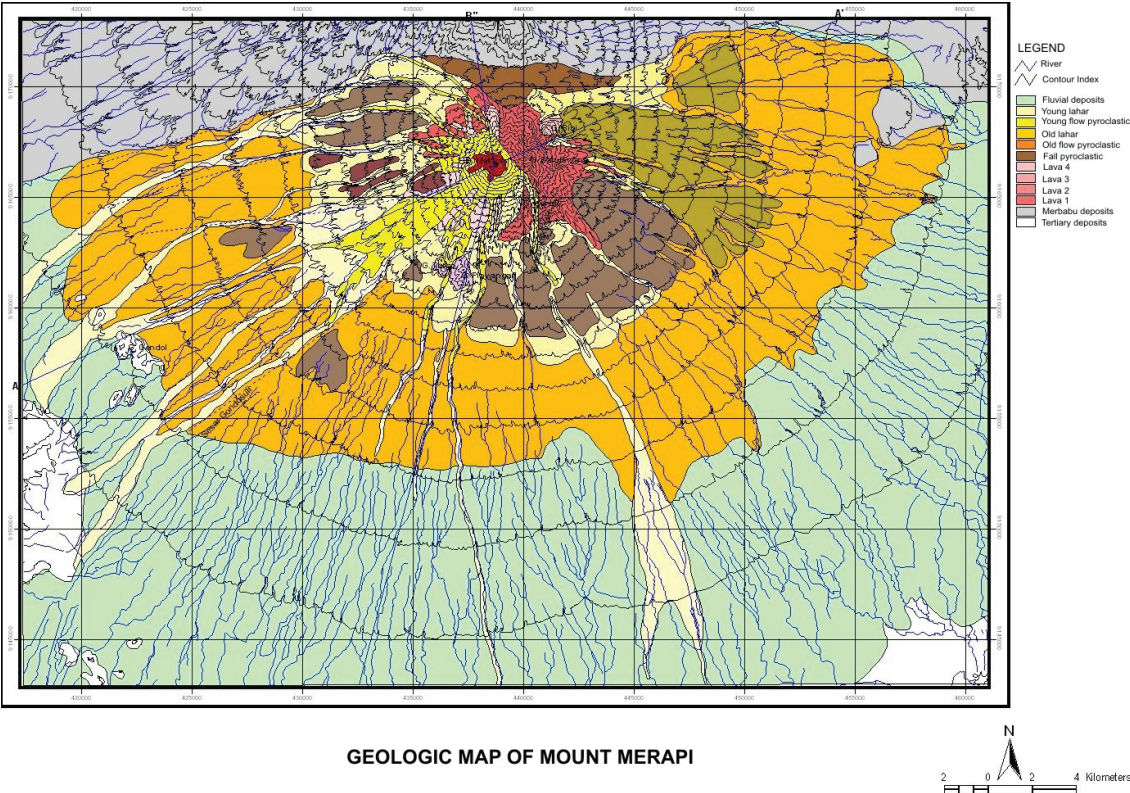


Figure 2. The geologic map of Mount Merapi

Table 1. Chemical Composition of Pyroclastic Deposits 1994 (Hammer, 2000)

Compound	Concentration (%)						Rata-rata
	Smpl 1	Smpl 2	Smpl 3	Smpl 4	Smpl 5	Smpl 6	
SiO ₂	66.1	66.1	64.7	74.5	72.2	72.6	69.37
TiO ₂	0.53	0.54	0.5	0.62	0.47	0.52	0.53
Al ₂ O ₃	15.2	14.5	15.5	12.3	12.1	11.7	13.55
MgO	0.73	0.58	0.75	0.25	0.15	0.12	0.43
CaO	2.06	1.54	2.49	0.18	0.44	0.44	1.19
MnO	0.13	0.11	0.09	0.12	0.08	0.11	0.11
Fe O ₂	3.61	3.48	4.1	0.96	2.13	2.5	2.80
Na ₂ O	3.54	3.91	3.72	2.92	3.51	3.42	3.50
K ₂ O	5.08	5.9	5.69	5.87	6.23	6.3	5.85
Total	96.98	96.66	97.54	97.72	97.31	97.71	97.32

Hydrogeologic System

Aquifers on the southern slope of Mout Merapi can be clasified into two type of free aquifer underlain by semi confined aquifer. The depth Groundwater level of the free aquifer ranges 1,5 m to 30 m deep. Piezometric level of the semi confined aquifer 15 to 5 m deep. The free aquifer is composed of the Yogyakarta Formation which is predominated by fall pyroclastic, lahar, alluvial and fluvial deposits, as sands with boulders, pebbles, granules. Semi confoned aquifer comprises mostly boulders, breccia, lahar, and pyroclastic deposits of Mature Merapi. Hydrogeologic system model of the souther slpoe of Merapi is shown in the Figure 3 (Sir MacDonald & Partners 1984)

Based on Cash & wright volcanic facies model, Sleman Formation is classified into medial facies, while the Yogyakarta Formation is clasified into diltal facies. The basic difference between the two formations is their grain size of the deposits. Sleman Formation predominantly composed of coubles to boulders fragments, while Yogyakarta Formation is composed of mostly sands. The two formations are then hydrogeologically mentioned as Sleman Aquifer and Yogyakarta Aquifer respectively. On the other hand deposits of mature Merapi built semi confined aquifer generally lies under the formations mentioned before. The basement of the quifers is lava of old and proto Merapi in the proximal and part of medial facies, and Tertiary sediments in the distal facies.

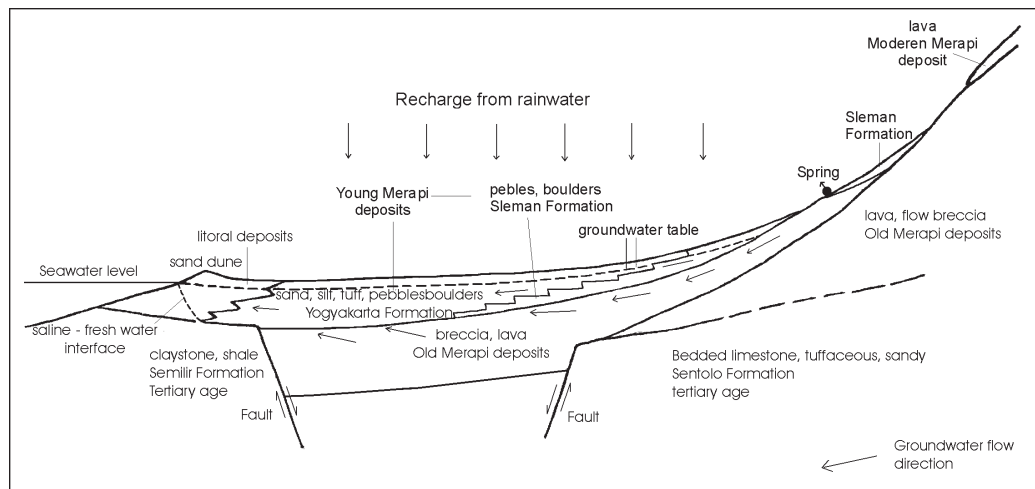


Figure 3. Hydrogeologic system conceptual model of Merapi southern slope

In general there is a clay layer in the depth of 40 m to 50 m below the surface, locally separating Yogyakarta and Sleman aquifers from the underlain deposits. The clay layer is interpreted to be formed in reduction environment, characterized by its Fe (iron) rich content. The thickness of the clay layer ranges 2 m to 5 m.

Both Yogyakarta and Sleman aquifers are classified into intergrain aquifer with groundwater flow southward direction, controlled by hydraulic gradient and topography.

Merapi Activity 2006 and Deposits

Results of 2006 Mount Merapi activity is sand, stone, ash deposits with various thickness, spread mostly in the area of southeastern and southern slopes of the volcano. There is a significant change of Merapi eruption direction. Previously since 1961 to 1994 the eruption direction was to the west. In 1994, Merapi erupted both west and southwards. In 2006 the biggest eruptions were southeastward (Figure 4). On 14 June 2006 A great pyroclastic flow attacked area of the surrounding River Gendol, of 7 km distant from the center of eruption. The nuee ardentes using the valley of River Gendol as the highway to flow. A tourist object, namely Kaliadem, Jambu village, in Cangkringan District was buried by more than 3 m thick of flow pyroclastic deposits (Figure 5). The valleys of River Gendol and River Opak were then fulfilled by pyroclastic sediments, a bunker was covered, two volunteers died. Thickness of the sediments at River Gendol is 3 m average, and at River Opak is 2 m average. Estimation of volume of the deposits filling River Gendol, River Opak, Kaliadem and surroundings is 276.000 m³, while on the near summit area at elevation of 1700 m above sea level (2 km from the summit) to the edge of deposits, the volume is about 5,6 million m³. Temperature of the deposits at the depth of 30 cm to 50 cm, after 6 month deposition was still 80°C - 100°C.



Figure 4. Mount Merapi eruption (June 2006)

Petrologic composition of Merapi eruption 2006 is andesitic: Since rainy seasons of 2006/2007 and 2007/2008, the deposits in the River Gendol and River Opak are gravitationally flowed down as lahar. Lahars not only occur in River Gendol and River Opak but also in River Boyong, River Kuning in the west parst, and River Woro in the east part of the study area.

Impact on Groundwater Environment

Mount Merapi eruption in the year 2006 has much changed the environment in the study area especially in Umbulharjo and Kepuharjo villages, cangkringan District. Many building and houses were buried by pyroclastic deposits. Plants were burnt and damaged by the glowing clouds. Catles were disturbed, because no more fresh grass to feed. This cause many people were forced to soale their catles, or transfered to the more safe places down slopes. Land surface condition is also changed physically and chemically.



Figure 5. Kaliadem was buried by >3 m thick of pyroclastic flow deposits

Table 2. Impact of Merapi 2006 Eruption to Hydrogeologic Potency

No	Location	Impact on the environment
1	Kaliadem	<ul style="list-style-type: none"> • A tourism object was covered by pyroclastic deposits • Buildings and hauses were buried • Plants were damaged and burnt • Springs dissappear • Road flooded with lahar deposits
2	Kali Kuning	<ul style="list-style-type: none"> • Springs covered by lahar deposit • Pipe networking damage
4	Kec. Cangkringan	Groundwater quality degradation

Table 3. Concentrations of ellements in groundwater pre and post 2006 eruption

Element / Parameter	Pre 2006 eruption (15 samples) (Kusumayudha 2003)		Post 2006 eruption (19 samples)	
	Concentration range (mg/l)	Average (mg/l)	Concentration Range (mg/l)	Average (mg/l)
Iron (Fe)	0,05 – 0,9	0,22	< 0,03 - 2,50	0,14
Calsium (Ca)	3,03 – 29,1	22,65	8,78 - 27,14	18,37
Magnesium (Mg)	0,4 – 25,71	9,73	1,03 - 23,1	10,85
Sodium (Na)	1,71 – 17,75	5,91	19 - 43	34,17

Potassium (K)	0,6 – 4,0	2,20	3 - 14	8,42
Chloride (Cl)	2,63 – 9,2	5,54	3,1 - 15,9	6,78
Sulfate (SO ₄)	1,5 – 21,9	6,42	< 2 - 30	8,83
Bicarbonate (HCO ₃)	65,6 – 198,4	113,7	66,82 - 186,07	130,83

Table 4. Values of pH, TDS dan EC of groundwater of Pre dan Post 2006 Eruption

Parameter	Pre 2006 Eruption (15 samples) (Kusumayudha, 2003)		Post 2006 Eruption (19 samples)	
	Range	Average	Range	Average
pH	6,7 – 8,3	7,2	6,2 - 7,2	6.7
TDS (mg/l)	95,25 – 143,6	109,35	107 - 204	143.947
EC μ mhos	173,6 – 326,67	180,13	171 - 316	246.95

Some groundwater sources were distict, drinking water piping damage by pyrocalstic and lahar deposits. Hydrogeologic condition after 2006 Merapi eruption is the increase of water turbidity, TDS, EC, and some compounds such as Na, K, HCO₃, and SO₄. The increase of chemical compounds are caused by dissolution of fine grained deposits of ash and dust by rainwater that contaminated groundwater and other water bady. Fine grained deposits of Merapi eruption 2006 is composed of Na₂O, K₂O, CO₂, S₂, and SO₂. On the other hand the concentration of Ca in some water samples are tend to decrease comparing to before eruption. The cause of this phenomenon is interpreted due to chemical composition of new Merapi deposts that is more accidic than the older deposits. New Merapi deposits is more rich of Na-plagioclase than Ca-plagioclase. The deposits also does not contain olivine that rich of Mg. Below is the breakdown of impact of 2006 Merapi eruption on hydrogeologic environment and potency of the study area.

Table 6. The changes of hydrogeologic environments as the impact of 2006 eruption

No		Change	Analysis
1	Existance of water sources	Springs dissapear	Covered by lahar deposits
2	Water Quality <ul style="list-style-type: none"> Iron Calcium Magnesium Sodium Potassium Bicarbonate Sulfate Chloride Ph TDS EC 	<ul style="list-style-type: none"> No significant change Decrease No significant chane Increase Increase Increase Increase No change Decrease Increase Increase 	<ul style="list-style-type: none"> - Chemical composition of the deposits are more accidic - The deposits are rich of ash dust, and volcanic glass that are containing Na₂O, K₂O and, gas CO₂, S₂ and SO₂. - The deposits are more accidic than thoes of older Merapi deposits Ash and dust pollution When TDS increase. Otomatically EC will increase
3	Pipe networking	Damage	Attacked by lahar

Conclusions

Based on the analyses broken down above, this study concludes that there are some groundwater environmental changes as the impact of Mount Merapi eruption during its activity period of 2006, as the following:

1. Mount Merapi eruption of June 2006 had produces pyroclastic deposits 5,6 million m³ whole volume and 276,000 m³ covering arround River Gendol, River Opak and Kaliadem touristm location. Area covered by the deposits is about 80,000 m square. The deposits consits of boulders to ash and dust grain sized with andesitic composition.
2. Pyroclastic deposits of Merapi eruption 2006 created lahar in River Gendol, River Boyong, River Kuning, and River Woro, with sediments of sand to boulder grain size with andesitic composition.
3. Merapi deposits of 2006 eruption buried about 80,000 m² area with 2 – 3 m thickness. Some buildings, hauses, groundwater sources (springs), piping networking, and degrade water quality in general. The water quality whics are change are the increase of turbidity, TDS, EC, concentration of Na, K, HCO₃, and SO₄. Onthe other hand, the concentration of Ca and pH decrease.

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WATER IMPACT IN A GARMENT LIFE CYCLE

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Laboratoire GEMTEX (Génie et Matériaux Textiles), ENSAIT (Ecole Nationale Supérieure des Arts et Industries Textiles)

Type of presentation: Oral session

Abstract:

The study of the garment life cycle, from the cradle to the grave, enables us to quantify the water consumption as well as the water pollution caused by a garment during its whole life time. Several studies have already been carried out on different types of clothing: dress, jeans, T-shirt, The studies show that the fibre production step, the garment finishing processes as well as its after-use have got the greatest impact on water (figure 1).

1. State of the art

The production of natural fibres, especially that of cotton, is very water demanding. Thus, for the cultivation of cotton crops, around 1000 to 500 litres of water are required for 1 kilogram of cotton fibre produced. The use of very high quantity of pesticides induces a significant water pollution (22 kg of chemicals per kilogram of cotton fibre produced according to 'Greenpeace'). This is the major cause of environmental disasters such as the disappearance of an important part of the Aral Sea. On the other hand, artificial or synthetic fibers require very little water for their synthesis.

The finishing steps include scouring for the removal of impurities from the fabric, bleaching, dyeing and eventually special finishing treatment such as : anti-shrinkage, softening, waterproofing... All these wet processing steps require water : around 150 litres of water are used to treat 1kg of textile fabric, and the water effluent during its disposal, still contains several chemical additives.

During its use, a garment is subjected to frequent washing. From an environmental point of view, though laundering with water is much better than dry cleaning, it nevertheless consumes a large amount of water and detergent which contributes a lot to household pollution. Recent studies show that the environmental impact during the garment use is as important as that of the garment manufacturing processes.

2. Key solutions and perspectives

To reduce the water impact of cotton, some countries are trying to promote the cultivation of organic cotton, ie with minimal use of pesticides and water. In parallel, the cultivation of genetically modified cotton crops may allow to reduce impact of crops on water.

As far as textile finishing processes are concerned, an optimisation of textile processes, in particular, rinsing, significantly reduces the volume of water used: for example, in France, the average volume per kilogram of textile treated has decreased from about 500 litres in 1980 to only 150 litres in 2000. Today studies are being carried out on new processes which consume less water and fewer chemicals : plasma or ultrasound treatments, dyeing using supercritical CO₂.... Moreover, studies are equally being carried out on more environmentally friendly chemicals for use in textile processes.

Regarding household laundering, washing machine cycles consume less and less water. Laundry powders are being formulated to limit their environmental impact. For example, the use of phosphates is virtually

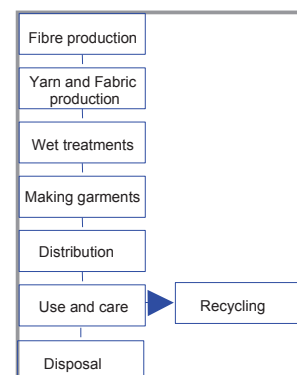


Figure 1 : main steps of a garment life cycle

eliminated from laundry powders in Europe. More and more organizations motivate consumers to wash their clothes less frequently so as to make a longer use of their garments, and to limit their impact on water.

Alternative methods may be developed to limit the environmental impact of laundering. A typical example is the stain-resist treatments of fabrics. These stain-resist treatments are carried out during the finishing step, they are permanent, and are therefore not removed during laundering. The environmental impact of this type of treatment as regards to water is low compared to other finishing processes. The aim of these treatments is to repel the stains so that the clothes may be worn for a longer time in between 2 washings.

Indeed there are 3 types of such stain resist treatments

- Those that prevent stains from penetrating inside the fabric (soil repellent)
- Those that cancel the harmful effect of stains and particularly unpleasant odours
- Those that allow stains to be removed with ease (and without detergent) in a washing with water (soil release).

During our presentation, we will show the benefits expected from these treatments with regards to water and detergent consumption.

3. Conclusions

The manufacture and use of a garment consume large quantities of water and generate a lot of pollution. The environmental impacts are mostly due to cultivation of cotton crops, to diverse textile finishing steps and to laundrings during the garment use.

Today there are several solutions to limit the environmental impact, both at the level of cotton crop production, as well as textile processing and laundering. Alternative methods may be used to limit the environmental impact of laundering.

Keywords: textile, LCA, finishing

CV :

Master level engineering degree in chemistry 1980

PHD in « Material Sciences » 1983

" Surface modifications of PP yarns under corona discharge"

Rhone Poulenc Recherche 1985-1991

Research in polymer engineering: Rheology and surface study

Ecole Nationale Supérieure des Arts et Industries Textiles 1992-2008

Laboratoire GEMTEX

Research in textile engineering:

Liquid management in textile structures

Textile functionalization (products and process)

Surface characterization

Professor since 2001

STUDY OF WATER FILTERING IN UNDER DEVELOPED AND NEED FOR USE OF TRADITIONAL FILTERING SYSTEMS.

Dr Hind Saidani-Scott, Dr Stephen Gundry, Dr Mike Tierney

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Type of presentation: Oral session

Abstract

In under developed countries and the ones suffering from droughts, the main source of drinking water is from what is called 'safe' sources such as standpipes and boreholes . This water becomes contaminated after it is stored in the home. The quality of water collected from unsafe sources such as rivers also remained poor. To overcome these problems, a study (called Aquapol), using a ceramic filter for treating water in the home has been carried out.

The filter intervention has taken place in Venda, South Africa and Zaka district, Zimbabwe. 30 households from (the main AQUAPOL study) have been given ceramic filters in each country. Microbiological water quality has been monitored in these households, together with diarrhoea episodes in young children. Water quality and diarrhoea levels in these households have been compared with water quality and diarrhoea in a control group. The control group consists of 30 households in each country, who do not have the filter. The filters have been evaluated over a period of six months to see whether they continue working well, even when in constant use.

The results show a clear reduction in diarrhoea in infants, hence, a higher surviving chance. The main problem is the high initial cost of water filters, and their maintenance, as well as their speed of filtering.

Therefore, another project looking at the development of 'local, traditional' filters, which overcome the manufactured problems has been carried out.

It was found that 'jeans' materials was very good in stopping a high number of bacteria and could be uses by everyone, with little maintenance.

Keywords: water filtering, ceramic filters, novel filtering methods, Aquapol Project

CV:

Dr Hind Saidani-Scott is a senior lecturer at the University of Bristol in the Mechanical Engineering Department. She is born and grow up in Algeria. Her first degree was in Physics, with an option in fluid Mechanics. After successfully getting a competitive grant to study in France, she took a DEA and a Doctorat 3eme cycle in ENSMA Poitiers. On finishing her thesis, she returned to Algiers for a 3 year's teaching assignment and again successfully got a grant for further research in Bristol. After 5 years, she submitted her research for a PHD, untitled: Heat and mass transfer in porous media with application to building materials. Since 1996, she has been a permanent lecturer, then senior lecturer, teaching thermodynamic, heat transfer, novel and non mechanical refrigeration systems and other related topics. In recent years, she has been involved with student' projects related to drying, recycling, novel materials characteristics, and with the EWB (Engineering without Borders). Her latest projects are with Mexico (IPM) on sustainability and recycling of food waste. In the last 2 years, she studies for a part time Law degree that she finished in November 2006.

JAPANESE EXPERIENCE DEVELOPMENT OF SMALL SCALE WATER SUPPLY

Ms.YAMAMOTO Keiko

Senior Advisor of water field, Japan International Cooperation Agency

Abstract

1. Introduction

Coverage of water supply system in Japan is 97 percent and 100% of sanitary toilet in 2006. 123 million people (127million in total)) can access to safe water for 24 hours at home by water supply system. Japanese people can enjoy very clean life. Japanese life expectancy both women and men is the longest in the world. One of reasons would be safe water and clean living environment throughout the country.

In other hands, 1.1billion people in the world, WHO reported in 2004, cannot access to safe water and 2.6 billion people cannot have sanitary toilet. Especially coverage of safe water and sanitation in rural area is very low. And then development of rural water supply and sanitation system is urgent and most important issues in the world.

Japanese ODA (Official Development Assistance) has been assisting the projects for supplying safe water in rural area in developing countries. These projects include not only facility construction but also community's capacity building.

We have had the success experiences on the development of rural water supply systems (the small scale water supply ; SSWS) in 50's to 60's periods. And also, at that time, there were a big movement of rural life improvement by housewives. Both the development and the movement have had synergetic effect. The experience could be applied for developing countries. The report will be a result of the study of Japanese experience.

2. History of development of rural water supply

Coverage of water supply was less than 30 percents in Japan after the end of World War 2, 1945-1950. Particularly, sanitary condition in the rural area was very poor. The development and rehabilitation of water supply system were implemented as urgent program by government. Coverage of water supply changed dramatically to 80% after 20 years from 26% in 1950.

Development of water supply brought the tap water to rural people.

As a result, Many people could use tap water at that time. The most benefit was the release from water fetching work from women.

3. Movement of the rural life improvement

It was carried out on the local base and as women's activity. One of main issues to be improved in the activities was water issue such as

- 1) Difficulty of fetching water,
- 2) Bad water quality,

3) Dark and inconvenient kitchen,

4) Outside bathroom and toilet

Most of wives requested the improvement of these matters. Many small water supply projects were implemented as the rural life improvement activities by women. Persons facilitated this movement were livelihood extension workers belonged in Ministry of Agriculture. Their activity methods were follows.

- To find a women leader in the community
- To make group members find several problems and think the solution.
- To use simple scientific methods like why need, how bad, what kind of impact
- To disseminate one activity and information to other groups.
- To observe similar but advanced example for members
- To become a key person among the different organization

For their hard work, these activities became a big movement. And then improvement of water supply was most important result.

4. Program approach

Japanese ODA now introduced program approach for effective cooperation to developing countries. Program approach consists of financial assistance and several technical assistances such as capacity building of government staff and community people, institutional improvement, formulating master plan and volunteer activities. We could see some influences of above Japanese past experiences.

Keywords: Rural water supply, Community capacity building, rural life improvement, ODA, Program approach

CV:

I worked for public waterworks utilities as engineer for 20 years in local government in Japan. After that I transferred for Japan International Cooperation Agency as senior adviser of water field since 1995. I visited almost 30 developing countries in Asia, Africa and Central and South America for study or as expert. Recently, I interest in the capacity development in water field. My presentation will be this matter.

A PROPOSAL FOR THE WATER MANAGEMENT IN THE RIVER AMAJAC SUB BASIN, STATE OF HIDALGO, MEXICO.

Vega Isuhuaylas, Griselle Felicita; Jimenez Sanchez, Leobardo; Rubiños Panta, Enrique; Manzo Ramos, Fernando; Quispe Limaylla, Anibal; Marañon Pimentel, Boris

Colegio de Postgraduados

Type of presentation: Oral session

Abstract:

Water availability is a critical topic in the Amajac river sub-basin in the State of Hidalgo, Mexico because, as a result of the inadequate management by the stakeholders, this resource is not available in the quality and quantity required. In the present work, water management was analyzed according to agricultural, domestic and industrial uses; and the consequences of these forms of use in the environment. A proposal was included to overcome the encountered problems.

The study was carried out in the Amajac river sub-basin. It has an extension of 6,954 km² and includes 34 municipalities of the State of Hidalgo, Mexico. Administratively, the sub-basin belongs to the Council of the Panuco river basin.

The information for the present study was obtained through the application of surveys and interviews which central topics were participation, agreement and perception of the problems in water management in its three main uses; the organizational forms; and their interrelations.

One of the main results was that the participation spaces generated by the Government like the Council of Panuco river basin, doesn't facilitate the appropriate decision-taking from the stakeholders over their spaces because the limitations in the participation and representation of those involved in water management. As the sub basin's current indexes of water contamination and soil degradation indicate, the inadequate water management has repercussions in the environmental aspects. The use of the Sustainable Rural Development Municipal Councils and the Rural Development District Councils is the proposal to cover the organizational absences. It implies an ordered and appropriate water management as well as a facilitating role of the institutions in order to be able to perform participation and agreement processes.

This work also propose that the dimension of the water management territory should be harmonized with the population's understanding to facilitate its participation as micro basins spaces or municipal administrative spaces, without losing the basin vision that implies giving a greater importance and responsibility to the municipal administrations at local level to achieve an integral water management in their respective areas and rural communities.

Key words: Agreement, participation, representation, water uses, basin.

Cv:

Agricultural engineer with specialization in water and soil resources, mastery in water sciences , with doctor degree in science, studies in rural development.

The main experience is in water management in basins, specifically in Integral application of the technical strategies. Generation, introduction of technologies and methodologies in the use and management of the natural resources. Validation to creating impact. Promotion of the integral management of basins that permits the economic development of the rural sector through promotion for the participation, formation of committees, fortification of the managerial capacitance, promotion of the woman participation in organized groups of managerial initiatives, training and technical support in management and administration of natural resources and Coordination with local governments. Ten years on experience.

ENVIRONMENTAL IMPACTS OF THE MAIN CONTAMINATING INDUSTRIAL AND AGRICULTURAL UNITS ON THE ECOLOGICAL SITUATION AND SUSTAINABLE DEVELOPMENT IN DNEPR RIVER BASIN REGION

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²Dnipropetrovsk Agrarian University, Ukraine

Type of presentation: Oral session

Abstract:

At present, Ukraine is suffering a deep environmental crisis. The scope of the environmental problems ranges from short term to long term and from local scale up to continental scale (thus affecting the environmental situation in neighbouring countries). Environmental problems result from all kinds of socio-economic activities of which industry, agriculture, municipal sewage production and transportation are the most polluting. As a result, the quality of water, soil, air is bad. The most serious consequence of these changes concerning the quality of the environmental compartments is the biological and genetic degradation of the people of Ukraine.

Water consumption by 35 million people and 45% of the industry of Ukraine along the Dnepr is about 20 billion m³ per year. Out of the overall volume of pollutants coming into the Black Sea from the territory of Ukraine, 52% comes from the river Dnepr.

Water resources are used intensively: the agricultural sector uses 35,8% and the industrial sector uses 21,8% of the total water supply.

The underground water resources of Ukraine are contaminated. The quality of groundwater is decreasing as a result of infiltration of polluted surface water and the use of mineral fertilisers and pesticides. As a result of the groundwater pollution, Ukraine is heavily dependent on surface water supplies for drinking, 70% of the population is supplied from the Dnepr River, 15% by other surface water sources and only 15% by groundwater. In order to provide industry and society with sufficient water, a large number of storage reservoirs have been built in the river systems.

Both types of industries (mining and metallurgical) make use of enormous quantities of resources and energy.

The thermal power plants cause tremendous air pollution, while nuclear power plants are in principle cleaner, but the impact on the environment of these plants (dispersal of radionuclides, especially Cs and Sr) is much more severe when accidents occur. This was exemplified in a catastrophic way by the Chernobyl disaster in 1986.

The high concentration of these ecologically dangerous industries and the location of many enterprises in the centres of cities aggravate the negative impacts on environment and human health.

Although most large industrial plants have treatment facilities, considerable untreated water is discharged into the rivers, because they are overloaded (e.g. 55% of all water discharged into Dnepr River is untreated). In addition, many smaller

industries do not treat their chemical wastes at all, before discharging either directly into rivers or into municipal sewerages.

The technology used in much of the metallurgical industry is outdated and energy inefficient, although there are modern sections found in individual plants. The steel industry originally developed in Ukraine because of plentiful and high quality domestic resources of iron and coal.

Energy consumption per ton raw steel is estimated in the range of 22,5 to 25,9 GJ, 20 to 40% higher than unit energy use in the European Community (EC) steel industry.

The metallurgical sector accounts for 35% of total gross air emissions and is especially a source of dust and carbon monoxide (CO).

Water consumption in the industry appears high, averaging 18,9 m³ per ton raw steel compared to 5-10 m³ per ton raw steel in some EC countries, even though some plants do recycle.

Dnipropetrovsk Region holds a wealth of mineral resources: mining of coal, mining of iron, manganese and uranium ores.

Apart from the problems of socio-economical kind, the coal reserves in Ukraine are considered among the hardest to develop in the world. Geological and mining conditions are becoming progressively difficult. The average depth of exploitation is 700 m, but in 15% of the mines (38 mines) the working levels are at a depth of 1000 to 1300 m (at which initial rock temperatures vary from 45 to 52°C; in 80 mines the air temperature exceeds permissible limits). This makes mining more difficult and more expensive.

The major environmental problem of the mining industry is the volume of its wastes. Vast areas of perhaps fertile land are covered with waste rock and tailings dumps. In Ukraine, annually, over 1,5 billion tons of wastes accumulate at surface dumps. The lowest estimates of the overall volume of these wastes reach 20 million tons (spread over 130,000 ha). In terms of volume, the mining industry is the major source of these wastes.

The current level of utilisation of these wastes as secondary raw material does not correspond to their economic value.

Another environmental problem of the mining industry is the large amount of groundwater that is released, and as the mines become deeper, the amount of water as well as its salinity increases. Annually, about 800 million m³ of saline water from mining is released into rivers, of which 100 million m³ is discharged directly into the Dnepr. The saline effluent can damage drinking water supplies.

Coal and iron mining produces an effluent of 60 million m³ highly mineralised water per year. The salinity of the water is up to three times greater than the salinity of seawater. It is contaminating the groundwater at shallower levels under present disposal conditions, making groundwater unfit as a source of drinking water for the local district.

There is also concern about contamination of the water resources with heavy metals and radionuclides.

The method of mining in some of the mines is outdated and hazardous.

About 30,1 million ha of Ukrainian black soil (chernozem) are under various crops, the majority under cereals, followed by industrial crops, potatoes and vegetables, and corn for silage. However, uncontrolled drainage has led to saline soils, while groundwater levels below other soils dropped dramatically. A considerable area (14,8% of the arable land) is exposed to erosion and on all investigated lands a decrease in the content of humus is determined.

Close to 50% of the total wastewater volume of Ukraine is municipal sewage. Furthermore, 27 cities and 499 towns do not have centralised sewage treatment systems at all. As a result, more than 4,4 million m³ of untreated or insufficiently treated wastewater are dumped into water bodies.

Keywords: sustainable development, water management, industrial pollution, environmental impact

CV:

Education:

2006	Graduation for Ph.D. of ???logy, Dnipropetrovsk National University,
1997-2001	Postgraduate, Institute for Nature Management Problems and Ecology, National Academy of Sciences of Ukraine Main objective: Development of Theoretical Fundamentals of Biogeochemical Circulation Assessment
1983-1988	State Educational Institute of Georgia, Faculty of Natural Sciences M.Sc., Biology and Chemistry, Diploma with Honors, Overall GPA: 4.97 Selected Courses: Ecosystem Stability; Waste Management; Biological Productivity
1990	Institute for Advanced Training of Teachers, Professional Advancement Courses on Ecological Education
1997	Dnepropetrovsk National University, Professional Advancement Courses on: ·Biosphere as a global ecosystem; ·Environmental engineering; ·Conformities of ecosystem functioning; ·Simulation of element circles in ecosystems.

Date of Birth: August 13, 1966

Position: Senior Researcher Scientist
Institute for Nature Management Problems and Ecology,
National Academy of Sciences of Ukraine
Chairwoman of Young Scientists Board

Awards:

2000-2002	Scholarship of the President of Ukraine for Young Scientists (the scholarship is awarded for outstanding scientific achievements)
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Publications:

Scientific achievements and research results have been reflected in 40 scientific publications.

MANAGEMENT AND LEADERSHIP ; ENTREPRENEURSHIP AND A WOMAN

Hiroko Kimura,

Mokan-Joka System Co., LTD , Representative Director

Type of presentation: Oral session

Abstract:

I attended at this ICWES as a Professional Engineer of sewage.

When I was university student, I was registered at a subject of child and worked as the teacher of the kindergarten after graduation for three years.

However, now I administer a company as Representative Director of the construction consultant, which is specialized in sewage business.

In 1980, then 28 years ago, I establish the company, when I was 34 years old.

The opportunity to establish a company was to realize "**Do-jyoka system**" which is my father developed.

"DO-jyoka system" is most preferable sewage system for very country I think.

Why can I say such things. Now I explain about it as an engineer and as a woman.

In Japan, because various laws are related complicatedly to solve a water problem, we can't realize it as merely "Development technology, which solve an environmental problem".

It's necessary to base on a standard, for example, "**Sewage Law**" which is needed by sewage business, and "**Building Standard Act**" which is needed by building construction, and "**Water Pollution Control Law**" which is needed by processing gray water, when we treat every liquid-waste.

Because "Do-jyoka system" is a technology, which is using the power of the nature that the soil has, it can solve environmental problems in embarrassed area, which is short of energy.

It was developed by using phenomenon of resolving when we dig up the hole, and bury garbage in that, and phenomenon of deodorization when we cover stink garbage with soil.

But it's not useful for society to be merely "A good technology was developed".

When it's realized and can solve a local environmental problem, it finally will be admirable technology

I've been trying to construct "Do-jyoka system" since I established a company.

Tadashi Niimi who is developer of "Do-jyoka system" focused on phenomenon of resolving when we dig up the hole, and bury garbage in that, and developed the technology named "*Niimi-trench*" by various experiments, the investigation and the researches.

"*Niimi-trench*" is actually construct in where there is no destination of discharge or require for energy conservation type septic tank as a patent method

Because "*Niimi-trench*" uses natural soil power, it's necessary to consider various conditions such as the soil quality, the type of climate, and the locations of underground water when set up it.

Though the structure of "*Niimi-trench*" looks easy, if you set up without understanding the content of the technology of the power of the soil and "*Niimi-trench*", the problem of stopped up comes to occur.

Moreover, to solve the problem of the sewage plant, "the soil coating method" named "Niimi-system" was developed by using the phenomenon which is not smelling when stink thing is covered with the soil

This technology can make a very simple sewage plant place which is like the park, because to cover the sewage processing tank with the soil, it can prevent the stink, the spray of the bubble, and the bacillus from dispersing.

"That't it! We can do it!", "We have been wanting such sewage system", and " The sewage plant is an event site": "Niimi-system" which spectacle is really like a park, is different from the current trouble facilities which makes bad smell.

Because past sewage plants was the trouble facilities, it needed to be construct in desolate place and must get water from vast area. However , Because this technology is possible to make the sewage plant like a park and not stinking, it is possible to construct in the district in the village that has been overcrowded and it is possible to reduce one processing district. It means a possibility of gradual sewer preparation by this technology, and shows that the sewage business corresponding to economic circumstances in the region can be done.

Nowadays, It came to be able to construct "Do-jyoka system" not only the processing of the gray water exhausted from the home but also "**Building Standard Law**" and "**Sewage Law**".

Qualifications of "Professional Engineer" requires both of knowledge that doctor's medical art and the lawyer's law interpretation, and I think that I can have gained strong power to solve environmental problems in the region by acquiring the qualification.

At the Japanese sewage, it's difficult to adopt the sewage technology of private enterprise developed. Because there are many difficulty of causing from "The administration vertically divided" like "MIT (the Ministry of Land, Infrastructure and Transport)" and "MAFF (The Ministry of Agriculture, Forestry and Fisheries), or so.

As female engineer, I have been making an effort with enthusiasm that is "good technology must be accepted" and "there was no people who could realize it without my broking difficulty.

As a result, the demand which is construct "**Do-jyoka system**" by cities, towns, and villages was accepted, and it came to be realized in each place.

And the sewage disposal plant by "**Do-jyoka system**" proved that we can easily prevent second pollution, and it become space of the rest that inhabitants are pleased with and we can eat food on the sewage disposal plant which is thought as annoying institution.

The spirit of the enterprise that wants to help the solution of environmental problems in an embarrassed area by "Do-jyoka system" comes to be transmitted correctly, and enters a new age of being materialized in not only Japan but also foreign countries including South Korea.

Though it is sure of "Do-jyoka system" with that it's the possible technology of solving water problem of troubling region, I really feel that we need engineer who has technical knowledge in each region, because of using natural force.

As a female engineer and as a teacher of kindergarten, I hope it would be able to leave the aqueous environment which is better for every countries children and grandchild by the combination of the energy-saving waste water treatment technology so that the woman who handles sanitary sewage which adhered to the life may solve the environmental problem.

I really feel that using the natural soil power maximum is necessary to solve environmental problems globally because now to meet the era which is serious global warming. .

I thank you for the opportunity of speech which title is "Entrepreneurship and woman" this time.

The technology is correctly conveyed by good human relation.

I wish ICWES continue success and happiness.

Thank you.

Keywords: Entrepreneurship and a woman

CV

When I was university student, I was registered at a subject of child and worked as the teacher of the kindergarten after graduation for three years.

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GLOBAL WARMING AND LIVESTOCK PRODUCTION IN BOTSWANA

A.A.Aganga, S.J.Nsoso, U.J.Omphile, P.Malope and A.O.Aganga

Botswana College of Agriculture, Gaborone , Botswana.

Type of presentation: Oral session

Abstract:

Introduction

The contribution to the GDP by the agriculture sector has declined from 40% at independence to about 4% . That has mainly been due to the rapid development of the mining sector and slow growth of the sector itself. The agriculture sector however, remains an important source of food, income, employment and capital formation for the population living in rural areas. About 2% of the formal employment and a significant proportion of informal sector employment arises from the agricultural sector. It is important that agriculture continue to make significant contributions to the GDP and the welfare of the 80% of the population that reside in communal areas and hence directly or indirectly involved in agriculture and related activities such as wildlife and veldt products. Therefore, attempts to strengthening this sector should, in part, be based on the fact that agriculture (including pastoral), has to be considered as an enterprise that adapts to modern farming methods; is cognizant of change in the environment as a result of human activities and changing climatic conditions. It is important that farming communities are well educated and prepared to meet the challenges of present day to agriculture. This can be achieved through training (irrespective of their background knowledge of agriculture and related activities) of the concerned parties. The management and utilization of natural resources have become a matter of great public interest both in Botswana and around the world. One reason for this is the realization that the key to Botswana (and many other parts of the world) economic development is based on sustainable utilization of natural resources. In order for the policy objectives of government to be realized, the farmers must understand constraints posed by the environment in which they farm. Among these constraints are climate change and its effect on the fauna, flora, surface and ground water availability.

Materials and methods

This study assessed the vulnerability and impact of climate change on the rangeland and livestock sectors. Specifically the areas assessed were: rangeland condition, livestock diseases, nutrition, breeds and breeding and economics. The study focused on vulnerability and impact of climate change on the livestock sector. Assessment was based on indicators such as livestock population parameters, birth and mortality rates, offtake, deaths due to various illnesses, changes in the breeding strategies due to policy, nutritional constraints, social and economic wellbeing of farmers. Vulnerability and impacts of the rangeland and livestock to climate change was assessed based on range condition scores in the communal cattle post areas, ranches and in the protected areas. Effects of policy (past and present) on both livestock and rangelands was assessed on the basis of secondary data as well as information that was gathered during the survey study and plant and water composition analyses. The study was conducted in selected sites in five agricultural regions during February to May 2007. The following sites were selected: Southern Region ,Western, Central, Francistown and Ngamiland .A structured survey instrument was developed and face to face interviews conducted for 100 farmers in the selected areas. In each study area 20 farmers comprised of 10 males and 10 females were randomly selected and interviewed. Visual appraisals of livestock breeds and rangeland conditions were conducted in each area during February to May 2007. All study sites were referenced for purposes of repeating the studies (if need be). A geographic point system was used to reference all the study sites and photographic pictures of rangelands, livestock, landscape etc taken. Climate change scenarios for Southern Africa were developed using tested simulation models in MAGICC 2.4 designed by Wigley et al. (2000) and SCENGEN designed by Wigley and Hulme (2000). Data were analysed using Procedure Frequency in Statistical Analysis System (SAS, 2003).

Results and Discussion

Climate acts directly upon animals, solar heat, humidity and dryness of the air. This affects the physiological processes of the animal that contribute to temperature regulation and affect hunger, thirst, reproduction and its physiological needs. Climatic factors control the vegetative cycles of forage crops, the choice and production methods of forage species, harvesting dates and particularly the resources and accessibility of drinking water. From time to time, annual rainfall does not come up to expectations and the amount of animal food available falls well below levels. Under these circumstances the farmer may have to alter his plans radically by reducing the animal number. Therefore the food available will be adequate to support fewer animals. Farmers can produce multi-nutrient blocks on their farmers for drought feeding.

This result predicts an increase in temperature of between 1.1 to 1.6 degrees over the next 30 years in Botswana. Global warming is also likely to lead to a change in the pattern of rainfall. The increase in temperature could be accompanied by a decrease in rainfall. A combination of these factors in Botswana

would most likely lead to a reduction in diseases and parasites. These conditions would also lead to an increase in heat stress. Farmers in Botswana should be made aware of these possibilities so that they can prepare themselves adequately. A pre-requisite to all mitigations is the need to fence grazing areas either as individuals or syndicates so that modern management techniques can be put in place. After fencing farmers could farm using local genotypes and diversify into other livestock types such as sheep, goats and wildlife. In addition, for increased heat stress, farmers also should ensure that there is adequate water and shading in grazing areas and kraals.

Keywords: Climate change, livestock Botswana

CV: A professor of ruminant nutrition and production.

RESEARCHING THE EVOLUTION OF THE EARTH'S OZONE TO ESTABLISH AN ACCURATE NATURAL BASELINE

Elizabeth Griffin

Herzberg Institution for Astrophysics, Victoria, BC, Canada

Keywords: Ozone – trend determination – Historic data – astronomical archives

Abstract

Naturally-occurring ozone (O_3) is an essential constituent of the earth's atmosphere, but has never received so much attention as when it was demonstrated that it could be on the decrease. The threat of its reduction has such dire consequences for all biological systems that it is energizing international campaigns, influencing the thinking of governments, and activating substantial alterations in the accustomed habits of millions throughout the world. However, the properties of ozone are not generally well known, while the actual facts concerning its concentration (and in particular its reduction) require expensive and time-consuming measurements with sophisticated instruments that are only accessible to the few.

The accuracy of our knowledge regarding changes in ozone concentrations, and in particular of recent decreases, is limited by data that have not always been as plentiful or as precise as in recent decades. If human interference, by releasing into the atmosphere CFCs and nitrous oxides which diffuse upwards and catalytically destroy ozone, is the sole cause of the observed decline then it is within human power to reverse the situation. However, natural long-term variations may also be a contributing factor, and it is that evidence which is not as well established as we have been led to believe. This is not to say that the simple conclusion of a sole (anthropogenic) cause is *wrong*, merely that the evidence is not yet incontrovertibly proven.

Ground-based observations of celestial objects inevitably pass through the stratosphere, where O_3 adds its signature at certain wavelengths. The most crisp (and therefore potentially the most precise) to work with are the Huggins bands, which occur in the UV close to the atmospheric cut-off caused by the intense O_3 Hartley band. Specific O_3 monitoring of the Huggins bands as seen against the Sun or the daytime sky commenced in Europe in the 1920s, and one site (at Arosa, in Switzerland) has maintained an unbroken set of records since 1926, yielding 250–300 daily means for most years. However, concentrations of O_3 are highly sensitive to local conditions (particularly pressure and temperature), so measurements from other, preferably independent, sources are needed in order to establish a more reliable picture of the global situation. The few O_3 stations contemporary with Arosa produced useful but much shorter data-sets, and since most were normalized to a “master” one and used identical equipment, they were not strictly independent.

One fully independent resource that has been ignored until very recently is astronomy's archives of heritage stellar spectra. Lack of trans-disciplinary database access, together with a general inability (even by astronomers) to measure historic astronomical data that are photographic and therefore inherently non-digital, are equally to blame for the lack of activity in that important area. This paper describes a proof-of-concept study and the start of a major campaign to measure those unresearched, non-digital data for this purpose. The project is beset by very specific challenges, not least because it requires measurements that were never intended by the original observers. However, its unique and rich potential for results of very substantial significance demands an effort that mankind cannot afford to pass over.

ENERGY WISDOM: CLIMATE CHANGE AND FUTURE ENERGY NEEDS

Jackie Carpenter

South West England Sustainable Enterprises (Trelay)

Type of presentation: Oral session

Abstract

The amount of energy available to fuel the global economy is about to enter a dramatic decline.

Oil is the basis of the global economy. Being a liquid fuel and thus easily transportable, it is used for almost all our transport systems. It is also used as feed-stock for many industrial processes, producing plastics, fertilisers and medicines. We use a wide variety of plastics for packaging, clothing, building materials and making computers and cars. Everywhere we look we see oil-based products. But oil is a finite material, laid down by a process that fossilised plant and animal remains millions of years ago in a one-off phenomenon.

The peak of oil production may have already been reached or is likely to be reached within the next few years. Price rises will not be the only problem; less oil being available will hit us harder. Market mechanisms will not be able to create more oil where none exists and there will be shortages across the world. Because we are pushing production to the limit at the moment, these shortages are likely to be sudden and dramatic when the remaining large oil wells go into decline. This will result in food shortages and probably civil unrest.

The economic growth model will not be able to be sustained without a cheap, increasing energy source. After oil has peaked there will be an economic decline. This is inevitable because our economic growth has been based on oil and cheap transport systems, so even if we have a considerable amount of other energy available – nuclear and coal for example – we shall not be able to reverse the decline. It will be a permanent decline, not a recession, and the decline will continue until the world reaches a stable situation with a population living a sustainable life-style within the new amount of energy and food that is available. A world population drop is likely, maybe to about one billion. If Nature orchestrates such a decline, our role will simply be to prevent as much suffering as we can.

Gas is another fossilised resource, used for heating in many homes. In many ways, heat is more important than the other energy we use, especially in a damp and cold country like the UK. Babies and old people can die without home heating. Gas is not a secure resource and its availability will decline too, maybe even more suddenly than oil.

There are huge reservoirs of coal, although much of the cheap easy-to-get coal has already been mined. Coal is carbon which has been sequestered by nature in a stable form, and it would be wise to leave it untouched if we wish to keep the climate of the planet as stable as possible. It is a dirty and unattractive fuel.

A significant amount of electricity comes from the fission of uranium in nuclear power stations, especially in France, but the world supplies of uranium are only sufficient for a few decades of electricity and many people are worried about the moral aspects of nuclear power stations. A considerable amount of international money has been invested in researching nuclear fusion, but the expected timescale for developing this technology is long and its problems may never be solved.

Renewable energy is the only safe, secure long-term solution to energy supplies for the future, but the development and construction of collection devices has been left too late; there is no longer the time to build enough renewable energy systems to maintain a twentieth century lifestyle. There is also a problem with land competition between renewable energy and food.

The idea of peak oil is a factual observation, not a theory. It is clear that very significant changes lie ahead, even though it is difficult to predict what those changes will be. Many people are already accepting that huge changes are inevitable, and are joining together in a grass-roots "Transition" movement.

The avoidance of war will be an important issue. Powerful governments throughout the world, despite the universal acceptance of human rights, will use armed forces to fight for resources, although fighting will not produce more oil nor help to achieve a desirable sustainable future. It will simply produce misery on the way.

As an engineer, I am enthusiastic about finding technological solutions. People sometimes imagine that clever engineers and scientists will solve all the problems we face, but we need to accept that nothing can replace the cheap oil that we have enjoyed for the past few decades. The technological solutions of the future will be many and varied, but they will be simple, appropriate technologies linked to a new, local, community-based future. Large inappropriate technologies such as nuclear power stations will need to be closed down in a safe and responsible manner, before our wealth has declined to the point where we are unable to do so.

Strategic planning will be our most important tool as we face an uncertain future. Fear and panic are no help. A clear and simple plan of what to do before we actually go over the edge of the cliff is needed.

Women are wise. Compared with men, women have a different sort of wisdom. The value of each single human being is clear to every woman who has borne a child. Women are natural peace-makers, an increasingly important role. We shall need to work with men to help them to accept the inevitable, for men can believe very strongly in magic bullets. Women will need to help men stop resisting the decline, and support them as we develop local communities and ways of life that will work in an energy-poor future. Women can become storytellers again, giving a clear and positive guidance towards a sustainable future. We can talk to the men and to the children about the wise strategies

we need as we head towards a world where we live in small, happy communities supplied by local renewable energy, local foods, appropriate technologies and local crafts. We need energy wisdom.

Keywords: Peak Oil Energy Sustainable Appropriate

CV:

Jackie Carpenter BSc (Hons) CEng MIMechE FRSA

Jackie is a chartered mechanical engineer and an expert on renewable energy, especially local community-based systems.

She became the most senior woman engineer in Brown and Root, managing multi-million-pound projects. She founded the charity, Energy 21, "uniting action for renewable energy", and worked for ten years as its MD. She was President of the Women's Engineering Society (UK) in 2002 - 2003.

Jackie raised two daughters born in the 1970s and is now a grandmother.

Jackie set up her home in Stroud to run on 100% renewable energy. In April 2007 she moved to North Cornwall to help create a new sustainable community at Trelay Farm near Crackington Haven. She is a freelance speaker, writer and consultant.

ADVANCES IN AUTOMOTIVE POWERTRAIN AND CO₂ EMISSIONS

Julie Winnard CEng, MIMechE

AVL Powertrain UK Ltd

Abstract:

With the increase in both public awareness and acceptance of issues such as Global Warming and Peak Oil, consumers are demanding "greener" vehicles and governments are tightening controls on vehicle environmental impacts such as emissions and disposal. What kinds of technologies are the motor manufacturers developing and what sorts of issues do they face in trying to address the changing set of market needs as well as the legislative demands?

In this paper I will outline both the situation now and in the near future, regarding the types of vehicles available in various markets and the demands of their consumers, which technologies are likely to be making an appearance in your nearest showroom soon, and how they help reduce emissions and other impacts. The following areas will be covered:

- Overview of the industry background: emissions and other laws impacting car makers, effects of globalisation and materials supply issues, effects of fuel supply, trends in consumer choice and technology supplied
- The main part of the paper will concern technology areas offering improvements in CO₂ emissions and fuel economy:
 - Combustion Engines: Future developments in diesel and gasoline technologies
 - Fuels: development of alternative fuels and new sources
 - Hybrid Vehicles: the main types of hybrid available and future trends
 - Fuel Cells: why fuel cells? Which types lend themselves to vehicles and how
- Finally I will consider some overarching questions:
 - What else are carmakers doing to reduce environmental impact?
 - What about the whole lifecycle of a car- what proportion of the impact is emissions?
 - Can a car ever be carbon neutral?

Keywords: CO₂, Emissions, Automotive, Powertrain

CV:

Julie is a chartered mechanical design engineer, innovator and project manager, with 15+ years of experience in automotive development activities from innovation and concept development, through detailed design, to investigation and resolution of quality, safety and cost issues. She has worked in areas from powertrain and braking to electronics and recently worked in the rail industry and on fuel cells. Trained in Life Cycle Analysis, with an overview of sustainability issues, she organised the 2005 annual conference of the Women's Engineering Society (WES), on Energy & Transport. She is a member of the UK's Sustainable Development Commission Advisory Panel

AVL Powertrain UK Ltd are the new UK-based arm of AVL, and are an engine development consultancy providing support to clients in the automotive, marine and other sectors. Working as a senior engineer and troubleshooter she assists teams with short-deadline tasks, and skills transfer. She provides project management skills and liaison engineering between clients and in-house. Her current client-facing role concerns projects before their official start, collecting and analyzing technical and commercial data and risks to provide senior management with good quality information for decision-making.

OCCURRENCE OF PAPAYA RINGSPOT VIRUS IN COTE D'IVOIRE

Hortense Atta Diallo^{1*}, Nazaire Kouassi² and Phil Jones³

¹ Université d'Abobo-Adjamé

² Centre National de recherche Agronomique

³ Global Plant Clinic, Plant Pathology and Microbiology Department, Rothamsted Research

Type of presentation: Poster

Abstract:

Plants showing symptoms typical of virus infection are observed in papaya orchards in Côte d'Ivoire. These symptoms include mosaic, yellowing, shoe-stringing, distortion, line patterns and hardening of the leaves as well as ringspots on some green fruits. In February 2006, eleven papaya orchards located in six production areas and papaya plants growing in the district of Abidjan were surveyed. For virus identification, fifty seven leaf samples were collected from plants showing some type of symptoms and three samples were collected from symptomless plants. The double antibody sandwich-enzyme linked immuno-sorbent assay (DAS-ELISA) was conducted using leaf extracts to test for the presence of several viruses including Papaya ringspot virus (PRSV). Nine samples out of the 60 tested were positive for PRSV. These samples came from three locations. Flexuous particles characteristic of potyviruses were observed in leaf-dip preparation of the ELISA-positive samples under the transmission electron microscope. Part of the coat protein gene with the 3'-untranslated region, a 676 bp fragment, was amplified by reverse transcription-polymerase chain reaction (RT-PCR) from one PRSV-positive sample using appropriate primers. The nucleotide sequence of the PCR product (Genbank Accession Number DQ84023) indicated that the virus is indeed PRSV (Diallo *et al.*, 2006). These results indicate not only that PRSV occurs in different papaya growing areas in Côte d'Ivoire, but also show the possibility that other viruses may be present in papaya.

Keywords: papaya, PRSV, symptoms, identification, ELISA

CV:

After the Bachelor of Science degree obtained at the Université de Côte d'Ivoire in 1991, I obtained both a Master's of Science degree in Plant pathology in 1994 and a PH.D. degree in Plant Science (Virology) in 1998 from the University of Arkansas.

Since November 1999, I am a lecturer and Researcher at the Université d'Abobo-Adjamé (Abidjan Côte d'Ivoire). I am a Technical Advisor to the President of the University in charge of cooperation.

I have benefited from several training in gender, leadership and mentoring. I am now a member of several professional organisations. I am also a member of several women organisations (National and International). In 2005, I participated in the ICWES13 meeting in Korea where I presented a poster.

WHAT IS SUSTAINABLE AGRICULTURE?

THE INFLUENCE OF AGRICULTURE DECLINE AND THE PROVISION · · · CASE IN JAPAN

RYO KIMURA

sakae-sekkei co.

Type of presentation: Poster

Abstract:

Current state of agriculture of Japan

The agriculture of Japan is in the crisis situation by import liberalization of agricultural products and aging of farmer. Farm population of Japan is about 2.44 million people. This is few with about 3.7% of the employed population.

In addition, the farmer of 65 years or more is 54% in all farmers. This is a sign of aging in the agriculture of Japan.

Oppositely The number of farmers from 15 to 40 years is 8%, these are very few figures.

Under the influence, agricultural rate of self-sufficiency is 40% in Japan.

The decline of agriculture destroys nature in the farm villages and breaks the spectacle in the farm village, and decreases the number of the animal and plant.

What is sustainable agriculture?

The agriculture of Japan has depended on the chemical fertilizer, agricultural chemicals, and the fossil fuel, for a long time. They have temporarily raised production, but they have polluted the soil, and hardened the soil for a long time.

And, they traps the next age agriculture in difficult. Based on such a failure, we are planning variously schedule for Sustainable Agriculture.

For example

1. Use a compost hat made from the fallen leaf and the domestic animal who collected from a surrounding mountain.
2. The farmer makes another kind of farm products and manages small-scale stock raising, does so a small cycle of raising crops with the compost of my house can be done if it. If they do it in each town, so a big circulation of agriculture arises. And they will invent biogas and other natural material.

Sustainable community building and city planning

My work is "Sustainable city planning and community building."

Concretely, to remake the nature river from concrete river, to remake the animal trail that destroyed by the road, to remake the traditional village that covered with Western houses.

The purpose of my work is a beautiful establishing of the country to use a traditional technology and a new technology.

Bioregion

The bioregion is a new ecosystem. When we design the some area, we have to investigate big area.

For example, one river has the influence power, for animals, fishes, plants, field, sea, etc.

So, we have to think about every influence, the human society is a part of the ecosystem.

To make a sustainable region is biotechnology regionalism.

And that is my job.

I want to introduction our job and new technology in Japan at ICWES 14.

Keywords: Sustainable ,Agriculture,Bioregion,Landscape,Nature

CV:

I graduated from the university of architecture.

It started, and I was designing construction. Next, the design of landscape architecture. It relates to agricultural landscape, and the work of environmental preservation, construction, and engineering works is done now.

QUALITY IMPROVEMENT TECHNOLOGY OF CULTURES (*ALLIUM SATIVUM* L AND *GLYCINE MAX.*(L.)*MERR.*) USING BALANCED SULPHURIC FERTILIZERS.

Oksana Sytar, Anatoliy Kosyan, Nataliya Taran.

Plant physiology and ecology department, biology faculty, Kyiv national Taras Shevchenko university

Type of presentation: Poster

Abstract:

Effective quality improvement technology of agricultural crops (*Allium sativum* L and *Glycine max.* (L.) Merr.) is developed on the basis of sulphur containing compound metabolic transformation definition in plants of garlic and a Soya at their exogenous regulation by mineral element feeding. The technology consists in increase of alliin and organic sulphide contents in bulbs of garlic for agricultural production and sulphur containing amino acids of Soya seed protein with preservation of normal productivity.

Development of effective technology of improvement of quality of agricultural crops (*Allium sativum* L and *Glycine max.* (L.) Merr.) is carried out on the basis of sulphur containing compound metabolic transformation definition in plants of garlic and a Soya at their exogenous regulation by mineral element feeding.

The technology consists in increase of contents alliin and organic sulphides (biologically active pharmacological valuable substances) in bulbs of garlic for agricultural vegetable manufacture and sulphur containing amino acids of Soya seed protein with preservation of given plants parameter productivity. Recently special attention started to pay on such important element of plant nutrition as sulphur to be the first traced element together with such important biological elements as nitrogen and phosphorus.

The use of sulphur containing fertilizers in quantity of 125 kg sulphur per hectare and treatment of plants by lipoic acid (growth regulating substance of a natural origin) solution alliin content in garlic bulbs raised by 111,6 %, and organic sulphates - by 115,2 % increasing food and pharmacological value of garlic bulbs twice.

Technology of sulphuric fertilizer use developed increases productivity of garlic active substance in one and a half times, and with using lipoic acid this increase can gain 100%. Economic efficiency of use only sulphuric fertilizers can gain \$2932, and in association with lipoic acid - \$4398 per hectares.

Sulphuric fertilizer (50 kg sulphate ammonium per hectare) application provides optimum conditions for growth and developments of Soya plants in Ukrainian Polesye and promotes improvement of Soya seed quality with free thiol content increase and sulphur-containing compounds at redistribution of protein fractions. The changes like these caused by sulphuric fertilizer application promote adaptive transformations of protective systems against lead ion action.

Sulphur supply activates Soya plant photosynthesis apparatus, promotes assimilation leaf square increase, transpiration and productivity indexes enlarge (bean quantity, seed mass). It stipulates experimental plant productivity by 20% in average.

Feeding with sulphur induced protein content increase in Soya seeds by 35% comparing to control. Also globulin enrichment with sulphur containing compounds that determine seed quality is observed.

Keywords: improvement of seed quality, adaptive transformations, sulphuric fertilizers, *Allium sativum* (L), *Glycine Max.* (L.) Merr

CV:

DATE OF BIRTH: 4 November 1979

NATIONALITY: Ukrainian

FAMILY POSITION: Single

EDUCATION: Kyiv National Taras Shevchenko University, Biology Faculty, Plant Physiology and Ecology Department
Graduated in 2002

Degrees obtained: Plants Physiologist; Teacher of Biology, Kyiv National Taras Shevchenko University, Biology Faculty, Plant Physiology and Ecology Department

Post-graduate student (2002-2005)

2005 –PhD degree

RESEARCH

EXPERIENCE: researcher of Plant Physiology and Ecology department of Taras Shevchenko National University

TEACHING

PRACTICE: Chair of Biochemistry, Kyiv Medical University

2005 – Present: Teacher

Native language: Ukrainian.

Foreign languages: English, Spanish, Russian.

MEMBERSHIPS: Member of Federation of European Societies of Plant Biology

Member of European Society for New Methods in Agricultural Research

Member of Non-government organization "Women in science"

My research interest:

- Molecular mechanisms of the heavy metal and pollutant toxicity
- Ecological aspects of toxin produced by microorganism
- Gender investigation in high education of Ukraine

MAIN PUBLICATIONS:

Matyshevcka O., Taran N., Sytar O., Teplyk N., Kobchenko K. (2006) Risks to young adults and women health state in Ukraine in the context of Chernobyl accident. Runbrief, Schwerpunkt: 20 Jahre Tschernobyl, NUT-April 2006, Germany, PP.13-18.

Sytar O., Taran N. Soya plant cultivation technology search taking into account its biological characteristics and environmental conditions. "Wombit" conference: women on biotechnologies, Rome, Italy, 21-23 June, 2007, www.wombit.net

THE REGENERATION PROJECT TO THE CULTURAL EXCHANGE CENTER FROM THE OLD RESIDENCE – THE COLLABORATION OF THE MODERN ARCHITECTURAL TECHNOLOGY AND THE TRADITIONAL CRAFTSMAN SKILLS OF WOODEN ARCHITECTURE

CHIGIRA.Miyuki

Hitachi Architects and engineers Co., Ltd. & The Woman Professional Engineers Society of Japan

Type of presentation: Poster

Abstract:

I had the project of the regeneration of the old residence in Kounosu city, Japan.

It is the private residence built in the Edo period. It was home of the celebrity in the region. But it was a deserted house where no one lived for some years. And the celebrity's bereaved family donated the house and the land to the city in 2002.

Konosu city examined how to use the premise establishing the committee. And it decided it to the change of the old private house to the cultural exchange center.

My company won the competition of the architectural design of the regional cultural exchange center.

Our concept was evaluated. The architectural parts of the old residence were recycled into the new building.

The regional cultural exchange center opened in June 2007. Now it has been managed by the NPO by the citizens.

The features of the project

- + It was the collaboration of the modern architectural technology and the traditional craftsman skills of wooden architecture.
- + The old buildings were considerably worn out and the new usage that the city had requested was different from the residence, but they were not demolished.
- + For environmental preservation, the technical skill of recycling without demolishing was devised.
- + The architectural materials in many parts of the old residence were recycled into Omoya (the new main house). For examples, beams, ceiling boards, sliding doors, window frames and so on.
- + Chashitsu (the tea-ceremony building), Hanare-zashiki (the room detached from the new main house) and Nagayamon (the special gate) were used as them were without remodeling it. Only the hurting wooden parts were changed.
- + The other materials were used for the Japanese garden. For examples, Kawara (roof tiles), base stones for the pillar and so on.
- + To lighten the garden, dense thickets were cut. But the many beautiful trees were conserved as much as possible.
- + The citizens had considered it from the start of the project as a committee.
- + They participated in the project planning when under construction.
- + NPO has managed the many events like the friendly concerts and workshops regional specialties now.
- + It is a project in which the citizens participated from beginning to end consistently.

The composition of the cultural exchange center

- + Nagayamon (the special gate)

Nagayamon was used as it. It was not remodeled. Only the hurting wooden parts were changed.

It is used as the souvenir shop of the regional vegetables and flowers.

- + The front garden

Floriculture farmers have planted and changed the flower every season.

It is very beautiful view.

- + Omoya (the new main building)

The old house of two stories was demolished, and the new building was constructed as the music hall built in wellhole style. The beams of the old residence were recycled in different shapes. The beams of four-step expression are the masterpieces.

It is used as the tea salon.

- + Hanare-zashiki (the room detached from the new main house)

Hanare-zashiki was used as it. It was not remodeled. Only the hurting wooden parts were changed.

It is used as the restaurant of the homemade noodles.

- + Chashitsu (the tea-ceremony building)

Chashitsu was used as it. It was not remodeled. Only the hurting wooden parts were changed.

It is used as the tea ceremony room.

- + The Japanese garden

It is a Japanese garden composed entirely of rocks, stones and sand. It consists a lot of materials in the old

residence.

The guests in Hanare-zashiki can see the Japanese garden when sitting straight.

+ The English garden (the rose garden)

The celebrity of the owner in the residence was a lover of the roses all over the world. A lot of perpetual roses were planted in the English garden in the site commemorating him.

Keywords: Environmental preservation, Old residence, Traditional craftsman skill, Community participation, Collaboration

CV:

I was born in Tokyo, Japan in 1961, graduated from The University of Chiba, Architectural department.

I am a registered architect and a PE.

Architectural projects are my present works.

E-WASTE MANAGEMENT IN THE PHILIPPINES: STATUS, CHALLENGES AND THE ROLE OF WOMEN IN SCIENCE

Maria Pythias B. Espino

Institute of Chemistry, College of Science, University of the Philippines

Type of presentation: Poster

Abstract:

The increasing dependence on electronic equipment in homes, schools and the workplace creates challenges in the management of electronic wastes. Improper handling and disposal of e-wastes may release heavy metals (Hg, Cd, Pb, Zn, Cr(VI), etc.), brominated flame retardants, plastics and polymeric substances that pose threat to human health and the environment. In the Philippines where chemical waste and solid waste management figure among its imminent environmental problems, women in science have an important role in helping government implement its national programs on hazardous waste management. To date, public involvement and education on the impacts of e-wastes are limited. At the University of the Philippines Institute of Chemistry, we have gradually introduced contemporary topics such as the management of chemical wastes and electronics or IT-related waste in our general chemistry courses. This paper will discuss the current status, issues and concerns regarding e-waste management in the country. Studies on public perception and leadership commitment, sound technologies for e-waste disposal, the impacts of the release of toxic chemicals from e-wastes, and alternative materials will be discussed.

Key words : electronic equipment, hazardous waste, environment

CV:

Maria Pythias B. Espino is an Assistant Professor at the University of the Philippines Institute of Chemistry. Her area of specialization is environmental and analytical chemistry. She handles undergraduate general chemistry and analytical chemistry and teaches analytical chemistry in the graduate program. She recently served as deputy director of her institute and currently serves as Safety, Health and Environment Officer on top of her teaching and mentoring duties.

ALTERATIONS OF LANDSCAPES AND HABITAT LOSS OF SKYLARK (*Alauda arvensis*) IN METROPOLITAN SUBURBS.

IMOTO, Ikuko

NPO The Geoecological Conservation Network

Type of presentation: Poster

Abstract:

When considering landscape we must include wildlife as fundamental elements of the scenery, because wildlife keeps the landscape animated and varied. And more importantly, richness of the species within the landscape should be considered to conserve the biodiversity and keep the region more healthy and preferable place. In rapidly changing suburban areas, alterations in landscapes and ecological systems are indicated by loss of wildlife species, because they are strongly dependant on vegetation type or land-cover type for their food, hide, and nesting place. In this study, a habitat model of skylark (*Alauda arvensis*) is made from a vegetation map and the line census data of 129 routes using GIS (Geographical Information System) in the study area which is placed in The Sagami River basin at suburbs of Tokyo metropolitan area. With this model potential habitat map of skylark is made in the study area. The map shows small habitats are scattered in mostly agricultural fields and expected to be diminished by urbanization. The phenomenon itself may be considered as not very important by people, as the skylark is not a rare and an endangered species when thinking in national scale. But the loss of the skylark habitat, which indicates an existence of an agro-ecological system, means losses of many species from the area and decrease of the biodiversity. Therefore it is important to know how rapidly the loss of the habitat has been occurring these days and where is the most fragile habitat to conserve. Land-use maps, which are converted to land cover maps, of the two different ages; 1979 and 1994, are used to show the habitat loss in 15 years. Comparing two potential habitat maps, it becomes apparent that large habitats are diminishing their size, and a green belt along the Sagami River is shortened by the land-use changes from agricultural fields to more urbanized use such as houses and roads. On the other hand, in some area habitats are increased. The one reason of the increase is the development program of a new-town. Before the development, woods and forests are clear-cut and flat grass lands are constructed for the oncoming new-town. Therefore it is clear that as the development move ahead more habitats loss will occur in the future.

Keywords: habitat loss, skylark, biodiversity, metropolitan suburbs, land-use

CV:

Landscape Architecture , Landscape Ecologist, and a Planner.

TEXTILE RECYCLING: STATE OF THE ART AND PROBLEMS CURRENTLY FACED

Michaëla Pearson, Anne-Marie Jolly-Desodt, Anne Perwuelz

Laboratoire GEMTEX (Génie et Matériaux Textiles), ENSAIT (Ecole Nationale Supérieure des Arts et Industries Textiles)

Type of presentation: Poster

Abstract:

Textile recycling is an important problem because clothing consumption is rather huge: as an idea, last year, France consumed 42 billion euros of clothing and UK 33: at world level the problem of what happens then is really fundamental. The presentation shows facts and potential solutions, particularly through the comparison of France and UK practices.

WASTES:

Clothing consumed generates from one part recycled textile and for the other part textile waste: in UK 25% is recycled while in France 12% is recycled; concerning wastes, practices can be very different, even for neighbour countries: The textile waste "disappears" in UK mostly through landfill (82% of the wastes) and in France through incineration (41%).

The first challenge concerns in the realisation of a more important transformation of this waste in recycled textile and, for the remaining, to find a way more satisfying for elimination of textile waste, for example through energy recovery: at this moment in France textile waste which is not incinerated can be buried (39% of the wastes) but 8% is biologically treated. These solutions have economic and environmental costs very different.

THE WAYS TEXTILES ARE RECYCLED:

They are very different according to the state of textile and its chemical composition: one can classify them in 4 categories: Second hand, wipers, fillings, fibre reclamation. However this list is not closed and perhaps new solutions could still appear.

For second hand the most popular channels are charity shops and developing countries (particularly Africa).

When textile (especially cotton made) is transformed in wipers, it has a direct impact in replacing its virgin material equivalent, which is a good thing from the environment point of view.

Knitted or woven woollens and similar materials are shredded into a fibrous condition for reuse by the industry in low-grade applications (car insulation, roofing felts, and furniture padding...)

Fibre reclamation could offer, if developed, opportunities for reuse: after the material is shredded into shoddy, it is mixed with other fibres, and then spun. When quality can be insured, this can be an interesting way of recycling because it avoids washing raw materials and dyeing. The use in non woven is also possible instead of spinning.

For synthetic material, melting is a possible solution, but this implies removal of non polyester components; then the garments are granulated and polymerised to form polyester chips. The problem is that the polymer obtained is not always of good quality; if synthetic textiles are melt to monomer it is possible to obtain higher quality polyester fibre but it requires additional energy and hence pollution.

THE NEED OF FASHION:

Second-hand clothing makes up the majority of collected textile but fashion creates with respect to recycling specific problems that do not exist for example in electrical recycling: some garments that are still in good state but no more fashionable are impossible to sell, even in Africa: because of the low costs of low quality textile, even poor people prefer to buy those fashion items that second hand ones. If clothes are transformed in wipers or filling, the consumer will consume virgin material when he buys clothing. At this moment in UK, fashion second hand NoLoGo represent a small amount of the purchases of second hand clothes. The "second life" of textile through design and customization could be a solution to satisfaction of the fashion need, but it implies that more designers feel interested by this channel.

THE PROBLEM OF QUALITY:

Another great preoccupation concerns quality of textile: when we study the different ways of recycling, if second hand is not possible, we observe that quality decreases in this process, even if the textile was in its first life of good quality. But, for some years there appears a new situation: the reuse proportion is declining due to low cost Far Eastern imports: in recent times 60% of all second-hand clothing collected was suitable for re-use, it is currently estimated that this amount is now only 40%. If processes to obtain new fibres apply to these textiles, the quality of the recycled material will not be good, either it will be more expensive or polluting.

Those cheap exports into the EU are in competition with the textile recycling industry and this depresses the sales and margins of second hand clothes.

ENVIRONMENTAL COST OF RECYCLING:

Studies are conducted to define a strategy for minimising logistic environmental cost of recycling. They have been realised in UK and show that transporting clothing banks to trailer sites represents 37% of the logistics process at the beginning of the recycling procedure. But studies made Patagonia show that logistics stays a weak part of CO₂ emission in respect to production of textile from virgin material. So this cost must be studied in a global way for each kind of recycling solutions, considering energy consumption, water consumption, economic costs, emissions of CO₂, natural resource consumption as is traditionally made during LifeCycleAssessment. This could imply specific strategies for the recycling reverse logistics.

SOLUTIONS: Consumer Awareness and good decision support tools for the designers.

No progress is possible if the consumer is not aware that volume and quality of its purchases have a direct impact on recycling and that it is of global interest for the future to pay for more quality. It is why the idea of recycling should be integrated at the beginning of the life of products (at the step of design) and then clearly mentioned to the consumer.

From the point of view of the textile distributors, even if facts concerning potential recyclables are not completely known, it is interesting to economically and environmentally evaluate the different options concerning the recycling of the textiles they are currently realising.

In our study we evaluated the energy consumed per tonne for new cotton T-shirts, Recycled Cotton T-Shirts, new cotton T-shirts, recycled polyester T-shirts as well as concerning the option to come back to monomers or to extract fibres so as to realise nonwovens. It is also possible to estimate others parameters linked to recycling process such as logistics. With these data it is possible to realise a decision support to compare design options, it is our actual work.

Keywords: Recycling, textile, garment, environment, decision

CV:

AM JOLLY is full professor in Ecole Nationale Supérieure des Arts et Industries Textiles.

Her fields of research are multicriteria decision systems for sustainable development, logistics and data fusion .

“CHEMPOLICY” PORTAL BRINGS THE KOREAN FINE CHEMISTRY COMMUNITY TOGETHER

Myung Hee Jung

Research and Policy Center for Chemical Technology, Korea Research Institute of Chemical Technology, Daejeon, Korea

Type of presentation: Poster

Abstract:

The Korean government has been financially supporting research and development (R&D) of fine chemicals over the past 30 years, resulting in patents, reports, scientific publications and new products. To make these results more accessible to the Korean fine chemistry community as well as to cope with the ever-changing world of science, the chemical policy portal project was initiated; the advancement of information technology in Korea was another impetus of this project. A centralized collaborative web portal in fine chemistry is believed to be beneficial to the Korean fine chemistry community which includes government officials involved with chemical policy making, people in the chemical industry and research chemists. Thus in 2007, the “Chempolicy” portal site has opened and has reached over 900 members as of December 2007; over 20,000 visits per month have been recorded. The “Chempolicy” portal provides users with resources including patents, journal articles, scientific news, research trends in and out of Korea, professional review articles, chemistry essays, conference information and government science policies and grant information. Moreover, potential collaborators in academia, as well as in industries can also be sought. Database is available on approximately 7500 chemical industries, about 3000 chemists and 18 chemical societies from all over Korea. It is the first of its kind in Korea and upon completion of the Korean version, an English site is to follow to serve not only the Korean chemistry community but also the global chemistry community.

Keywords: Chemical policy, web portal, information, fine chemistry, chemistry database

CV:

Myung Hee Jung is board of director of INWES and has served as president of the Association of Korean Woman Scientists and Engineers from 2004~2005. She was responsible for organizing the 13th ICWES as ICWES 13 Chair, which was held in Seoul, Korea in 2005. She is currently the director of the Research Policy Center for Chemical Technology at the Korea Research Institute of Chemical Technology which is located in the research complex in Daejeon, Korea.

THE ROLE OF GEOINFORMATION IN POVERTY REDUCTION IN DEVELOPING COUNTRIES

Faith Njoki Karanja

Department of Surveying, University of Nairobi

Type of presentation: Poster

Abstract

Poverty is viewed as a condition of lack of full economic access to fundamental human needs for instance food, shelter and safe drinking water. According to World Bank report, extreme poverty refers to living on less than 1US\$ a day whereas moderate poverty refers to less than 2US\$ a day whereby in 2001 an estimated 1.1 billion people had consumption levels below 1US\$ and 2.7 billion on less than 2US\$. Globally, women are said to be the poorest of the worlds poor with statistics showing that 70% (about 900 million of the 1.3 billion people) live in absolute poverty. In Sub-Saharan Africa, the Gross Domestic Product (GDP) decreased by 14% percent and extreme poverty increased from 41% in 1981 to 46 percent in 2001 thus increasing the number of people living in poverty from 231 million to 318 million. Specifically in Kenya 58.3% of the population lives on less than below 2US \$ whereas 22.2% living on less than 1US\$ which implies that more than 50% of the total population lives below national poverty line.

Poverty is a spatial problem and even before understanding the causes (what), there is need to identify the geographic location (where) and the extent of poverty (how much) so that homegrown solutions can be sought. This study therefore demonstrates how Geoinformation can be used to map, quantify and assist in understanding the causes of poverty. Four main poverty measures are considered namely economic, social, demographic and vulnerability indicators for two case studies one representing a low level and a high income area in Nairobi Kenya. A comparison is made on the poverty measures to emphasize on the disparities that exist between the two classes. The information generated can then be used as a basis for generating and implementing poverty reduction policies.

Introduction

The causes of poverty are sometimes complex to understand. At the international level, global causes like unfair trade policies, aid and debt, etc have been cited. On a national level lack of proper public administration, financial management policies and good governance have been attributed to poverty growth.

Poverty has many consequences, for instance lack of access to essential health services, can lead to hunger (800 million people go to bed hungry every night), mental and physical health problems that make it difficult to improve the situation. It has been reported that one third of deaths which translates to 18 million people a year or 50,000 per day are as a result of poverty-related causes. Since 1990 a total of 270 million people, most of them women and children, have died as a result of poverty. In addition those living in poverty have a lower life expectancy for instance, every year nearly 11 million children living in poverty die before their fifth birthday. There is also increased risk of homelessness and drug abuse by poverty, [WHO, 1999].

However, according to world bank report, the percentage of people living below poverty line has decreased globally since 1990 as shown in table 1.

Table 1: Global population of households living below poverty line [Source World Bank, 2007]

Region	1990 %	2002 %	2004 %
East Asia and Pacific	15.4	12.33	9.07
Europe and Central Asia	3.60	1.28	0.97
Latin America and Caribbean	9.62	9.08	8.64
Middle East and North Africa	2.08	1.69	1.47
South Asia	35.04	33.44	30.84
Sub-Saharan Africa	46.07	42.63	41.09

Poverty Measures

These are indicators that can used to characterize poverty within a given geographic region. They include:-

- Economic Indicators are monetary regarding household well-being of food and non-food consumption or expenditure and income.
- Social indicators are non-monetary that give an indication of a household well being e.g. quality and access to education, health, nutrition, social capital and other basic services.
- Demographic indicators are concerned with the gender and age structure of households as well as household size.

- Vulnerability indicators on the other hand deal with factors like environmental exposures and hazards, physical insecurity, political dynamics, etc.

[Davis, 2003]

Geoinformation Technology

It is a science which involves development and use of information science infrastructure to address the problems of geosciences and related branches of engineering. The Three main tasks of geoinformation technology are namely:-

- Development and management of databases of geodata
 - Analysis and modeling of geodata
 - Development and integration of computer tools and software for the first two tasks.

[Longley, et. al., 2005]

Geoinformation Technology and Poverty Reduction

Within the context of

Poverty reduction, the idea is to be able to acquire data that would support this initiative. Of prime importance is the spatial data that defines the geographic location of the area of interest and non-spatial data that pertain to the economic status, availability of basic services, demographic data, etc. Once this data has been captured and entered into a database. The next step is to carry out integrated analysis with the objectives of addressing the questions:-

- Where do we have poverty?
- How much poverty is being experienced (extent)?
- What are the causes poverty?

The where query can be addressed by simply identifying those households or areas with people living on less than 1US\$. How much poverty is being experienced or the extent is then an extrapolation to highlight the region experiencing poverty in order to appreciate the impact and seek for measures to address the problem. The prevailing environmental, social, political, situation can assist in understanding some of the causes of poverty. The contextual information regarding the environment can be provided by remote sensing data which gives a visual perspective of the existing ground situation.



Figure 1a) Quickbird image of a low-level income area



Figure 1b) Map of a low-level income area



Figure 2a) Quickbird image of a high-level income area Figure 2b) Map of a high-level income area
Figure 1a shows a satellite image (Quickbird) and 1b is a corresponding map of an example of a low-level income area Mathare where the people live on less than 1US\$ a day and the housing is characterized by slums which are very congested and absence of infrastructure. The population here depends on manual jobs for survival and the population is very high. They also have no security of tenure.

An example of a high-level income area is shown by figure 2a which is a satellite image (Quickbird) whereas 2b is a map of Muthaiga. It is evident that the infrastructure is well designed with well built and spaced houses and gardens. The community here consists of people who are employed by international/multinational or private companies as well as self employed.

The spatial dimension introduced by Geoinformation technology enables the situation on the ground to be diagnosed and understood in terms of where and extent of poverty as opposed to the traditional way of relying on household survey thus enabling even causes to be established and appropriate measures undertaken.

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World Health Organization, 1999; The World Health Report – Making a difference.
<http://www.who.int/whr/1999/en/>

Key Words: Geoinformation, Poverty Reduction, Mapping, Indicators, Policies

CV:

I am currently a lecturer in the Department of Geospatial and Space Technology in the School of Engineering, University of Nairobi, where my main areas of specialization are Geographic Information Systems and Remote Sensing. I teach both undergraduate and postgraduate students, supervise Masters and Ph.D thesis as well as undergraduate projects. For my education background, I have Ph.D.(2002) from University of Hannover Germany, Institute of Geoinformation and Photogrammetry, MSc. (Surveying, 1997) from the University of Nairobi, Postgraduate Diploma (in Computer Science, 1993), University of Nairobi and BSc. (Surveying, 1991), University of Nairobi. Im currently undertaking a Masters in Business Administration to improve on my leadership skills. Im also involved in various committees in the University aimed at enhancing programmes making them more attractive to female students. Further, my vision is to apply my knowledge and skills and position to assist in improving on the living conditions of the disadvantaged specifically women by empowering them to be self sustaining.

INTEGRAL PROPOSAL TO FORTIFY THE DEVELOPMENT OF THE PRODUCING AND MICRO ENTERPRISES WOMEN IN POVERTY SITUATION

Marcela Laguna Morales

Director of Development, Gender and Citizenship, Civil Association, Chiapas, México.

Type of presentation: Poster

Abstract:

With the basis of to the experience on research, implementation and evaluation of public policies for women in situation of poverty in rural contexts, indigenous and suburban, I will make a diagnosis and an integral proposal to found out general lineaments to incorporate to the women to the development in conditions of equity and equality of opportunities.

The scopes that I allow myself to propose, with base to an analysis of the reality conducted with active participation of the women en Chiapas, México, and Guatemala Centro America are: integral handling of the natural resources, fortification of the micro economy, food production and the capacities of the women to transform their own life.

This communication rescues the importance of the construction of the women like active social subjects, considering its specific diversity, its conditions, their contributions and their active participation in the development.

It is necessary to make visibly and to recognize the contribution of the women the economy, the development, the food production and in general to the development of the society, nevertheless, is fundamental to identify the obstacles related to its conditions of gender, ethnic group and class so that they can be gotten up to the human development in better conditions and for acceding to the benefits of equitable way.

In this communication I rescue the importance of fortifying the capacity of agency of the women from approaching economic and financial resources like non financiers and of fortification of abilities by means of the qualification and specific issues related financial, technician, like a forest management, micro enterprises improvement abilities, agro ecological approach to increases the food production without affect the poor quality of life for women that participate in the programs, and the others issues to get a better and more efficient resources management under a gender perspective in the technological tools.

The technical aspects often are forgotten within the programs of development for women because the granted financial resources are quantifiable that aspects so nouns as the improvement of the self-esteem, the health, the education and the development of solidarity and mutual aid between women.

In this work and with the basis on the lived experience, I share the methodological guidelines that must as much be boarded, from the implementation of the public policies, like from the non governmental and international organizations promoting the access of the women to the resources, technology and new knowledge that allow to develop their capacity of agency to transform their conditions of life and for affecting by means of their organization, to the design of policies in the local scope so that the governments and the institutions have a paper of greater commitment for the equality and equity of gender from their specific programs.

At the same time, I will develop a system of indicators in the scale micro and the intermediate scale to measure the advance that from the public policies will have to be moderate to consider if the aspects of gender in their design, implementation and evaluation are built-in.

The great indicators that I recognized as very important to account in a development strategy with gender mainstreaming are:

1. - Natural resources: access and control. I will make visible the contribution of the women to the integral handling of the natural resources taking as case study the situation of women refugee Guatemalan integrated in Chiapas, Mexico. The rural and indigenous women are related of specific way to the natural resources considering indicating like: knowledge of the biodiversity, integral handling which they make in backyards, traditional parcel, and management knowledge.

2. – Fortifying micro economy and saving systems. I systematize the experience of work with women micro enterprises who initiated the fortification of their small companies through conforming systems of

micro saving and micro loans with the purpose of fortifying their economic scope and the generation of income. I rescue the experience lived on work during 4 years in a micro saving program and micro loans and the made evaluation of impact. I propose lines of work to fortify the access of the women in poverty to the saving, the micro credit, the qualification and the access to right markets for a greater fairness in its incorporation to the economy.

3. – Empowerment for rural women for food production with technological and new information access. With base to an analysis on the participation of the rural women to the food production, the obstacles factors and the potentialities, I allow myself to make an integral proposal of qualification and fortification of the food production, specially of the maize to try a greater improvement of the producing food women considering the indicators: sexual division of the work in the home and the parcel and backyard, used technology and profile of access and control of resources and benefits.

4. – Empowerment in agency and improvement of technical qualification. I systematize the experience of integral qualification to indigenous women, no indigenous, craftswomen, producers of foods and micro enterprises with the purpose of contributing to the design of a program of integral qualification with gender perspective that allows the women to improve its abilities, to recognize its rights and to efficiently handle to its resources and benefits for an incorporation to the development in conditions of greater equity and equality.

Key words: gender, public policy, development, equity, equality, environmental, agricultural production, saving, micro credit, appropriate technology.

CV:

Agricultural Engineer by the UNAM, specialist in Agricultural Systems and Master Degree in Gender and Rural Development by the School of Postgraduados in Agricultural Sciences. She has been working and living in Chiapas State and she worked with rural, indigenous, and suburban women in several issues related at environmental management, improvement economical programs, microcredit systems, and empowerment integral approach methods for non literacy women in a several urban and rural contexts in Chiapas and Guatemala.

She has been gender consultant for the ACNUR and for FAO designing programs in leadership, handling of natural resources, saving, credit, and gender mainstreaming incorporation into the organizations.

From 2001 to 2007 she directed public policies with perspective of gender in the state of Chiapas and coordinated the research on femicide. Published articles specialized on gender in the magazine Agrociencia of the School of Postgraduates and scientific publications as the postgraduate colleague of the South Border and elaborated manuals and material didactic for indigenous women and farmers in Chiapas and Guatemala.

She conform the Network of Investigators by the Life and the Freedom of the Women, Gender and Economy Network in México and America Latina. At the moment she studies and she lives in Granada, Spain taking courses into the European Masters in Studies of the Women and Gender and she is going to return to her Country in June as a Director of the Civil Association Development, Gender and Citizenship in Chiapas, Mexico. Next October she will arrive to the Hull University to continue her studies in gender and development as a scholarship student by Erasmus Mundus Consortium.

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AN ALTERNATIVE PROCESS FOR NATURAL INDIGO PRODUCTION FROM *POLYGONUM TINCTORIUM*

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Type of presentation: Poster

Abstract:

Natural dyes have been used historically worldwide. The introduction of synthetic dyes replaced almost completely natural dyes. Recently, the interest in natural dyes has regained due to the environmental concern and health hazards of synthetic dyes. The technology of obtaining colors from natural resources and natural dyeing was widely practiced from the Silla Kingdom(57 BC to 935 AD) in Korea. According to documentations, indigo, safflower, and gardenia seed were cultivated as important crops for dye extraction. Indigo is the most important blue natural dye in traditional Korea. The traditional technology of obtaining natural indigo dye and dyeing is complex. In traditional method of natural indigo formation in Korea, indican(indigo precursor) is extracted by steeping plant materials in water for 1-7 days. Steeping period is varied by the experiences of different dyers. The extract is filtered and the powders of oyster shell or cockle shell are added to the extract while stirring with a stick vigorously until deep blue color appears on the surface of the extract. Shell powder was made traditionally by burning shells at above 1,000 °C and stored in pottery. Indigo dyes are obtained in slurry state by sedimentation and filtration with cotton fabrics. This procedure has been used successfully in forming natural indigo dye. However, quality and quantity of the dye are variable because the extraction conditions and subsequent conversion into indigo are relied on the imprecise experiences of different individuals. It is handed down by mouth and maintained by art crafters' experiences. It is necessary to standardize the production procedure for better quality of natural indigo dye, and more efficient process has to be explored for industrial application.

In this work, the natural indigo production from Dyers' Knotweed(*polygonum tinctorium*) was standardized based on the traditional method in Korea. A standard procedure was optimized considering the conditions of indican extraction from plant material and precipitation, storage of extract, etc. The results of study to determine the influence of experimental conditions on the total amount of crude dye obtained are presented. The contents of indigo and indirubin in the crude indigo dye obtained were analyzed by spectrophotometry. Dyeings were carried out to define obtained shade and color depth with synthetic dye. In addition, indigo formation process applying beta-glucosidase was examined as an alternative process. We screened beta-glucosidase showing high activity to indican by systematic approach and investigated whether the screened enzymes have proper abilities for industrial application. The screened enzymes were applied to pure indican and indigo plant extract. The results appeared that beta-glucosidase deduced from *S. meliloti* was the most effective and showed the best activity at pH 7 and 30 °C.

Key words: Indican, Indigo, *Polygonum tinctorium*, beta-glucosidase, *S. meliloti*

CV:

'86- present; professor, Dept. of Clothing and Textiles, Chonnam National University

'01-'03; Dean, College of Human Ecology, CNU.

'03-'05: Exchange professor, College of Textiles, North Carolina State University, USA

'81-'86.8; Ph.D., University of Maryland, College Park, USA

MONITORING OF ENVIRONMENTAL WATER FOR CONTENT TOXIC ORGANIC POLLUTANTS AND NEW DEVELOPMENTS IN IMPROVEMENTS OF QUALITY CONTROL OF WATER

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Type of presentation: Poster

Abstract:

***Clear environmental water is pledge
of health of new generations***

In addition to the practices of planning, developing, distribution and optimum utilizing of water resources, the main object of water management should to include people education of ecological realization. The execution of the requisite security regulations and purity of technological process in industries and agriculture, sustainable use of natural resources for quality of environmental waters is necessary in the field of water management. Environmental water has been adversely affected in quality by anthropogenic influence. Phenolic compounds are common pollutants of environmental water in consequence of their formation in natural processes and human activity. Phenol itself is very toxic (maximum allowed concentration (MAC) in drinking water is $0.001 \text{ mg}\cdot\text{L}^{-1}$) but some substituted phenols, such as nonylphenol, octylphenol and pentachlorophenol even more hazardous. That is why according to the European Union legislation MAC for total phenolic content in drinking water is extended to $0.5 \text{ }\mu\text{g}\cdot\text{L}^{-1}$. Due to low MAC and complicated composition of environmental samples, pre-concentration of phenol traces is commonly requires prior its quantitative determination. We proposed organo-silica adsorbent for solid phase extraction technique of phenolic compounds from aqueous solutions having bi-functional nature of immobilized layer. The adsorbent (TX-SiO₂) has a major fraction (91%) of hydrophilic diol-groups and minor fraction (9%) of amphiphilic long-chain nonionic surfactant - Triton X-100 (polyoxyethylated isooctylphenol). Organo-silica adsorbent demonstrated high affinity to ion associate of azophenolates (derivative substance of phenols) with cationic surfactants. Due to this affinity 0.03 g of the adsorbent in static conditions can completely ($>98,2\%$) remove phenol (up to $2.4 \text{ mg}\cdot\text{g}^{-1}$) and 1-naphthol ($1.5 \text{ mg}\cdot\text{g}^{-1}$) from up to 250 ml of polluted water. Adsorbed analytes can be easy eluted by acetonitrile for further analysis or contrary quantitatively determine on the phase of adsorbent by solid-phase colorimetry. New procedure allows simple determination of phenol and 1-naphthol in polluted water on MAC level. Stability and high intensity of the color of adsorbate allows monitoring of 1-naphthol by naked eye test-method.

The proposed adsorbent – TX-SiO₂ was successfully applied as solid phase extragent to the determination of phenol in environmental water samples with unknown contents of phenolic compounds. Water samples (water from river Lybid, Kiev) were examined directly using the procedure proposed for phenol pre-concentration with its further photometric determination in acetonitrile eluate in form of ion associate. To examine the reliability of the proposed system, certain amounts of standard phenol solution were added to the sample solutions and analyzed according to the proposed method. Phenol content was calculated by comparing the results obtained before and after addition of the standard solutions of phenol. The samples taken from river flow in Kiev contain about $3.5\pm 0.6 \text{ }\mu\text{g}\cdot\text{L}^{-1}$ of phenol.

Key words: Environmental water, water management, phenol, 1-naphthol, naked eye test-method

Cv:

From 1997 till 2002 I was studied in Kiev National Taras Shevchenko University (the department of analytical chemistry). At 2000 I received the bachelor degree, and at 2002 - the master degree. After graduation from the university I entered the post-graduation studies of the same university. From 2002 to 2005 I worked as assistant in O.O. Bogomoletz National Medical University, Kiev, Ukraine . From 2006 - assistant in Kiev National Taras Shevchenko University (the department of analytical chemistry) I worked at The circle of my scientific interests is connected with sorbtion methods of organic and inorganic toxicants' microquantity pre-concentration. I worked at researching and developing different test-methods of detecting heavy metals such as Zn, Cd, Hg, Cu, Pb in drink water. I got knowledge in working with atomic absorption and photoelectron spectrometers within heavy metals detection. I had run in potentiometric, conductometric and colorimetric analyses. In the present time I am elaborating the sorbtion pre-concentration methods with the following test or chromatography detection of phenol and its nitro and chlor derivatives.

MARINE ENVIRONMENTAL EVALUATION IN THE INNER ISE BAY ,JAPAN

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Abstract:

1.Introduction

Among studies on red tide, those that use mathematical information and statistics have been performed from the 1980's in accordance with the preliminary investigation on red tide by the Fisheries Agency, including the famous case for Hiroshima Bay using Ouchi's multiple regression analysis. Now, we targeted to estimate Red Tide Index "*Chl-a*" at the inner Ise Bay in Japan of water regulation before and after.

2.Data and Method

About Red tide Index: In general, red tide indicates a visual and customary name for the "phenomenon that microalgae floating in the seawater suddenly proliferates in an abnormal way causing the color change of seawater." However, this is not enough in order to quantitatively understand red tide, and the definition of red tide is not necessarily clarified. Although the criteria for red tide is different by researchers, we selected *chl-a* as Red Tide Index, and attempted the multiple regression analysis.

About the stage selection of the cell: Microorganisms including microalgae and bacteria have the induction phase, the logarithmic growth phase, the stationary phase and the death phase.

Therefore, the timing for red tide was divided based on the ratio between *Chl-a* and phaeopigment and, prepared a multiple regression model. (the induction phase and logarithmic growth phase, the stationary phase and the death phase-1.5over, 1~1.49 ,0~0.9) Now, we selected the death phase Data.

About Multiple Regression: The electronic database(N=death phase 402 / total data 1958) for the fiscal years 1995 to 2006 was selected, Among the electronic databases selected, the electronic database with the total of 176 pieces for the fiscal years 1995 to 2000 was used for analysis, and the electronic database with the total of 226 pieces for the years 2001 to 2006 was used to estimate regression model.

Secondly, multiple regression model were calculated with the multiple regression analysis using some explanatory variables in addition to the objective variable *chl-a*. Explanatory variables were determined and selected from factors with a high fill rate of data as well as with normal distribution, and the multiple regression formula selected from some variables was obtained in accordance with the sequential selection method, with F=2.0 as a threshold criteria for variables.

Finally, the multiple regression model was applied to the new database distributed it in regulation front and back to estimate *chl-a*., and investigated influence in the water regulation.

3.Results

The following are the results of the multiple regression model. The estimated multiple regression model in the death phase is expressed as follows when the number of data is set at 176.

$Chl-a = -150 + 9.61 T-N + 11.8 pH + 4.77 DO + 0.697 Tem. + 92.2 T-P$

In this case, the contribution rate adjusted by the degree of freedom is $R^2_{adj}=0.663$. Therefore, the measured *chl-a* shows that this multiple regression model explains approximately 66% of fluctuation of actual measurement values.

Correlation (R^2) between the estimated *chl-a* in death phase and the actual measurement value for the years April 2001 to September 2002 (before regulation) is 0.518 compared with the years 1995 to 2000 (Ave.), while 0.206 for the year October 2002-FY 2006(after regulation). While R^2 for the years April 2001 to September 2002 (before regulation) shows a decline within a minor range, it maintains approximately 60-70% of explanatory rate. On the other hand, R^2 for the year October 2002-FY 2006(after regulation) shows a rapid decline.

4.Discussion

The following two points are considered as the causes for rapid decline of R^2 for the years 2004 to 2005: 1) pull by outliers in the data, and 2) fluctuation of parameters due to reasons including water quality control. But, 1) is already denied in a precedent study. Also in the interannual variability of total load published by Aichi Prefecture every five years, remarkable decline of T-P concentration in the inner bay of Ise was observed around the time after establishment of the law, in conjunction with decline of R^2 . Therefore, it was assumed that the influence of decline in T-P's absolute amount caused by human-induced cutback of activities resulted in parameter fluctuation in the multiple regression model, in the significant decline for the October 2002-FY 2006. In this study we were able to evaluate influence from the application direct back of the regulation.

Keywords : Red Tide Index, the multiple regression model, water regulation

CV:

My name is Chika Suzuki. I'm COE* A. Research Fellow in Doctoral Program Graduate School of Environmental Studies, Nagoya University Japan (COE A. Research Fellow .Dr. course graduate school student), and Medal Scholarship member Nagoya University. At the same time, I belong to Women Professional Engineers Society of Japan (WPESJ) and Institution of Professional Engineers, Japan(IPEJ).Now, I study statistical Marine bioscience and encourage marine education activity for children. The attached document s are our work-2Posters Promotion of the marine education regarding underwater environment and the swimming condition of the fish with fish type machine creature "mechanimal".

Marine environmental evaluation in the inner Ise Bay ,Japan

I would be delighted to hear from you. If it possible, I would like to apply for the travel award.

Program of Ministry of Education, culture,sports, science and technology-Japan

PROMOTION OF THE MARINE EDUCATION REGARDING UNDERWATER ENVIRONMENT AND THE SWIMMING CONDITION OF THE FISH WITH FISH TYPE MACHINE CREATURE “MECHANIMAL”.

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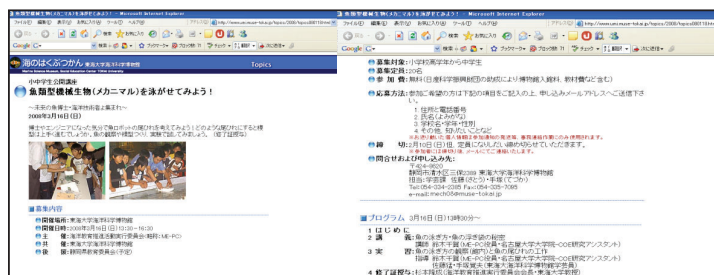
Abstract:

The spread of marine education is important, especially, in school education including the compulsory education. The life was born on the ocean. The fish evolved a swimming system in underwater environment. When we practice marine education, the understanding of the system is the one of the problems that we should wrestle with. However, the opportunity to study while comparing some fish in a natural condition is hard to get it by the school education. Therefore we use fish type machine creature “mechanimal” which teachers are available in an educational front, beginning an instructional activity for the purpose of deepening knowledge of children about the swimming condition of the fish and underwater environment. To help with further understanding, included the distribution of the original text which Suzuki wrote down a procedure, too. We plan it so that it is an opportunity for students to be future Dr. and an engineer, report it about the education result got the open lecture.

※ Introduction page-“Mechanimal” open lecture in Japanese

The promoter and Leader- Chika Suzuki. Furtherance Group- NISSAN SCIENCE FOUNDATION

<http://www.umi.muse-tokai.jp/topics/2008/topics080118.html>



Keywords: marine education, school education, fish type machine creature “mechanimal”

CV:

My name is Chika Suzuki. I'm COE* A. Research Fellow in Doctoral Program Graduate School of Environmental Studies, Nagoya University Japan (COE A. Research Fellow .Dr. course graduate school student), and Medal Scholarship member Nagoya University. At the same time, I belong to Women Professional Engineers Society of Japan (WPESJ) and Institution of Professional Engineers, Japan(IPEJ).Now, I study statistical Marine bioscience and encourage marine education activity for children. The attached documents are our work-2Posters

Promotion of the marine education regarding underwater environment and the swimming condition of the fish with fish type machine creature "mechanimal".

Marine environmental evaluation in the inner Ise Bay ,Japan

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Program of Ministry of Education, culture,sports, science and technology-Japan

THE AFFECT OF GLOBAL WARMING ON JAVANESE AGRICULTURAL CALENDAR

Sari Virgawati Faculty of Agriculture University of Pembangunan Nasional (UPN) “Veteran”
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Abstract

Javanese farmers prefer to use their own traditional weather forecasting with Javanese agricultural calendar called in native as Pranata Mangsa. Pranata Mangsa means “season arrangement” and is used as a guideline for Javanese farmers to work since 1855. For them, this calendar gives more accurate estimation in prediction the season. Java Island had a humid tropical climate with two different seasons, i.e. the dry season and the rainy season. The dry season generally prevails from June to September, while the rainy season from December to March. Recently the length of dry season and rainy season changed as a result of global warming. The inter-season period is often changeable and unpredictable. In the agricultural sector this change affects the farming system, such as cropping pattern, irrigation and harvesting, which in turn bring about to the unstable yield.. This study is aimed to answer the question: does the Javanese agricultural calendar “Pranata Mangsa” is still applicable as a guideline for farming due to the global warming phenomena. The method used in this study is by converting the seasonal indicator in Pranata Mangsa into meteorological elements range value. By the assumption that the seasonal indicators in Pranata Mangsa correspond with seasonal indicator in current meteorology cycle, it would show how the global warming affect the Javanese agricultural calendar.

Key words: Pranata mangsa, javanese, meteorology, global warming, agriculture

CV:

Born: Yogyakarta, September 15th, 1965

1991 Graduate as Bachelor degree from Agricultural Engineering, Gadjah Mada University, Yogyakarta

1998 Graduate as Master Degree (M.Eng.) from Agricultural Mechanization and Management, Asian Institute of Technolpgy, Thailand

Up to now post as Head of Land Information System Laboratory

About Yvette RAMOS



Holds a Master's Degree in Human Resource Management and MBA "Change & Technology Management" from IAE Aix-En-Provence, France (2002) (www.iae-aix.com)

Holds a Master's degree in Engineering – (Electronics Telecom) from the Ecole Polytechnique Féminine (www.epf.fr) in 1992 in France.

With a background in Engineering (Electronic transactions – smart card applications) and over fourteen years professional experience, starting with a position of Project Manager in the Industry to Expert in Change and Human Resource Management, including capacity building experience and ten years in International organisations, she has developed extensive knowledge of human resources management theories and principles, and since last six years reinforced her competencies in the application of modern management techniques, implementation of human resources planning and career development programmes.

With both Portuguese and French nationalities and excellent practice of English and Spanish, also thanks to the different and diverse positions she had in the past, from technical sales support to business development manager, she developed interpersonal, negotiating and persuasive skills. She had the chance to follow long-term training in psychology and human relation techniques.

Over the last ten years, she had the chance to work with international teams, in the private and public sector, in the business and humanitarian environment. She holds the position of Expert at the specialized UN Agency ITU, the International Telecom Union, Development Bureau, with HQ in Geneva, Switzerland.

She is Director for Europe in the International Network of Women in Engineering & Science (www.inwes.org) and is a member of the HR Geneva Association of Human Resources professionals.

She is the responsible of International relations at the Board of the French association of women engineers.

She is 37, married with three children and lives in France, between Annecy and Geneva.