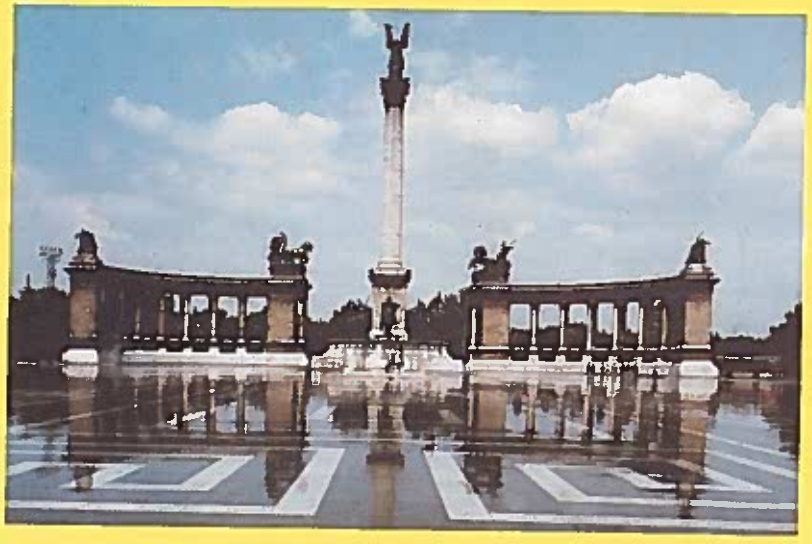
iCwes10

FINAL PROGRAM

10th International Conference
of
Women Engineers and Scientists

TOWARDS THE THIRD MILLENNIUM: THE ROLE OF THE INTELLECTUAL POTENTIAL IN A NEW WORLD



Budapest, Hungary
8-10 October, 1996

Organized by

MATE

Scientific Society of Measurement, Automation and Informatics

Sponsored by
Hungarian Academy of Sciences (MTA)
Foundation for Industry (IMFA)
National Committee for Technological Developments (OMFB)
Soros Foundation

iCwes10

FINAL PROGRAM

10th International Conference
of
Women Engineers and Scientists

TOWARDS THE THIRD MILLENNIUM: THE ROLE OF THE INTELLECTUAL POTENTIAL IN A NEW WORLD

Budapest, Hungary
8-10 October, 1996

Organized by

MATE

Scientific Society of Measurement, Automation and Informatics

Sponsored by
Hungarian Academy of Sciences (MTA)
Foundation for Industry (IMFA)
National Committee for Technological Developments (OMFB)
Soros Foundation

CONTENTS

INVITATION

Welcome to the *10th International Conference of Women Engineers and Scientists!*

It is a great pleasure and honour for our Scientific Society of Measurement, Automation and Informatics (MATE) to host this event first time in a Central-East European country.

These conferences held normally every three years in different countries, since the first one in USA 1964, provide a unique opportunity to demonstrate the achievements of women engineers and scientists. The most important aspect is the getting together of women active in science and engineering from all over the world to discuss their experiences and to learn from each other.

The technical program is composed of plenary papers presented by excellent invited speakers on relevant and important topics, workshops, panel discussion and contributed sessions.

Some social events are also planned and accompanying persons will find plenty of activities to choose from the program of cultural events organized this year around the millecentennial anniversary of the foundation of our country.

We look forward to seeing you in Budapest in October, 1996.

Zsuzsa Szentgyörgyi
Chairman of ICWES10

Organizing Committee:

Zs. SZENTGYÖRGYI, EE, *Conference Chairman*
Zs. PINTÉR, MSc, *NOC Chairman*
Cs. BÁNYÁSZ, PhD, *Editor*
R. BARS, PhD
M. FODOR, EE
Gy. RONTÓ, DSc
A. TOMPA, MD PhD
M. WELLEK

Conference Secretariat

ICWES10, Ms. Zsuzsa PINTÉR
Scientific Society of Measurement, Automation and Informatics (MATE)
H-1055 Budapest, Kossuth Lajos tér 6-8, Hungary
Phone: (+36-1) 132-9571
Fax: (+36-1) 153-1406
Telex: MTESZ 225792

GENERAL INFORMATION

Host City

The Hungarian capital, Budapest, known as the *Pearl of the Danube*, is a bustling city in the heart of Europe, with over two million inhabitants. Buda on the right bank of the Danube, has hills and valleys, and has for centuries been the administrative centre of the country; it was formerly the royal seat. On the left bank, Pest has grown into a large, busy and modern city, spreading out on to the plain.

Venue

The conference will be held in the office building of the Scientific Society of Measurement, Automation and Informatics (MATE) *(Budapest, Kossuth Lajos tér 6-8, phone: 132-9571, fax: 153-1406)*, known also as the "House of Technology" on the Pest bank, near the downtown area.

Visas

Visas are *not* required from visitors from European countries, except Albania. Colleagues from a few overseas countries are required visas (please check beforehand) but these are usually issued within 24 hours.

Official Language

The official language of the Conference is English.

Airport Transfers

The Air Traffic and Airport Administration (LRI) Airport Passenger Service is at your disposal with comfortable minibuses taking you to any address in the city, daily between 06:00 am. and 10:00 pm, from both terminals. (Terminal 1. is for foreign airlines, Terminal 2 is mainly for MALÉV, Hungarian Airlines). This service offers reasonable price (~7 USD for one transfer) and is much more reliable than taxis.

For participants arriving by train at any of Budapest's railway stations we suggest to take a taxi to the hotel.

Public transport in Budapest

Buses, trams and underground/subway (METRO) run without conductors. Tickets should be purchased in advance at METRO stations or in tobacco shops. Tickets, except the daily, weekly ones, are valid for one ride only and must be punched inside the vehicles or at the entrance to the METRO.

Accommodation

Hotels in the down-town area (walking distance from the conference site) and at greater distance but with good public transport, are available in the price categories:

Single room (with bath/shower incl. breakfast+taxes)

Grand Hotel Hungaria $100/night
Hotel Taverna $130/night

Keleti Pu

Double room (with bath/shower incl. breakfast+taxes)

Grand Hotel Hungaria $130/night
Hotel Taverna $150/night

Student housing; Student lodging is available on request without breakfast (student card required):
$30/night

Hotel deposit is required; see registration form.

Registration

All attendees are kindly requested to register. A Registration Form is enclosed. One separate form per participant should be completed and returned to the Conference Secretariat as soon as possible. Use a photocopy of the form if an extra is necessary.

Registration Fee

	Before **May 15, 1996**	After
Student fee	$50	$100
Author's registration fee	$300	$350
Full registration	$350	$400

The registration fee includes participation in all professional activities, the welcoming reception, coffee/tea during breaks, the

Conference Proceedings and the excursion on Wednesday, October 9, 2:00 pm. Extra tickets for the accompanying guests to the excursion will be available at the registration desk at 30 USD.

Method of Payment

The registration fee and hotel deposit should be sent by *bank transfer* to the following account of the Scientific Society of Measurement and Automation:

"ICWES10 Conference"
No.: 102-00823-22212694-00000000
Magyar Hitelbank
H-1051 Budapest, Arany J. u. 20
HUNGARY

Please attach a copy of the remittance to the registration form.

Please note

- payments sent by bank transfer must be free of charges for the MATE
- the cutoff date for advance registration (May15, 1996) will be strictly enforced
- for on-spot payments, only cash will be accepted.

Confirmation

Confirmation of registration and hotel reservation will be mailed upon receipt of the completed registration form.

Refunds

Registrations cancelled in writing and received on or before Sept 15, 1996, will be refunded subject to a 20% administration charge. No fees will be returned for cancellation requests received after 15th September. The Conference Proceedings will be forwarded later.

Check In and Information Desk

A registration and information desk will be open at the Conference site, in the Hall in front of the Room 702.

Monday October 7	12:00-18:00
Tuesday October 8	7:30-16:00
Wednesday October 9	8:00-14:00
Thursday October 10	8:00-16:00

Weather

Hungary is in the temperate zone, the mid-October weather is usually pleasant Daily temperature reaches between 15°C and 20°C, and the relative humidity is below 50%. However, the evenings may be cool, so a light jacket or sweatshirt may be useful.

Social events

Welcoming Reception, Tuesday October 8, 19:00, Room 702

A pleasant evening to taste the rich Hungarian cuisine with traditional folk entertainment.
All registered participants and their accompanying guests are cordially invited.

Banquet, Thursday October 10, 20:00 (optional)

For those who are interested tickets can be purchased at the registration desk at 40 USD.

Sight-seeing Tour in Budapest (optional)

Upon request, a sight-seeing tour can be arranged on Friday, October 11, 9:00 am for those leaving later. Price: 30 USD. Please sign up on the registration form.

TECHNICAL PROGRAM

Tuesday October 8

09:00-10:00 **OPENING ADDRESSES AND LECTURES**
Room A

ICWES ONE TO NINE
E. Laverick (UK)

WHY HUNGARY?
Zs. Szentgyörgyi (H)

10:00-10:30 *Coffee Break*

10:30-12:00 **PLENARY SESSIONS I.-II.**
Room A

WOMEN INTO SCIENCE AND ENGINEERING
Baroness Platt of Writtle (UK)

THE INFLUENCE OF SCIENCE AND HI-TECH ON MODERN LITERATURE
M. Kubovy (USA)

12:00-13:00 *Lunch Time*

13:00-15:00 **TECHNICAL SESSIONS**

NEW TRENDS IN NATURAL SCIENCES AND TECHNOLOGY I.
Room A

THE VALUE OF ESTIMATING IN PRICING CONSTRUCTION PROJECTS
A.M.M. Liu (HK) and R.F. Fellows (UK)

INTEGRATED COMMUNICATION /INFORMATION SYSTEMS IN THE CONSTRUCTION PROCESS
I. Kalt Scholl (CH)

A NEW ALTERNATIVE OF TORSIONAL TORQUE COMPENSATION IN AN ELASTIC TWO-MASS DRIVING SYSTEM
A. Porumb (RO)

SMALL ELECTRICAL DRIVES IN OUR HOUSEHOLD
K. Vincze (H)

ELECTRONMICROSCOPY INVESTIGATION ON 10 NM PARTICLES OF MAGNETITE
T. Shishido (J)

FORMATION OF A P-N JUNCTION IN TiO2 UPON VOLTAGE APPLICATION
D.P. Korfiatis, Th.E. Mantzavinou, R. Pandi S.F. Potamianou and K.A.Th. Thoma (GR)

WOMEN IN SCIENCES I.
Room B

DEVELOPMENT AND ROLE OF WOMEN IN TECHNOLOGY AND ENGINEERING BASED INDUSTRIES
A. E. Minto (UK)

WOMEN IN THE HONG KONG CONSTRUCTION INDUSTRY
L.Y. Ng (HK)

WOMEN IN COMPUTER TECHNOLOGY IN HONG KONG UNIVERSITIES
M. Fukuda and G. Chong (HK)

THE CHANGES IN MANUFACTURING MANAGEMENT AND THE OPPORTUNITIES FOR WOMEN
C. Strain and E. Panagiotakou (UK)

HOW WOMAN DEVELOP HER CAREER IN SCIENCE AND ENGINEERING?
M. Kazuno, E. Ogawa, Y. Sendoda, T. Yamada and H. Kakutani (J)

WOMEN IN SCIENCES
A. Szemik-Hojniak (PL)

15:00-15:20 Coffee Break

15:20-17:00 TECHNICAL SESSIONS

NEW TRENDS IN NATURAL SCIENCES AND TECHNOLOGY II.
Room A

METEOROLOGY IN MEDICINE AND BIOLOGY
Á. Drahos, Zs. Öreg and I. Örményi (H)

SUCCESSFUL IMPLEMENTATION OF INTEGRATED SYSTEMS
E. Erdélyi (H)

COMPUTER-ASSISTED DECISION SUPPORT SYSTEMS FOR MEDICAL APPLICATIONS
M. Frize, F.G. Solven, M. Stevenson and B. Nickerson (CDN)

ENERGY - NOW AND FOR THE NEXT CENTURY
W. C. Marcy LaBelle (USA)

DIRECT CONVERSION OF SOLAR ENERGY INTO ELECTRIC POWER
M. Ramrakhiani (IND)

CHANCES OF WOMEN FOR A CAREER IN THE DIFFERENT COUNTRIES
Room B

WOMEN IN ENGINEERING IN CANADA: WHERE DO WE GO FROM HERE?
M. Frize (CDN)

A SURVEY OF WOMEN AND MEN ENGINEERS IN THE UNITED STATES
P. Layne (USA)

WOMEN IN GEORGIA
E. Buadze (GEORGIA)

WOMEN ENGINEERS IN FRANCE: EDUCATION AND CAREER
M. Rodot, C. Chavany and B. Labatut-Chabaud (F)

THE SWISS ASSOCIATION OF WOMEN ENGINEERS (SVIN/ASFI)
I. Kalt Scholl and C. Closs (CH)

Reception (702)

Wednesday October 9

08:00-08:40 **PLENARY SESSION III.**
Room A

SOCIO-ECONOMIC SITUATION, DEPRESSION AND MORBIDITY IN THE HUNGARIAN FEMALE POPULATION
M.S. Kopp, Á. Skrabski, S. Szedmák and J. Lőke (H)

08:40-09:00 *Coffee Break*

09:00-11:00 **TECHNICAL SESSION**

TRANSFER OF KNOWLEDGE
Room A

CHEMICALS AT HOME AND IN OUR LIVES: A WOMEN'S PROJECT
M. Abelló and M. Medir (E)

RESEARCH - INDUSTRY INTERACTION FOR EFFECTIVE TECHNOLOGY TRANSFER
V.J. Nashikkar (IND)

AN INNOVATIVE APPROACH TO TECHNOLOGY TRANSFER-BUSINESS INCUBATORS
K. Harer (USA)

FOREIGN STUDENTS IN JAPAN
A. Tsugawa (J)

ACCESS BY INTERNATIONAL EDUCATORS TO THE RESOURCES OF NASA ON SPACE TOPICS
B. P. Preece (USA)

A NEW APPROACH TO TEACHING SCIENCE IN THE USA - THE STATEWIDE SYSTEMIC INITIATIVE PROGRAMS
B. P. Preece (USA)

TEACHING OF BIOMEDICAL TECHNOLOGY AT KANDÓ KÁLMÁN TECHNICAL COLLEGE
L. Halmi (H)

SCIENCE AND ENGINEERING EDUCATION: CASE STUDIES OF TRANSFORMING THE UNIVERSITY CURRICULUM TO FEMALE-FRIENDLY AND COMMUNITY-CENTERED APPROACHES
H.P. Hynes and J. Watts (USA)

11:00-12:00 **WORKSHOP I.**

LOW BUDGET ACTIVITIES TO INTEREST GIRLS IN SCIENCE AND ENGINEERING
Room A
Organized by B. P. Preece (USA)

12:00-13:00 *Lunch Time*

13:00-14:00 **WORKSHOP II.**

SUCCESSFUL NETWORKING BETWEEN PROFESSIONAL ENGINEERING, SCIENTIFIC AND EDUCATIONAL ORGANIZATIONS
Room A
Organized by B. P. Preece (USA)

Thursday October 10

09:00-09:40 **PLENARY SESSION IV.**
Room A

IS THE SOLAR RADIATION BENEFICIAL OR HARMFUL?
Gy. Rontó (H)

09:40-10:00 *Coffee Break*

10:00-12:00 **PANEL DISCUSSION**

THE ROLE OF THE PROFESSIONAL WOMEN IN THE NEW ORDER OF HUNGARY
Room A
Organized by V. Blinken (USA) and A. Tompa (H)

THE INTERNAL CONFLICT OF WOMEN TODAY - BALANCING CAREERS AND FAMILY LIFE
Cs. Csoboth , M. Kopp and S. Szedmák (H)

LIFE EXPECTANCY AND WORKING CONDITIONS AMONG HUNGARIAN WOMEN EMPLOYEES
A. Tompa (H)

WOMEN'S ROLE IN THE ENVIRONMENT PROTECTION AND NATURE CONSERVATION
K. Rodics (H)

FEMINISM-RELATED DYSFUNCTION IN SOCIALIZATION
M. Hernádi (H)

QUANTITATIVE AND QUALITATIVE CHARACTERISTICS OF WAY OF LIFE AMONG HOSPITAL FEMALE DOCTORS
B. Boga (H)

GENDER DIFFERENCES IN COGNITIVE FUNCTIONS OF THE BRAIN
J. Hámori (H)

12:00-13:00 *Lunch Time*

13:00-15:00 **TECHNICAL SESSIONS**

NEW TRENDS IN NATURAL SCIENCES AND TECHNOLOGY III.
Room A

DEVELOPMENT IN TRAFFIC IN BOTSWANA WITH SPECIAL REGARD TO SAFETY
V. Vokolkova (RB)

ICE PREDICTION ON ROADWAY COVERING: BOTH TRAFFIC SAFETY AND ENVIRONMENT PROBLEMS
T.V. Samodurova (RUS)

IMPACT OF CONGESTED TRAFFIC ON EMISSIONS FROM ROAD VEHICLES
J.A. Cox (UK)

MODELLING AND SIMULATION FOR A FLY-BY-WIRE AIRCRAFT
P. Madhuranath (IND)

PROCESS TECHNIQUES USED BY BNFL TO PROTECT THE ENVIRONMENT
J.P. Crabtree (UK)

INTERACTIVE POLLUTION MAPPING ON THE INTERNET: MAKING SENSE OF ENVIRONMENTAL INFORMATION
J.T. McDonnell and S. Pipes (UK)

CHROMATIC ADAPTATION TESTING WITH A COMPUTER GRAPHICS SYSTEM
K. Wenzel (H)

WOMEN IN SCIENCES II.
Room B

REDESIGN OF AN ENGINEERING CURRICULUM INFORMED BY THE WOMEN-IN-ENGINEERING PROGRAM
P.F. Mead, D. Bigio, J. Duncan and E. Rosenfeld (USA)

CROSS-CULTURAL & CHILLY CLIMATE ISSUES FOR WOMEN IN ENGINEERING
S. Cavin and A. Siskind (USA)

SEX CULTURE OF FEMALE STUDENTS IN HONG KONG
A.M.M. Liu and L.Y. Ng (HK)

CHANGES IN THE ROLE OF WOMEN IN HUNGARY DURING THE 50 YEARS
Á. Fényi (H)

15:00-15:30 **CLOSING SESSION**

NOTES:

PROGRAM AT-A-GLANCE

Time	October 8 TUESDAY Room A		October 9 WEDNESDAY Room A	October 10 THURSDAY Room A	
7:30-9:00	REGISTRATION		8:00-8:40 PLENARY III.	9:00-9:40 PLENARY IV.	
9:00-10:00	OPENING SESSION		8:40-9:00 *Coffee Break*	9:40-10:00 *Coffee Break*	
10:00-10:30	*Coffee Break*		9:00-11:00 TRANSFER OF KNOWLEDGE	10:00-12:00 PANEL DISCUSSION: THE ROLE OF THE PROFESSIONAL WOMEN IN THE NEW ORDER OF HUNGARY	
10:30-12:00	PLENARY I. & PLENARY II.		11:00-12:00 WORKSHOP I.		
12:00-13:00	*Lunch Time*		*Lunch Time*	*Lunch Time*	
13:00-15:00	NEW TRENDS IN NATURAL SCIENCES AND TECHNOLOGY I. Room A	WOMEN IN SCIENCES I. Room B	13:00-14:00 WORKSHOP II.	NEW TRENDS IN NATURAL SCIENCES AND TECHNOLOGY III. Room A	WOMEN IN SCIENCES II. Room B
15:00-15:20	*Coffee Break*		14:00 EXCURSION BY BUS with dinner	15:00-15:30 CLOSING SESSION	
15:20-17:00	NEW TRENDS IN NATURAL SCIENCES AND TECHNOLOGY II. Room A	CHANCES OF WOMEN Room B		16:00 Meeting of Delegates	
19:00 20:00	WELCOMING RECEPTION			BANQUET	

ЭКОЛОГИЧЕСКАЯ ЖЕНСКАЯ АССАМБЛЕЯ
ENVIRONMENTAL WOMEN'S ASSEMBLY

RUSSIAN ACADEMY FOR PUBLIC SERVICE UNDER
THE PRESIDENT OF THE PF
PR VERNADSKOGO, 84
MOSCOW 117606
TELEPHONE: (095) 151 03 91
FAX: (095) 434 5700

«Woman is the Heart of Nature,
Life Itself is Impossible Without Her...»

Environmental Women's Assembly (EWA) is a inter-regional NGO created by decision of International Congress on «Women for Environmental Protection» (23-26 November, 1993 at the Russian Academy of Administration in Moscow) held under the auspices of the UNESCO and the Council of Europe. It unites environmental scientists of various fields: biologists, medical doctors, philosophers, economists, teachers, sociologists, historians, lawyers working in science, education, public administration; leaders of women's and environmental organizations. EWA has its branches in the town of Krasnoarmeysk (Moscow region), in Alma-Ata City and Alma-Ata region (Kazakhstan), in Erevan (Republic of Armenia, partnership), in the city of Baku (Azerbaijan). EWA is a pioneer woman's organization in Russia of environmental orientation.

Assembly's activities are guided by provisions set forth in basic document of the UN Conference on Environment and Development in Rio de Janeiro, by the UN, UNESCO and UNEP decisions, international agreements and Russia's Laws aimed at environmental protection, improvement of quality of life and advancement of women's role in sustainable, environmentally sound development.

MAIN OBJECTIVES OF THE ASSEMBLY ARE :

- to direct the efforts of the Assembly members towards protection of universal values (environment, peace, human rights, cultural heritage, and others), mobilization of women's participation in the international environmental movement;
- to participate together with other women's movements in formulation of environmental programs and legislation for solving problems of health protection, family, expectant mothers and their progeny in environmentally unfavorable areas;
- to elaborate programs for environmental education of women from various professional groups, as well as women not involved in public production (housewives, retired workers, disabled persons); to teach trained managers-ecologists;
- to establish contacts with overseas national and international organizations, women's included; to participate with them in joint scientific, educational and practical activities; to organize joint actions, bilateral and multilateral meetings for solving problems of environmental protection;
- to participate in projects for environmental security, including emergency situations; to be represented in international organizations as a national section.

ACTIVITIES OF THE ASSEMBLY:

Its main lines are: scientific research work with participation in international research projects; concept and programs formulation for environmental education of women and children; cultural dimension (spiritual world of human being, arts, belief in good and beauty as

means of educational process); expanding cooperation with foreign national and international organizations.

Members of the Assembly periodically take part in All-Russia and international fora (i.e. in 20 major events during 1993 - 98). EWA acted as an initiator and organizer of four international environmental fora held in Moscow under the auspices of UNESCO. These included: international congress on «Women for Environmental Protection» (1993), which gathered four hundred Russian and foreign environmental scientists and public figures. Documents of the congress, Address to the President and Prime-Minister of Russia contained appeal to mobilize and advance woman's role in environmental protection. In May 1996 the Assembly organized a one-week forum on «Women for Union, Environmental Protection and Cultural Development» with several conferences and events held within its framework, such as: on Environmental Education, on Labor and Employment of Women; an exposition «Nature and Culture», and environmental raids.

The Assembly is in charge of elaboration and coordination of international scientific research project on «Women in Extreme Situations of Environmental Disasters» with participation of eight countries (Armenia, Belarus, France, Greece, Italy, Kazakhstan, Russia, Ukraine). Pursuant to basic provisions of the draft document by the Council of Europe the following international conferences were held with active participation of members of the Assembly: in Athens on «Gender Approaches to Emergency Situations: Women's Realities» (May 1995), in San Marino on «Equal Approach to Sanitary Problems of Extreme Situations: Women's Role» (December 1995), and in Moscow on «Women in Extreme Situations: Protecting the Rights and Interests of Women» (January 1997). Materials of the conference were published in four books (total volume of which amounted to 32 printer's sheets) and presented in the Commission on the Status of Women located in the United Nations Headquarters in New York and in the State Duma in Moscow in 1998.

The Assembly works in cooperation with the State Duma and the Council of Federation of the Federal Assembly of Russia, with women's NGOs of Russia, such as: ECOFAM («Women in Support of Ecological Programs»), Confederation of Business and Professional Women of Russia, with environmental trade-union ECOASS-PROF, Association of University Women, Moscow State University Women's Union, World's Hut of Peace (Society of Scientists in Republic of Tuva), and others. The EWA takes part in All-Russia Days of Protection from Environmental Risks (April-June). Since its very establishment the Assembly has been working in close contact with the Commission of the Russian Federation for UNESCO, with the staff members in the UNESCO Headquarters (Paris), with the Council of Europe, and other international organizations, as well as the Commission on the Status of Women of the Economic and Social Council of the United Nations (New York). EWA is a member and Russian coordinator of the Women's International Network: Emergency Situations and Solidarity(WIN) .

GOVERNING BODIES OF THE ASSEMBLY ARE:
Board, Council. Officers: president and two vice-presidents, accountable to the General Meeting of the Assembly. Assembly has consultative status with UN from 1999.

Alla I. PERMINOVA Перминова

President, Environmental Women's Assembly
Doctor of History, Professor, Russian Academy for Public Service under the President of the Russian Federation, Academician, MAI to the UN

October 1998

Minutes of the Meeting of the ICWES10 Delegates

held at the Society of Measurement, Automation and Informatics (MATE)
Budapest, Thursday, October 10, 1996 at 1600 hrs.

PRESENT:

Elizabeth Laverick	Chairman and ICWES9 Chairman
May Maple	Deputy ICWES9 Chairman
Zsuzsa Szentgyörgyi	ICWES10 Chairman
Anna Tompa	Deputy ICWES10 Chairman
Ciceley Thompson	ICWES2 Chairman
Vera Vokolkova	Botswana
Dormer Ellis	Canada
Mitsuko Kazuno	Japan
Meera Ramrakhiani	India
Kante Assa Bore	Mali
Anna Szemik-Hojniak	Poland
Tatjana Samodurova	Russia
Abello Montse	Spain
Isabelle Kalt Scholl	Switzerland
Elizabeth Rhodes	UK
Peggy Layne	USA
Marie Theresa Lukusa Nonyabo	Zaire

plus observers from six countries, Canada, Japan, Mali, UK, USA, Zaire.

1. Dr. Laverick explained that she had been asked to conduct the meeting by and on behalf of the ICWES10 Chairman.

2. Minutes of the last meeting held on July 18, 1991: These were circulated to the meeting together with the Guidelines.

3. Confirmation of the mandates of the delegates: The Chairman named those members present whom she understood were delegates representing their various countries, together with the ICWES Chairmen Emeriti and their personally named deputies. It was noted that all others present were observers.

4. Amendments to the Guidelines:
Three amendments to the Guidelines were put forward in advance of the ICWES9 Delegates meeting (see Item 4.1 of the minutes). Following discussion it was agreed at that meeting that these were should be send to all official ICWES9 delegates within six months of ICWES9, inviting written comment. There being no further comments received the amendments were declared adopted.

   A further proposed amendment to the Guidelines was received from Ase Skov of Denmark for consideration at the ICWES10 Delegates meeting. This read as follows:

   Section 1: add "G. At least two official languages, English and French, should be used for documentation and presentations at the Conference"
   After discussion it was agreed to modify the proposal as follows:

   Section 1: add "G. The official language used for documentation and presentations at the Conference should be English, but a second language could be used at the discretion of the host country.

5. Consideration of bids for ICWES11: The Chairman announced that only one bid had been received, from Japan, offering to host ICWES11 in 1999. The Japanese proposal had been circulated to all Conference participants. There being no other proposals Professor Mitsuko Kazuno was asked to say a few words in support of the proposal. Following this the delegates voted in favour of accepting the Japanese proposal.

   The American delegate, then spoke of the intention of the USA to bid for ICWES12 to be held in 2002 on the West coast. This would precede the SWE Conference, and delegates would be invited to stay on and attend this also.

6. Election of Convenor and Members of the ICWES Continuity Committee (ICC): The Chairman of ICWES10 had expressed her wish not to stand for election as Convenor on the ICC. The Chairman proposed that Minako Tanaka, who was attending her second ICWES, be elected Convenor. This was unanimously agreed.

Area Representatives: The following arrangements were agreed.

North America (Canada &USA):	Dr. Dormer Ellis
Latin America:	the Convenor to consult with Ms. Angeline Perez-Lopez
Middle East:	the Convenor to invite Professor Mahin Rahmani to continue
Far East:	Dr. Mitsuko Kazuno
India Sub-Continent:	The Convenor to consult Ila Ghose
Africa:	*Arabic speaking* - vacant (no news of Chebanne Hassiba since ICWES8) *English speaking* - The Convenor to consult Joanne Maduka *French speaking* - Loteta Dimandja
Western Europe:	the Convenor to invite de Kryger to continue
Eastern Europe:	Zsuzsa Szentgyörgyi
UK, Australia and New Zealand:	the President of the Women's Engineering Society (UK) or her personally named deputy.

7. Any Other Business

A paper by Loteta Dimandja entitled "The development of Africa, myth or reality" was circulated to attendees. There being no further business the meeting was closed.

THE UNIVERSITY OF TOKYO

The University of Tokyo is the oldest national university in Japan operated under the auspices of the Ministry of Education, Science and Culture. It offers courses in essentially all academic disciplines at both undergraduate and graduate levels and provides research facilities for these disciplines. The University aims to provide its students with opportunities for intellectual development as well as for the acquisition of professional knowledge and skills.

1) Number of Educational and Administrative Personnel (as of May 1, 1995)

President	1
Vice-President (Professor)	(2)
Professor	1,275
Associate Professor	1,182
Lecturer (Full-Time)	154
Assistant	1,473
Teacher of Attached School	36
Administrative Officer	3,902
Total	8,023

2) Number of Students Enrolled (as of May 1, 1995)

	Total No.	Female	Foreign Student
Undergraduate Student	16,346	2,486	99
Undergraduate Research Student	327	149	17
Postgraduate Student : Master	4,595	941	371
: Doctor	4,188	830	879
Postgraduate Research Student	556	189	394
Research Student of Institute	243	61	20
Total	26,255	4,656	1,780

Eng. ~ 3%

Organization

The University organization consists of the College of Arts and Sciences, nine Faculties, a Graduate School with twelve divisions, twelve Research Institutes, and some Facilities.

1) Undergraduate Faculties

College of Arts and Sciences
Law
Medicine
Engineering
Letters
Science
Agriculture
Economics
Education
Pharmaceutical Sciences

2) Divisions of the Graduate School

Humanities
Education
Law and Politics
Sociology
Economics
Int'l & Interdisciplinary Studies
Science
Engineering
Agricultural Science
Medical Science
Pharmaceutical Sciece
Mathematical Science

3) Research Institutes

Institute of Medical Science
Earthquake Research Institute
Institute of Oriental Culture
Institute of Social Science
Institute of Scioinformation and Communication Studies
Institute of Industrial Science
Historiographycal Institute
Institute of Molecular and Cellular Biosciences
Institute for Cosmic Ray Research
Institute for Nuclear Study
Institute for Solid State Physics
Ocean Research Institute

4) Facilities Open To the Univertsity's Scholars

University Museum
Cryogenic Center
Radioisotope Center
Research Center for Nuclear Science and Technology
Educational Computer Center
Environmental Science Center
Molecular Genetics Research Lab.
Research Center for Advanced Science and Technology
Research into Artifacts, Center for Engineering

5) Facilities Open To All Scholars In Japan

Computer Center
Center for Climate System Research

The Graduate School of Science

The Graduate School of Science has the following fields of specialization.

Information Science
Physics
Astronomy
Earth & Planetary Physics
Chemistry
Biopysics & Biochemistry
Biological Sciences
Geology
Mineralogy
Geography

Mailing Address :
Akiko Tsugawa, Ph.D. / Lecturer, Foreign Student Advisor
International Liaison Office,
School of Science, The University of Tokyo
7-3-1 Hongo, Bunkyo-ku, Tokyo 113, Japan
(Tel/FAX: +81-3-3812-2413)
(e-mail: tsugawa@is.s.u-tokyo.ac.jp)

The University of Tokyo : International Exchange Program

The University has graduate student and/or faculty exchange agreements with the following universities abroad. Some of the agreements are departmental.

1. Among Universitites

Exchange of academic staff :

Austria	U. of Technology (Wien)
Brazil	U. of São Paulo
China	Beijing U., Qinghua U., Chinese Academy of Social Sciences, Fudan U., U. of Science and Technology of China
France	U. Rene Descartes (ParisV), U. Pierre et Marie Curie (Paris VI) U. Louis Pasteur (Stransbourg I), Ecole Normale Superieure
Germany	U. of Ruhr (Bochum), U. of Tubingen, Phillips U. of Marburg, Humbolt U. of Berlin, Free U. of Berlin
Israel	Weizmann Institute of Science
Italy	U. di Roma "La Sapienza", U. Degli Studi Di Milano, U. Degli Stude Di Padava
Korea	Seoul National U.
The Netherlands	Leiden State U.
Norway	U. I Oslo, U. I Bergen, U. I Trondheim, U. I Tromso
Philippines	U. of the Philippines
Poland	U. of Warsaw
Spain	U. Complutense de Madrid
Sweden	U. of Stockholm, The Royal Inst. of Technology
Switzerland	European Organization for Nuclear Research
Thailand	Chulalongkorn U., Thammasat U.
U.K.	London School of Economics and Political Science (U. of London)
U.S.A.	U. of Illinois, U. of Arizona, U. of Washington, U. of California, San Diego, U. of Maryland, U. of Chicago

Exchange of students :

Austria	U. of Technology (Wien)
Canada	U. of British Columbia
France	Lorraine Inst. of Technology
Germany	U. of Stuttgart
India	U. of Delhi
Switzerland	Federal Inst. of Technology of Lausanne
U.K.	U. of Essex, U. of Oxford
U.S.A.	Stanford U., Harvard U., U. of California at Berkeley, Massachusetts Inst. of Technology, Princeton U.

2. Among Departments

Argentine	National U. of La Plata
China	Beijing College of Forestry, Dalian Inst. of Technology
Denmark	Niels Bohr Inst., The University of Copenhagen
France	Inst. de Physique du Globe de Paris
Germany	Beselischaft für Schwerionenforschung
Indonesia	Bogor Agricultural U., Bandung Inst. of Technology
U.K.	U. College of London, Imperial College of Science,Technology and Medicine
U.S.A.	Woods Hole Oceanographic Inst., U. of California, U. of Hawaii, U. of Pensylvania

iCwes10

TENTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

PREPRINTS

TOWARDS THE THIRD MILLENNIUM: THE ROLE OF THE INTELLECTUAL POTENTIAL IN A NEW WORLD

Edited by
Cs. Bányász

Budapest, Hungary
8-10 October, 1996

Organized by
MATE
Scientific Society of Measurement, Automation and Informatics

ICWES10

TENTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

PREPRINTS

TOWARDS THE THIRD MILLENNIUM: THE ROLE OF THE INTELLECTUAL POTENTIAL IN A NEW WORLD

Edited by
Cs. Bányász

Budapest, Hungary
8-10 October, 1996

Organized by

MATE

Scientific Society of Measurement, Automation and Informatics

Organizing Committee:

Zs. SZENTGYÖRGYI, EE, *Conference Chairman*
Zs. PINTÉR, MSc, *NOC Chairman*
Cs. BÁNYÁSZ, PhD, *Editor*
R. BARS, PhD
M. FODOR, EE
Gy. RONTÓ, DSc
A. TOMPA, MD PhD
M. WELLEK

Conference Secretariat

ICWES10, Ms. Zsuzsa PINTÉR
Scientific Society of Measurement, Automation and Informatics (MATE)
H-1055 Budapest, Kossuth Lajos tér 6-8, Hungary
Phone: (+36-1) 132-9571
Fax: (+36-1) 153-1406
Telex: MTESZ 225792

Sponsored by
Hungarian Academy of Sciences (MTA)
Foundation for Industry (IMFA)
National Committee for Technological Developments (OMFB)
Soros Foundation

CONTENTS

TECHNICAL SESSIONS

NEW TRENDS IN NATURAL SCIENCES AND TECHNOLOGY

WOMEN IN SCIENCES

CHANCES OF WOMEN FOR A CAREER IN THE DIFFERENT COUNTRIES

TRANSFER OF KNOWLEDGE

AUTHOR INDEX

ICWES ONE TO NINE

Dr. Elizabeth Laverick
OBE CEng CPhys FIEEE

INTRODUCTION

In the 'Sixties', with the increasing interest in non-discrimination and equal opportunity in the Western world, conferences concerning the role of women in the scheme of things were not unusual, and the position of women in science and engineering, where women professionals had little visibility except in the USSR, was (and still is) a favourite subject for discussion and analysis. However, as Aileen Cavanagh, then President of the United States' Society of Women Engineers said at the official opening, in 1964, of the First International Conference of Women Engineers and Scientists held in New York, (ICWES 1), such debates, "had taken place for far too long without the benefit of facts, and most often by people - including both men and women - who had never met a woman Engineer or Scientist." So, when I was invited to address the Japanese Forum of Women Engineers on the subject of "Women Engineers and Scientists Worldwide" I naturally turned to the published reports and proceedings of that Conference and the following eight such Conferences which have taken place between 1964 and 1991. I was fortunate enough to be able to attend seven out of the nine, and preparing this gave me great satisfaction as I looked back and tried to put into perspective what I have learned from those Conferences about women engineers and scientists worldwide.

HISTORICAL BACKGROUND TO ICWES

The First International Conference of Women Engineers and Scientists took place in New York City whilst the great World Fair was in progress and the World Fair Organisers declared June 15 1964 to be Women Engineers and Scientists Day. The World Fair made a great impact on the Conference: various exhibits were visited on the first day of the Conference including General Motors Futurama and Behind the Scenes and Socony Mobil Exhibit. The second day was devoted to technical tours including Bell Labs and the new Research Centre of IBM. The third day we got down to business. The Conference had taken as its theme "Focus for the Future - Developing Engineering and Scientific Talent". Its aims (to quote Aileen Cavanagh yet again) were "to look at the future technological needs of a peaceful world, define those areas of endeavour in which our scientifically inclined and inventive youth of today - boys and girls alike - can find their opportunities for service to their fellow men of tomorrow".

The Conference brought together more than 400 delegates from 32 nations to exchange information and to create new patterns and new plans for the activities of women engineers and scientists. In her keynote address Dr. Lillian Gilbreth, a renowned management consultant who, with her husband, pioneered the study of time and motion which became so important in Industrial Engineering at that time, said "we have come together to focus our attention on the future needs of the world. We shall try, through pooling our diverse experiences, to estimate what those needs will be and then to consider ways in which we can best contribute to those needs."

The Technical programme consisted of six sessions. The first session considered the requirements for engineering and scientific manpower to meet the challenge of sustaining the expanding population of the world, and the technical services needed in support thereof. The following three sessions established the specific types of scientific and engineering talent needed, describing the state of the world in the major areas of human need, namely, food and water, clothing and shelter, heat and power, communications and transportation. Session Five covered the current status of women engineers and scientists and information was published about Australia and New Zealand, Europe, Iran, Japan, North America, the Philippines, South and Central America, Syria, Turkey and the USSR. Session 6 was in the form of a symposium on "Developing Engineering and Scientific Talent", at which various eminent people were invited to contribute statements as a basis for discussion. There is no report of the discussion as such, but a summary statement emerged from the Conference which pointed out the many ways in which science and engineering

were contributing to improved world living conditions, and the possibility of achieving the outstanding potential of the future by co-operation. Also emphasised was the inadequate supply of trained personnel to implement future world needs.

Finally, the Conference resolved:

1. to encourage each participant to report about the Conference in her home country or region.
2. to encourage women to increase their participation in the professional societies in their countries.
3. to encourage women to enter the field(s of engineering and science) and to improve their qualifications not only during their student days but throughout their professional life.
4. to maintain the central file of women engineers and scientists used for this Conference and enlarge it as much as possible.

So ended the First International Conference of Women Engineers and Scientists. It was attended by a delegation from the UK of some 22 engineers and scientists, who were so inspired that on their return they persuaded the Women's Engineering Society in the UK to host a second such Conference. This took place in the University City of Cambridge in 1967 - the technical theme chosen was "The Application of Technology to World Food Problems".

The inaugural address was given by Dorothy Hollingsworth OBE, a chemist and Head of the Food Science Advice Branch of the Ministry of Agriculture, Fisheries and Food. Her address was entitled "Nutritional Goals in a World Context", and in it she traced the growth of thought on the application of nutritional knowledge to the problem of feeding populations. Experiences in the UK since the beginning of this century were used to illustrate certain general principles. International **action** in matters of food started with the League of Nation's concept in the 1930s of "the marriage of health and agriculture". This was followed by the setting up in 1945 of the Food and Agricultural Organisation of the United Nations for the purpose of raising nutritional levels and standards of living worldwide. Twenty years on and it was clear that the difficulties were even more daunting than anticipated, and a food crisis of staggering proportion was predicted by 1985 unless the rich nations drastically increased aid to poor nations for food and population control programmes. This address provoked much discussion and formed a stimulating introduction to the ensuing sessions on "Enough for everyone", "The Use of Power in Agriculture", "Increasing Food Production" and "Future Trends".

Again, there was a second theme - "The Woman Professional Engineer" and Jo Webb, an American chemical engineer and author gave the opening address, entitled "Science versus the Humanities - a harmful dichotomy". She put forward the hypothesis that science and the humanities are not separate and unrelated, but are subclasses of philosophy. She traced the division between the rational and the intuitive approaches to an understanding of life, through the ages to the present day. She expressed the view hat changes in education to emphasise the importance of both modes of thinking were imperative, as was the need for, and satisfaction to be found in, social responsibility combined with professional commitment. Jo Webb also reported on a survey which she had carried out in which she invited 34 people from different countries to complete a questionnaire about women engineers. She pointed out that professionally qualified women engineers were in a striking minority in every country in the world - one in three in the USSR, one in one thousand in the USA. Her questionnaire was an attempt to collect information about women engineers on a common basis, something that the first ICWES had failed to do.

Most importantly, during the Conference a meeting of delegates was held to discuss the possibility of further cooperation between women engineers and scientists. In addition to delegates representing Supporting Societies from France, Italy, Japan, USA and UK, there was one delegate from each country, and a few interested observers. After a lengthy discussion, the major points which emerged were as follows:

1. There was an unanimous desire for the continuation of International Conferences of Women Engineers and Scientists.
2. However it was agreed that, although an international secretariat to organise the Conferences was desirable, the cost would be prohibitive. Each Conference would therefore build upon its predecessors and self help, and enthusiastic volunteers would provide the necessary workers. Even so a host organisation would be very necessary.
3. A Conference representative in each country was desirable who would organise her own voluntary supporting and fund-raising sub-committee.
4. Three years was a reasonable gap between Conferences.
5. The Conference venue should move round the world.
6. Conference participation should be truly world-wide and a great effort should be made to secure the attendance of delegates from all countries.

A third Conference was mooted for 1970, and a small international committee was entrusted with the task of ensuring the continuity of the Conferences. Its members were drawn from Africa, Asia, Europe, Latin America, the Middle East and North America. The Chairman was Isabel Hardwich from the UK, the Honorary Secretary of the ICWES 2 Organising Committee.

So ICWES was well and truly launched!

ICWES 2 was the first Conference to introduce "The Bringing of Greetings Ceremony". On the eve of the Conference delegates were invited to attend in national costume, and each country delivered greetings to the host country. This was followed by a "get to know you" party. Of course, we English are at a great disadvantage when it comes to national costume, and rely on the Scottish and the Welsh to represent the United Kingdom. However with countries such as Austria, Brazil, Ghana, India, Iran and of course Japan, to mention just a few; it was a most colourful evening, and the UK delegates were put in the shade.

ICWES 2 vied with ICWES 1 in providing a wide range of visits, some technical and some cultural (taking Jo Webb's comments on unification to heart). Based as we were in the City of Cambridge, using the facilities of the University, we were able to tour some of the historic colleges and enjoy such differing pleasures as an organ recital in King's College chapel, and a demonstration of Morris dancing - a ritual English folk dance symbolising death and rebirth, performed by groups of white-clad men wearing bells and carrying sticks and handkerchiefs. The host Society also gave its *own* party in the historic town of Bury St. Edmunds where, in the Athenaeum, the 18th Century assembly room where Dickens used to give readings, we "treated" the delegates to a full-blown demonstration of the scottish pipes, and haggis for supper. An additional attraction was the post-Conference tour of the Irish Republic. All-in-all, the Conferences are a golden opportunity for delegates to learn more about the heritage of the host, as well as getting to know each other.

THE ICWES SERIES

So, ICWES 1 and 2 were a great success involving 374 and 313 delegates respectively, 87 from 32 overseas countries at ICWES 1 and 191 from 35 overseas countries at ICWES 2.

The third ICWES was held in Turin, Italy, in 1971 this time with 233 delegates, 188 from overseas. They discussed "Planning for Progress" and "Women's Professional and Family Duties". The Opening took place in the Royal Palace, Palazzio Madama. The Inaugural address, given by Professor Andrea Ferrari Toniolo examined and analysed five points relating to the deep links existing between technical and human progress. 69 papers were presented on various topics - Energy Sources, Communication and Transport, Computer Technology, Housing, Town and Community Planning, Industrial Production and Human Engineering. The second theme, "Women's Professional and Family Duties" attracted a further 28 papers.

It was at this Conference that the meeting of delegates, in addition to choosing Poland as the host country for ICWES 4, discussed the format of the Conferences. Clearly some delegates felt that time should be allowed for more detailed consideration of the topics, for example by working groups. Some would have preferred less time to be spent on the papers (which should preferably not be too specialised) and more time in discussion. However it was appreciated that the large number of papers could provide a greater opportunity to learn how other countries resolved their problems also that some organisations would not support delegates if the theme were too narrow. In practice each of the three Conferences was quite different from one another.

Again, the program included the possibility of visiting places of historic interest and beauty as well as of technical interest. Particularly memorable was the visit to the historical motor museum which was followed, after a luncheon provided by the Fiat Company, by a trip round their manufacturing facility where the UK delegates were particularly interested to see women and men working together on the production lines. This was something you would not have seen in England at that time!

Four years later found us in Cracow, Poland - the first time for many of us "behind the iron curtain". Again more than 30 countries were represented and there were 148 foreign delegates in a total of 618. The themes were "New Techniques in the Service of Mankind" and "Contemporary Sociological Problems of Women Engineers and Scientists". The Opening address was delivered by the Scientific Secretary of the Polish Academy of Sciences and President of the Council of the Polish Federation of Engineering Associations, Professor Jan Kaczmarek. He told us that in Poland "women accounted for 46% of the labour force. They constituted 39% of manpower with University education, 54% with secondary school vocational education and 70% with general education. 50% of medical doctors were women, 91% dentists and 83% pharmacists. They account for 31% of the University teaching staff. They are active in light industry, food and agricultural industry as well as in printing, electro-technical and chemical industries. They play a more and more important role in the scientific life of the country. They are awarded about 25% of all university degrees". Not surprisingly, 50 of the 106 papers were given by Poles.

At the Delegates meeting, where 32 countries were represented, the Chairman put forward the aims of ICWES as: *Firstly*, to bring together professional women engineers and scientists worldwide. *Secondly* to encourage the use of technology for the betterment of life, and *Thirdly* to consider how to increase the participation of women in this. These aims were adopted, and although slightly differently worded are still the aims today. In discussing the host country for ICWES 5 it was recorded that "There was a general feeling that Japan would be an ideal venue". (There were six Japanese delegates present at ICWES 4). However the Japanese representative regretted she was unable to commit the Society of Japanese Scientists. In the event no definite offer to host ICWES 5 was forthcoming. After the Conference an offer was received from France and accepted by postal ballot among the delegates.

Rouen, the ancient capital of Normandy situated on the River Seine, became the venue for ICWES 5, and it was at this Conference that the meeting of national representatives confirmed the aims of ICWES, and laid down Guidelines which included the composition of the Delegates meeting and its purpose (mainly to decide the host for the next Conference). They also regularised the ICWES Continuity Committee set up

at ICWES 2. Their responsibilities are to encourage organisations to put forward proposals to host the next ICWES, and, once the host is agreed to assist in the dissemination of its details. These guidelines can only be amended at the Delegates meeting. Some minor amendments have been made in ensuing years. Finally, the offer to the meeting by India to host the sixth ICWES in 1978 was unanimously accepted.

The theme chosen for ICWES 5 - Technology and Freedom - included a session on "Information of women on scientific and industrial careers and their training in these careers", as well as sessions entitled "Industrialized production - wherefore?" "From the transfer of technology to industrial cooperation" and "Responsibilities of the Research Scientist". At the close it was emphasized that engineers and scientists have not only a responsibility to their professions but also to the public. This responsibility is of the utmost significance to women scientists and engineers, who are in a better position to convey their knowledge to a seldom well-informed public and to help all women to realise they should not be unconcerned with a world ruled by technology but have a part to play in it.

1981 took us to Bombay to discuss "Science, Technology and Society". The Conference was opened by Indira Gandhi, the Prime Minister. It was a great thrill to meet one of the few women Prime Ministers in the world. There was a large delegation from India, mainly from academia and research institutes and many of the papers they presented were highly specialised and concerned with very specific research problems. Only 18 papers were offered by delegates from overseas, of whom there were 55 in all. Many of these took the opportunity to extend their stay following the Conference, and to learn more about this fascinating continent.

In 1984 ICWES returned to the USA, to Washington D.C. with its museums, galleries, historical monuments and of course the White House. The theme was "Technology - an International Bridge"; its aims were to reduce the gaps in understanding and knowledge among the peoples of the world. Not only was it run in conjunction with the US Society of Women Engineers' National and Student Conferences, but the extensive programme of talks was arranged in three parallel sessions covering 15 topics, ranging from Defence, through Technology and Society to Transportation and Our Planet Earth. There were also sessions on Undergraduate Education, and Women in Engineering and Science, and for those papers which did not fit into any of 14 topics there was a "Pot Pourri" session. Industry was very much to the fore at the Conference, running recruitment evenings and participating in an exhibition. Professional development workshops were available most afternoons, proving a great attraction to the younger delegates. Technical and other tours abounded - usually at least six to choose from every afternoon! We were spoiled for choice...

1987 took us to the Ivory Coast - the theme "Science, Technology and Development". The Conference was opened by the Head of State, preceeded in procession by a group of Kings and Chieftains resplendent in beautiful robes and carrying golden carved staffs and maces. The theme was explored at plenary sessions, and working parties met to discuss "Science and Women", "Communication and Transfer of Technology", "Science and Development" and "Sciences and Techniques". Recommendations from the working parties emerged at the final plenary session. Visits were made to the Port Authority, palm nut plantations and a power station. The Conference ended with a buffet banquet, with African dancers and fireworks, and an enormous ICWES iced cake!

And so to ICWES 9 - hosted by the Women's Engineering Society (UK) at the University of Warwick in Coventry, England in 1991. The theme was "Communication" and topics included Transport, Satellites and Telecommunications, Basic Sciences, Information Transfer, Technology Transfer, Education, Career Development and Gender issues and Demographics, i.e. the education, training, employment and status of women engineers and scientists worldwide. It attracted 466 delegates including 139 from 41 other countries.

On the first evening a "Bringing of Greetings" ceremony was held followed by a party in the form of an Old English Fayre, which included stalls providing such Old English delicacies as Game pie, Syllabub and Mead (a honey-based drink), and entertainment from Morris Dancers and a Jazz band. We were honoured by the "visit" of the famous Lady Godiva who in the 11th Century rode naked through the marketplace of Coventry in order to pursuade her husband to reduce the taxes he had imposed on the town.

Needless to say a variety of tours, technical and social, were made available, and, learning from the Washington experience, a career guidance and training seminar was held for the younger delegates. With a view to increasing the number of girls interested in engineering, AND to tell our delegates more about our country, the opportunity was taken to hold an exhibition in parallel with the Conference with stands from industry, government and educational and professional organisations. A series of educational events was also held during the week to which local schools were invited and in which delegates were also able to participate. These included a WISE (Women into Science and Engineering) bus, (a travelling exhibition offering hands-on experience), part of a project organised by the Engineering Council and the Equal Opportunities Commission to tell schoolgirls about Science and Engineering. Also a lecture for schoolchildren organised by the Institution of Mechanical Engineers was given by the Post Office. This was attended by some 1000 pupils, who also visited the exhibition.

The delegates meeting, held on the Thursday, appointed the new ICWES Continuity Committee. They agreed that subject to their scrutiny of detailed proposals, the Nigerian offer to host ICWES 10 in 1994 be accepted. However, because of political instability in Nigeria, the Continuity Committee was NOT able to confirm the acceptance of the Nigerian offer. Fortunately Hungary stepped into the breach and offered to host ICWES 10 in 1996.

So what can we learn from the ICWES series so far in terms of its stated aims?

Firstly the figures of attendance and of countries represented show that our first aim, that women active in the fields of engineering and science shall know each other worldwide, is being achieved (see Table 1). More needs to be done to promote the Conference worldwide, and to help us all to keep in touch. However, a lot has been learned also in terms of getting to know MORE about each other, and this I will discuss again under the section "The status of women engineers and scientists".

Secondly, the themes chosen have been wide ranging and, in line with our second aim, have enabled us to consider and discuss areas where technology can be used for the betterment of life. Not only has this encouraged a large number of papers, and attracted large audiences, but also the papers have provided an impressive record of the growing technical contributions made by women in these particular areas over the last 27 years.

This is of course, by example, impinges on our *third aim* - that the participation of women in engineering and science shall be increased. In addition many of the papers in the sociological sessions discussed the different ways in which countries are tackling the problem of the shortage of women engineers and scientists, and the waste of talent that this implies.

Table 1.

INTERNATIONAL CONFERENCES OF WOMEN ENGINEERS AND SCIENTISTS (ICWES)

		Year	No of Delegates	No of countries
ICWES 1	**USA**			
(Focus on the Future)		1964	374 (87)	32
ICWES 2	**UK**			
(Application of Technology to World Food Problems)				
(The Woman Professional Engineer)		1967	313 (191)	35
ICWES 3	**ITALY**			
(Planning for Progress)				
(Women's Professional & Family duties)		1971	233 (188)	32
ICWES 4	**POLAND**			
(Contemporary Sociological problems of Women Engineers and Scientists)				
(New Techniques in the Service of Mankind)		1975	618 (148)	30
ICWES 5	**FRANCE**			
(Technology and Freedom)		1978	146 (103)	30
ICWES 6	**INDIA**			
(Science, Technology & Technology)		1981	394 (55)	17
ICWES 7	**USA**			
(Technology - An International Bridge)		1984	1204+ (54)	9
ICWES 8	**IVORY COAST**			
(Science Technology & Development)		1987	221 (51)	21
ICWES 9	**UK**			
(Communication)		1991	466 (139)	42

( ) = Overseas
+ = Combined with SWE Students Conference

WOMENS ENGINEERING

WHY HUNGARY?

Dr. Zsuzsa Szentgyörgyi

Why just Hungary was chosen to be the scene of the 10. International Conference of Women Engineers and Scientists? Why this not too big - or, better to say, small - country on the edge of Central Europe: not in the very centre of the developed rich but not just on the real peripheries, where the newly rapidly developing countries, and the desperately lagged behind nations are thronging. Halfway between the centre and periphery lives here a nation, which have taken this land before one thousand and a hundred years ago, became a part of the European culture, and, has been a creative contributor of this culture for the centuries. The territory of the country is round 93 thousand square kilometer (about two and a half times larger than the Netherlands), and the GDP per capita is about 4,5 thousand dollar pro year.

You can always draw a balance between the facts what a country has and has not. I could cite you quite a long list what we do not have: first of all, being in the very centre of the continent we are devoid of seashores, and so, big international harbours as well; here have no rich ore and coal mines, and our medium rich oil- and natural gas-fields were mainly depleted during the Second World War by the German, and after the war by the Soviet occupiers. We have no high mountains, quick rivers because some decades ago we were deprived of them. And, last but not least, my contemporaries and our predecessors survived a long series of fallen revolutions and fights for freedom, lost wares, invaders, occupiers, colonizers - and among them liberators who immediately became the new oppressors themselves.

Quite a sorrow list of the "having-not"s. On the other side, however, Hungary can be much more characterized by a number of "yes, we have" treasure, values, and abilities. Good soil for agriculture, mild and temperate climate, beautiful landscapes are exceptionally valuable. Here, we have the Balaton, Europe's biggest warm-water lake, lots of thermal sources and springs, here flows the big river, Danube, and so, we have a big international harbour on her. Situated on the cross-roads of nations and physical roads, Hungary is apt for a vivid traffic of goods and transit not only of real products but - what is more significant - of ideas, knowledge, culture as well.

I think, the real and chief values of our country can be found in the culture of the Hungarian people. A small country, which gave eleven Nobel-prize winners the world! Soon have I to add, however, that ten of them got the prize abroad, and not in the homeland. Nevertheless they were Hungarian, not only because their overwhelming majority was born here, held a Hungarian family name, but, what is more important, they were brought up here, and established here at least a part of the scientific bases to their outstanding results. Two of them: the chemist George Olah and the economist-mathematician John Harsanyi were given the highest scientific prize last year. They were grown-up people already as they left the country. And if we go back in time, in Hungary was born, brought up and partly worked here Ignaz Born, Mozart's close friend, the pattern of Sarastro's figure, a giant in the science and practice of mining and metallurgy, and establisher of the world's first scientific society. The two Bolyai's, father and son, the great mathematicians, especially John, the son, who "created a new world" in mathematics, now everyday's bread of the modern physics. In the recent century a legion of Hungarian geniuses swarmed into the world, mainly to England and the USA, flying from the Nazi's terror after 1933. Theodore Karman, founder of the modern aerodynamics, Dennis Gabor, Nobel-prize winner, inventor of the holography, Leo Szilard, an extraordinarily original genius, co-inventor of the nuclear reactor, Eugene Wigner, Nobel-prize winner, one of the greatest physicist of the 20. century, John von Neumann, founder of the modern electronical digital computers, Nicholas Kurti, world-champion in producing extremely low temperatures. The only Hungarian who got the Nobel-prize in the homeland, Albert Szent-Györgyi, the discoverer of the vitamin C left later on the country too, and lived in the USA. They were the Martians on the Earth, as Professor George Marx called them in his famous book.

All these people and a big number of less famous but very valuable other were compelled to leave Hungary mainly because of political reasons - first of all Jews, whose naked life was threatened not only by the

German occupiers but by their Hungarian collaborators too. The wind of wars, revolutions and counter-revolutions, or sometimes simply the lack of perspectives had blown out hundred thousands, perhaps millions of Hungarian people - gifted, skilled, whose creative force was used and enjoyed by luckier nations.

Yes, our country is windy, very windy, not only in real but in transitive meaning too. To live on the cross-roads is often dangerous, not always an advantage. On the other hand, however, probably just this sharp and difficult situation made Hungarian people extraordinarily adaptive, docile, quick to understand and enterprising. May be, this was one of the reasons that the ICWES Council chose Hungary. Of course, among other reasons we have not to forget the great historical social transition in the early nineties. Those time Hungary belonged to a region being highly interesting in the eyes of the international public opinion: one of the newly independent, post-communist countries, perhaps the most open among them. And there was just another reason, why the year 1996 was chosen. When the ICWES Committee decided to organize in Budapest the 10. Conference, our capital was the planned scene of the next World Exposition. That is why the Hungarian Organizing Committee firstly suggested for the Conference the month May, since the Expo was due to open its gates in June this year, and it seemed evident that the ICWES Conference would be an accompanying and introducing event of the Expo.

In 1994 turned out, however, that the country is not able to undertake such a big event, mainly because of economic reasons, and so, the Hungarian government and the Parliament renounced it. So, along with the diminishing World Exhibition this possibility disappeared for us. That is why we postponed our Conference to a more suitable date. Early autumn, the Indian Summer (what is called in Hungarian by a less polite name, the Summer of Old Ladies) in this region used to be a very nice, sunny and mild part of the year, in contrast to the capricious young summer.

So, why Hungary? I think and hope that I could answer the question, and justify the answer as well. You are welcome here, in our small - but small is beautiful! -, not rich but developing country, with charming landscapes, nice cultural memories, and hospitable people. Beside the Conference enjoy the hospitality of Hungary! We try our best that our dear Guests spend here pleasant days and bring good memories with themselves.

WOMEN INTO SCIENCE AND ENGINEERING

Baroness Platt of Writtle CBE DL FEng

Patron, WISE
Former Chair, EOC, Great Britain
House of Lords, London SW1, England

The prosperity and quality of life of all nations depends on the intelligent application of technology and innovation in all areas of life. To do this countries need well-qualified engineers, both women and men. Throughout all fields of education, industry and commerce, and in government, encouragement needs to be given to girls and women to study science and technology and pursue careers in those fields. Employers need then actively to recruit women, and put into practice flexible working arrangements so they can retain those valuable women engineers when they also have children.

In 1993, our Engineering Profession in the UK were very pleased when the Government Office of Science & Technology published "Realising our Potential". I quote from the first page:-

"The understanding and application of science are fundamental to the fortunes of modern nations. Science, technology and engineering are intimately linked with progress across the whole range of human endeavour: educational, intellectual, medical, environmental, social, economic and cultural. They provide - through tools as diverse as mathematical modelling, biotechnology and earth observation from space - a vital part of humankind's armoury for solving long-standing, world-wide problems, such as poverty and disease, and for addressing new global challenges such as those facing the environment.

The history of the United Kingdom has shown the intimate connection between free trade, the application of science to tradeable products, and national prosperity. The industrial revolution which played so large a part in creating the modern world was made possible by our great engineers of the eighteenth and nineteenth centuries. In a world where ever fiercer competition prevails, history's lessons are highly pertinent"

It is not often that Governments make statements of this kind, and back them up with a programme of ongoing action. The White Paper has set up a complex Technology Foresight programme involving many people: Industrialists, Academics, researchers with special expertise in particular areas of technology, to try to foresee where Britain should concentrate her productive and innovative capacity, so as to result in wealth creation and a better quality of life for our country in the future. Engineers of course will have to be deeply involved. That is good for our profession in the UK, both in achieving public respect, but also in encouraging engineers to take a broad view of innovation, and not concentrate on their own narrow speciality.

If people are to retain their standard of living and the sort of public services that prevent hardship to the handicapped, the elderly, and the inadequate, nations must sell their goods in the markets of the world in order to earn the money for public and private provision. Because other countries have been quicker to apply the new technologies to

production and manufacture than the UK, they have been able to reduce prices and take our markets. The UK have to catch up in this race and produce more economically too. They say the British never see the writing on the wall until they have their backs to it, and there is an element of truth in that. However, up and coming sunrise industry in our country does appreciate the urgency of the matter, and is hard at work applying new technology and regaining its marketing position in the world and will be backed by the Government policies outlined in "Realising our Potential". In that sort of situation it is everybody's business in all our countries to see that children do not leave school frightened of the new technologies which are going to permeate their working lives in the 21st century.

To have the necessary technologically, literate human resources ready for the 21st century, it is essential to make science and technology and engineering attractive to girls as well as to boys whose working lives will all be in the 21st century and that must be as true universally as in Great Britain. As Sir Walter Bodmer said in his Presidential address to the Association for Science Education, "Everybody needs to be scientate". That needs to be true throughout their school careers, and we hope afterwards that girls' interest in science will be kept up all through their lives just as much as the boys. The world would be a better place if that interest were awakened and maintained worldwide. That is not to suggest girls and boys should be educated narrowly in science, just as they should not be educated only in the humanities. Either exclusion is unacceptable in an increasingly knowledge based society. It is the interaction of the so called two cultures which is so essential. The cultured person must be knowledgeable right across the board: Arts, Science, Humanities - the lot.

Later in a working environment, because of the ever increasing sum of knowledge, human beings in all our countries will have to work in teams contributing from the base of their own specialisms, but at the same time being able to imagine how the whole jigsaw of specialisms of a team can fit into each other to the enhancement of the whole product whatever that product might be. An earlier broad education, including practical technological experience will stand them in good stead throughout their working lives.

An industrial in-house magazine showed an illustration of the control board for a system of theatre lighting. In the past, too easily drama could be categorised as an art. How artistic would a performance be today without specialist lighting for dramatic effect, quick spot lights, or colour change? Where would a production be without microphones judicially placed for sound effect and the acoustic enhancement of the actors' voices so the merest whisper can be heard everywhere in the theatre or, indeed, if it be a televised performance, in the homes of people throughout the world? Whether it be in tourism, air travel or running an hotel, an art gallery, a school, an orchestra, a hospital, a bank, a departmental store or a factory, the manager of the future, and many of the people working there, will have to have a basis of scientific knowledge and of the applications of new technology if they are to survive in a highly competitive world.

The British Engineering Council with assistance from the Department of Trade and Industry has for a number of years been developing the initiative "Neighbourhood Engineers" so that eventually there will be two or three volunteer engineers - either technician, incorporated, or chartered, both men and women- attached to every secondary school, to work with teachers, perhaps to help with problem-solving projects, and thereby to raise the profile of engineering in schools. Engineering is not a school subject; very few teachers have any experience of the reality of the subject, so that children are not encouraged to take it up as a career. It is hoped that this initiative in putting over the reality, and the enthusiasm of the volunteer engineers for their chosen career will encourage more boys and girls to become engineers too - and they must be enthusiastic and interesting. Boring engineers with old fashioned attitudes will actually put young people off - so they have to be well chosen!

Young people are usually very environmentally interested and caring, both boys and girls, but perhaps particularly girls. They often do not connect engineers with caring for the environment, which of course they must. The UK Engineering Council believes that engineers must always bear in mind the effect of their projects on the environment and asses their associated risk to people, and the danger of pollution of the atmosphere, land rivers etc. The Council has issued a Code of Practice, and is offering prizes nationally to encourage high standards amongst engineers in this sort of activity. If carefully-thought-out total policies to protect the environment are brought into action at design stage, instead of as a last minute bolt-on after-thought, money can actually be saved, and more cost-effective production processes achieved as a result.

Britain signed the Rio Agreement on limitation of environmental pollution, which requires strong policies in action if targets are to be achieved worldwide, and development on behalf of humanity is to be sustainable. Engineers who care about the environment and can innovate so that the necessary technological programmes are executed efficiently and economically and lead to commercial success will be much in demand. These ideas need to be put over sympathetically in schools too, which is seldom the case unless practising engineers and scientists are personally involved.

In 1994 the first decade of the WISE campaign (Women into Science and Engineering) was celebrated; I chaired its committee when it was first set up in 1984. It has now been in action for 12 years.

The Equal Opportunities Commission had long felt that literally half the talents of the nation were being neglected in the field of science and engineering and the Engineering Council, of which I was the only woman member, set up in 1981 as a result of the Finniston report, decided right from the start that they would encourage more women into our profession. Those firm resolutions were behind the setting up of the WISE campaign in 1984. The fact that in Britain there were nine hundred thousand eighteen year olds in 1981 and six hundred thousand in 1995, a dramatic drop of a third, has lent great urgency to the matter. If the so far untapped resource of the talents in girls' heads are not brought in, the quality of the profession of engineering, and indeed all technology-based professions will fall drastically. That would have unfortunate results for our country, and I expect a similar situation exists in many countries throughout the world.

Because of this, the UK Government initiated a national study, and published "The Rising Tide", another White Paper at the order of the Office of Science and Technology and I quote from the first page:-

"By the year 2000, Great Britain will have approximately 23.5 million women aged 16 years or over: women will represent 46 per cent of the civilian labour force. Demographic trends and changes in economic activity rates show that four-fifths of the projected net increase in the civilian labour force in Great Britain to the year 2006 will be women. The full potential of this expanded labour force needs to be tapped.

One area of particular importance in underpinning our economic competitiveness and quality of life is science, engineering and technology (SET). The Government in its recent White Paper "Realising our Potential: a Strategy for Science, Engineering and Technology", acknowledges that women are the country's biggest single most under-valued and therefore under-used human resource."

Those statements are of fundamental importance in promoting the prosperity of our country. For far too long these careers have been regarded as a male preserve.

Changes in fundamental attitudes in society take several decades to become acceptable, especially in unfamiliar fields like these. There needs to be a fundamental rethink if opportunities for girls are to be more equal. Too often engineering is put over as hard and mechanical. In fact the inventions of scientists and engineers have heated our homes, produced labour saving equipment and mechanical aids for the handicapped, life saving incubators for premature babies, aids to industry and medicine, to make our lives more healthy, comfortable and less dominated by drudgery and disease than they have ever been throughout history. These ideas need to permeate education, not just be part of the science curriculum. Often at present they are not mentioned at all.

Over the past few years a great deal has happened for the good in education: new technologies have been introduced, computers are more common, equal opportunities policies are progressing in schools in Britain. Nevertheless the need for girls to be technologically competent is an urgent one and one cannot start too early.

One of the EOC's publications - "An Equal Start"- shows the little boy sewing, and the little girl drilling a piece of wood. If efforts are not made to counteract the traditional assumptions, girls will always work with soft materials and never with hard; boys will always play with mechanical toys but never learn to cook or clean or care for children. All that leads to individual helplessness for both sexes when they grow up. If both sexes learn all of the skills, both will have more confidence and independence, both at home and at work, and more choice of skilled careers.

The Engineering Council together with a teachers' union commissioned a report by Professor Alan Smithers and Pauline Zientek of the School of Education at the University of Manchester called "Gender in Primary Schools". It shows that of over 500 five year olds questioned 95% of boys thought car repairs could only be done by men whilst 86% of girls thought that only women should mend clothes. The report shows gender stereotyping firmly established in the minds of these five year olds. 73% of boys and 66% of girls thought that scientists could only be men, which just shows the built-in prejudices that have to be overcome in both sexes. Interestingly children of mothers with professional occupations were less stereotyped than the others.

Both this report and "An Equal Start" put forward recommendations for action both in nursery and primary schools to combat these prejudices, but clearly once again it is a long term battle.

These days computers are far more available in both Primary and Secondary schools in the UK. It is vitally important that girls as well as boys have hands-on experience, that the software is not all Star Wars and the like, but is angled towards other interests so that girls feel it is relevant to their lives too. Otherwise they label it as just boring, switch off, and take no further interest; a disaster both for them and for all our countries.

Various reports over the years have shown that many more boys than girls have hands-on experience of computers at home. They still tend to be boys' toys and the boys can monopolise them if the teacher does not control the situation. Girls-only computer clubs in the lunch hour can help, in which the girls familiarise themselves with the machines, and can go back to mixed groups when they are more confident in their use.

The Engineering Council has published, "Problem Solving in the Primary School", which is science based. As in all other Engineering Council publications it assumes that teachers and schools will encourage girls and boys equally in their interests in technological and scientific subjects and will make sure that the problem solving is orientated towards subjects in which girls are interested. There are encouraging signs that this is happening.

Too often, when girls want to be engineers, it can be the teachers that put them off. Girls often say they want to work with people, and unenlightened careers staff steer them to teaching or nursing. Those are excellent careers if the girls have a vocation in that direction, but too often they slide into them because no one has explained to them that engineers work with people too. The design, production and marketing team includes engineers, accountants, graphic designers, production, advertising and marketing staff. Engineers must explain their ideas clearly to all these people; to men and women on the shop floor, to the Board of Directors and last, but perhaps most important of all, to the customers. Without satisfied customers firms go to the wall. An intelligent, technologically qualified woman can be very good at exercising her charm and thoughtful nature to explain the product, listen to the customer's point of view and see that the customer gets what he or she wants. Those facets of the profession are seldom emphasised at school and that is where "Neighbourhood Engineers", especially women, can persuade girls of a much more attractive and realistic picture of the profession of engineering.

It is very difficult for a youngster still at school to imagine what a job is like. Films are a help. A film was made in Canada about women engineers, showing one who had developed a new type of artificial leg. The top consisted of a water bag. She fitted it to a man who had, only recently, had his leg amputated. She then pumped it up gently so he could walk comfortably, much to his gratitude. In the same film a woman engineer was explaining to a nurse how to operate a very sophisticated incubator for saving babies' lives. One has only to look around the home to see the contribution engineers have made. Without them we would not have deep freezes, refrigerators, vacuum cleaners, washing machines, central heating, and all the applications of electricity to take the drudgery out of life and to improve our comfort. Very often women have a particular contribution to make to the design of these domestic appliances because of their practical experience.

Women are now working successfully in very unexpected places. Over the years I have met young women site engineers on major construction projects, a manager of a light metal forging factory, technicians on helicopter design and production, senior engineers in electronics factories, and one under 30 who had just returned from laying sewers in Kuwait. There are many more.

They demonstrate by their relaxed and pleasant attitude and their technological competence and efficiency that they know what they are talking about. Clearly their employers are pleased to send them as their ambassadors. They are also a great asset in schools to describe their jobs and career prospects and why they enjoy their profession of engineering and find it challenging and exciting.

The British Women's Engineering Society is doing an excellent job collating lists of these young women who are prepared to talk about their job to girls in schools. Being near to their own age the girls can relate to them and really understand what makes the job rewarding. They alone can explode the myth that to be an engineer means to be unfeminine, which is a very real fear in the minds of teenage girls. Recently two attractive young women engineers walked into a classroom with their briefcases and high heels, "bright-eyed and bushy-tailed" and said to the girls, "And who do you think we are?" The girls said, "Teacher, lawyer, doctor?" "No", said these two young women, "Engineers!" From then on the door was open. The girls were much more interested. Careers staff need to display a very positive attitude if they are to succeed in encouraging girls into non-traditional careers.

If local industry can send young women involved in interesting jobs to talk to the girls, that is very worthwhile. Young women nearer to the girls in age can talk about the reality of their jobs and encourage girls to realise that they too could be knowledgeable and take on responsibilities in their work without losing their femininity. That will encourage them to see that their school work in science and technology can be of immense value in the development of lifelong rewarding careers. They used to say that diamonds are a girl's best friend. Nowadays scarce skills are a girl's best friend. You can only sell diamonds once. You can sell scarce skills every month, every year for the rest of your lives.

There are now six WISE buses on the road. The first one was launched by the Prime Minister. There is a bus now financed entirely by British Gas, another one by British Rail. They travel in the firm's house colours so they can advertise their generosity, for which the WISE committee is very grateful. They are naturally overbooked because they give girls a new and practical insight into science and technology with their computerised pneumatic and electronic equipment. They give the girls hands-on experience, technological careers literature and videos and there is a general atmosphere of encouragement for girls. They are a very exciting arrival in any school playground and are bound to take the interest of girls and their teachers, and we hope, of their parents in the evenings, and destroy unrealistic ideas of technology-based careers.

The UK Engineering Training Authority, has done a lot over the years to encourage girls to take up careers in engineering. Their Insight courses have been very successful giving girls of seventeen four day taster courses in universities where they see the engineering departments and again meet young women engineers and visit industry. There are five hundred places for seventeen year old girls in their lower sixth year and about two thirds opt for careers in engineering afterwards on an informed basis. The courses are equally valuable when girls make up their minds not to take up engineering, but on an informed basis.

ENTRA also provide a variety of incentives to employers and to girls to become technicians, which is very valuable work as so few people realise what rewarding careers technicians can have. In my view, in England we do not give enough attention to the encouragement of middle-ability children who could be much valued members of the workforce at technician level. A British Institution for Electronic Technicians and the Women's Engineering Society run an annual competition - "Young Woman Engineer of the Year". Of course, the real winners in that competition are the employers who employ those outstanding young women. Encouragingly, BTEC, the technician qualification awarding body in the UK, reports an increase of women involved in their engineering courses from 2% to 5% over a decade.

As a result of the WISE campaign a lot of employers started to produce special recruitment literature just for girls. For example, Marconi - "The wise guys came to us, but not enough wise women". British Gas published their teenage magazine GETWISE. Westlands produced an excellent recruitment leaflet, "Girls use your craft technician skills to become an engineer". As a result, Southwest Television produced a programme. Lorna Tucker was one of the technicians they had encouraged. The interviewer said to the Training Officer, in a very patronising way, "And are these girls much use to the firm?" The Training Officer said, "Yes, they are an extremely valuable asset. One of them, Sue Rothwell, won the "Technician of the Year Award" in Westlands this year." Then this patronising voice said to Lorna, aged nineteen, "What do you think you have got that the boys have not got?" she looked him straight in the eye and said, "Class!" So she had too. They were lucky to have her. They do find that these pioneering girls are very able and she won the "Technician of the Year Award" the following year, not surprisingly, and some years later is now sent by her firm on a management course in France.

The House of Lords Select Committee on Science and Technology, of which I was a member, in its study of Education and Training in the new Technologies, emphasised the importance of support for a continuing WISE campaign in schools and colleges as an important long term solution to the problem of skills shortages.

However, as the report says, "The short term needs of industry can only be met by increasing further the amount of retraining and conversion courses. In particular there should be more courses designed to meet the needs of women re-entering employment.

There should be a large scale increase in provision of continuing education and in employers' updating and retraining programmes, which have an importance approaching that of initial education. Individuals will have to recognise the importance of self-improvement in retraining."

There are many mature women within the workforce today not fulfilling their capabilities and

willing to retrain to attain promotion and responsibility, who did not have the opportunity when they were young. Enlightened employers will seek them out, and enable women to use their skills and talents to the full, equally with men, to their own and their employer's advantage.

The Confederation of British Industry organised a conference in response to a Government Committee Report on the shortage of Information Technology skills. All day the message was, work away in the schools to change attitudes, but that is the long-term solution. The short-term solution is in retraining the existing workforce.

When employers spend thousands of pounds in investing in new and more productive high-tech machinery they must also invest in the retraining of the workforce, women as well as men, so that the operation of the machinery will be properly understood and it will achieve its maximum benefit. Human resource development at all levels is just as important as technological development, and Universities, and Further Education Colleges can be a great asset in providing new opportunities and well designed access courses for mature students wishing to improve their skills in technological fields of work. Many interesting initiatives are happening in Britain to allow women to attain the necessary preliminary skills to enter higher level courses in technological subjects confident of success.

West Cheshire College Engineering Department recruited 18 women all over 25 on to a course in mechanical electric and electronic technology. To the delight and pride of the course tutors all gained 1st Class Technician Certificates including 31 distinctions and 103 Merit Passes.

The WISE campaign has been a success due to all the support the EOC and the Engineering Council have received from many institutions, Industry and Commerce and the Government from the Prime Minister downwards. The Engineering Council has produced WISE booklets which give information on courses available to girls in schools and colleges. Women, I am glad to say. now form about 14% of all undergraduates in engineering, increasing from 7% of first years only in 1984, and without reducing the percentage of women students in science. That is a major step forward since 1941 when I went up to Cambridge. Then there were 5 of us amongst 250 men, and later on we discovered there had only been 9 ever before! We were not even a statistic!

I hope what I have said is helpful to you in encouraging more women to study technological subjects such as engineering. After that it has to be realised amongst employers that they will need to be able to combine successful careers with happy and responsible family life, and that must mean providing more flexible working arrangements convenient to employer and employee.

In the 21st century, it is to be hoped that fathers will take very much more responsibility in the upbringing of children, together with mothers, and parental leave will become more commonplace, instead of the vast majority of the responsibility remaining with mothers as it does today, so that they feel guilty leaving their children while at work and guilty at home not utilising their technological skills. Those fundamental changes in Society's attitudes again need several decades before being accepted in depth throughout the Community.

Most women, although not all, want to combine happy and responsible family life with a successful career. Professional women foreseeing progress in responsible careers mostly put off having their families until their thirties. This is just the time when young men are studying for MBA's and finding ways to grasp new responsibility and experience so as to forward their careers. When children arrive, it is important that both parents are involved in their upbringing. The present mentality of 6 days a week, 10 hours a day duty if you want promotion, is bad for industry and commerce and bad for the involvement of both parents and needs to change fundamentally in the 21st century. The upbringing of children is vital to our future Society and responsible parenthood is the key to its success.

Each family needs to work out how that is to be thought out in practice, but employers cannot opt out of those decisions, and must take responsibility for the provision of a variety of flexible working arrangements, so as to achieve mutual convenience between employer and employee, whether male or female, so that all parties continue to benefit from hard won and expensive, technical skills and in-house expertise. Those technical skills, education and expertise will have been acquired at considerable public and private cost and must not be wasted. If flexible arrangements are not available and clear to employees, the unspoken message can lead to ambitious and highly intelligent women deciding not to have families. That may be very sad for them personally, but also genetically disastrous for our nations.

Opportunity 2000 was launched in 1991 with the aim of pressing for more family friendly policies for the next century. It is a voluntary organisation which Lady Howe chairs and has proved very successful in that now about 300 major firms belong covering over 25% of the UK workforce.

The Prime Minister spoke at the launch and said amongst other things:-

" I want to see all women having the same opportunities as men. We want more women in top posts. Relatively few men think that combining career, marriage and children will involve choices or pose dilemmas. But for women these three simple human ambitions are still hard to combine.

This is the problem we must tackle today, and which Opportunity 2000 addresses. It is above all about changing attitudes. The time has come to ask why women should need to be prepared to conform to traditional working patterns. Why can't work be organised on a part-time basis, with or without job sharing? Why can't career breaks be recognised as something positive from which people might actually gain in terms of effectiveness and fresh thinking?

We increasingly need to come to terms with these facts. I am delighted that the employers participating in Opportunity 2000 have done so. I hope many more employers will follow suit. It is in their interests to do so."

In Britain, as the Prime Minister highlighted, major employers have been increasingly focusing on providing more flexible working arrangements so that women can combine successful lifelong careers with happy and responsible family life. This is of course especially important for technologically qualified professional women where, if they have a period out of employment, they may lose touch with progress in their field of work, and updating their skills and expertise, and never return. This is a major loss of public and private investment that no country can afford.

The most important thing when a woman asks for maternity leave is for her line manager to sit down with her and discuss her lifelong career aspirations, and then to settle either at that time or later in her maternity leave what arrangements will mutually suit the employer and employee in future, with the aim of not losing important investment in skills and in-house expertise. The key to success is understanding and flexibility between the woman and her line manager and her firm. It may be that flexitime, part-time work, job sharing, off-site working, childcare vouchers, parental leave, yearly contracts, provision of childcare, either together or separately will solve the problem to their mutual satisfaction.

The Engineering Council early on in the WISE campaign set up a career break working party and produced a report and video for the Boards of Companies explaining how these sort of policies could be practically put into action. As a result, many large engineering companies now have a wide variety of flexible schemes in action, so girls who become engineers now will benefit from them!

By the time of the Millennium the Sex Discrimination Act in the UK will be 25 years old, and of course there have been many developments in legislation since then to make working conditions more equal between men and women, and there will be more by the year 2000. That progress needs to continue, so that equal opportunities are thoroughly accepted throughout Society, whether it be in schools, colleges or universities, in industry and commerce, in government, and in families throughout the world. At present there is still a long way to go, so that efforts must continue well into the 21st century building on successful experience, continuing to make progress both recruiting and retaining many more women in careers in science and engineering.

REFERENCES

Realising our Potential, HMSO (1993).

The Rising Tide, HMSO (1994).

An Equal Start, The Equal Opportunities Commission (1992).

Gender in Primary Schools, Alan Smithers & Pauline Zientek, The Engineering Council (1991).

Problem Solving in the Primary School, The Engineering Council (1985).

The House of Lords Select Committee Report "Education & Training & the New Technologies".

WISE Booklets, The Engineering Council.

Career Break Working Party Report & Video, The Engineering Council (1985).