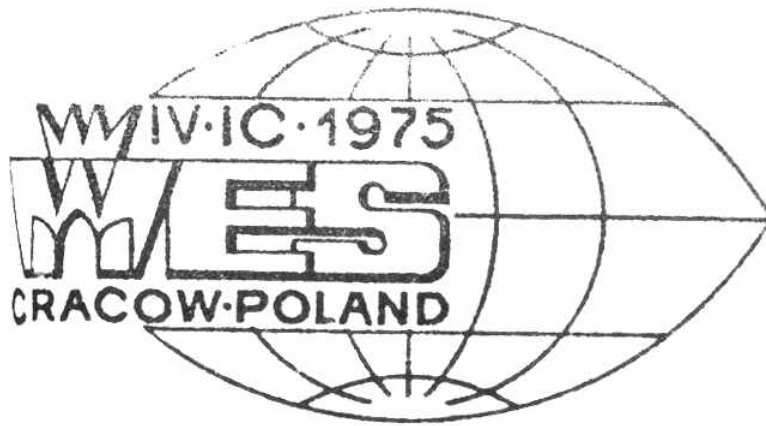


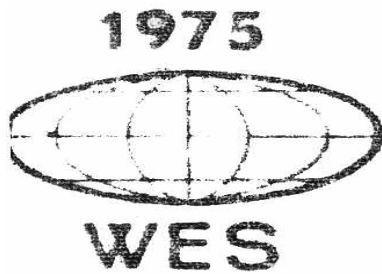
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IRAN

**FOURTH INTERNATIONAL CONFERENCE OF WOMEN
ENGINEERS AND SCIENTISTS**

September 8 - 13, 1975 Cracow, Poland



**CONFERENCE SECRETARIAT:
Ośrodek Postępu Technicznego NOT
Świętojerska 5/7
00-236 Warszawa, POLAND
Telex no: 814460 OPT-PL
Tel. no: 31-93-65**



Warsaw, March 1975

1. Introduction

The 4th International Conference of Women Engineer and Scientists will be held in Cracow, Poland, from Monday, September 8 through Saturday, September 13, 1975. We express the sincere hope that those who attend the Conference will make it a lasting success. Taking this opportunity we wish to call your attention to the fact that the 4th ICWES will take place in the year which has been proclaimed by the United Nations as the International Women's Year. Our meeting will, therefore, aim at presenting achievements of women engineers in science and technology, their social function position in the world of science.

The main topic of the conference: New Technique in the Service of Mankind, refers to almost all branches of today's economy and industry, thus establishing common ground for all the contributions and discussions of the conference which should therefore concentrate on the relationship between the achievements of technology and the welfare of all nations.

The complex problems of psychophysical human needs put great responsibility upon the world of science and technology of recognizing the full significance of interdisciplinary collaboration and correlation with biological sciences, the humanities and others in determining conditions of human life.

The keynote of the conference is the conviction that science and technology should serve mankind in satisfying its needs as well as increasing better and happier environment. The contribution of women to the successful solution of this problem seems to be of paramount importance.

2. Working sections and the themes for the conference

- Section 1 Contemporary sociological problems of women engineers and scientists. Role of women engineers and scientists in the development of science and technology.
- Section 2 Spatial arrangement of human environment
Human settlements: towns, housing estates, buildings. New trends in material and structural solutions for various types of building.
House and municipal installations. New techniques of infrastructure.
- Section 3 Problems of nutrition
Agriculture, forestry, horticulture, food industry.
- Section 4 Material supply and equipment problems
Textile, clothes, furrier's, shoe and furniture industries. Ceramics.
- Section 5 Transport
New means of transport. Motorization and roads.
Airways and waterways.
- Section 6 Automation and computer science problems
Digital systems. Data transmission. Computer aided design. Management information systems. Process control. Information retrieval systems for science and technology.
- Section 7 Raw materials and power engineering
Raw material and semi-finished products for modern technologies.
Sources of primary energy and different kinds of secondary / refined / energy.

3. Programme of the Conference

Saturday and Sunday, September 6-7, 1975

9 a.m. - 9 p.m. Registration desk open at the Cracow Academy of Mining and Metallurgy/Aleja Mickiewicza 30/. Additional Information Desks will be provided at the airport and the railway station. Transportation to the Main Reception Centre and hotels will be arranged.

Monday, September 8, 1975

10 a.m. - 1 p.m. Opening Ceremony and plenary session at the Kijów Cinema Theatre

1 p.m. - 2 p.m. Fashion show

7.30 p.m. - 10 p.m. Reception given by the Organizing Committee of the Conference

Tuesday, September 9, 1975

9.30 a.m. - 11 a.m. Working sessions at the Academy of Mining and Metallurgy

11 a.m. - 11.30 a.m. Break for refreshments

11.30 a.m. - 1 p.m. Working sessions

3 p.m. - 7.30 p.m. Sightseeing of Cracow and the Wawel Castle

9- p.m. - 10 p.m. Film show

Wednesday, September 10, 1975

9.30 a.m. - 11 a.m. Working sessions

11 a.m. - 11.30 a.m. Break for refreshments

11.30 a.m. - 1 p.m. Working sessions

3 p.m. - 7 p.m. Sightseeing of Oświęcim

9 p.m. - 10 p.m. Film show

Thursday, September 11, 1915

9 a.m. - 1.30 p.m.	Visits to factories, laboratories, etc.
1.30 p.m. - 7.30 p.m.	Free time
8 p.m. - 10 p.m.	Folk dance and song show.

Friday, September 12, 1915

9.30 a.m. - 11.am.	Working sessions
11 a.m. - 11.30 a.m.	Break for refreshments
11.30 a.m. - 1 p.m.	Working sessions
1.30 p.m. - 6.30 p.m.	Coach excursion to Ojców and Pieskowa Skata or to Wieliczka - depending on individual requests.
8 p.m. - 10 p.m.	Closing dinner

Saturday, September 13, 1915

9.30 a.m. - 1 p.m.	Plenary session and close of the conference

4. Information about papers and languages of the conference

Owing to, the large number of papers which will be read during the conference and the need for discussions in specialized groups there will only be two plenary sessions at the beginning and at the end of the conference. Three working days will be devoted to the debates in specialized groups which will allow more time for exchange of opinions and deeper analysis of the subject under discussion. The most important problems discussed during the working sessions will be presented at the plenary session during the last day of the conference.

The languages of the conference will be English, French, Russian and Polish. During the plenary sessions simultaneous translations will be ensured. During the working sessions however direct translation only into the English language will be provided.

Although the main topics of the hitherto declared papers have already been settled the Organizing Committee invites other reports and papers and if sent now to reach us early enough they stand a good chance of appearing in the Proceeding of the Conference.

We have so far received 43 papers, from abroad including 11 topics in Section one, 10 in Section two, 3 in Section three, 3 in Section four, 1 in Section five, 7 in Section six, and 8 in Section seven.

Very few papers in Sections five, three, four have been sent to us. Therefore by extending the application dead-line we hope to have those other sections fully represented. The papers which have reached us from abroad by now and those from the Polish participants seem to fill up the time assigned the respective sections.

Papers can be typed in English, French or Russian.

It is requested, however, that the following conditions are complied with:

- the typescript of the paper must not exceed 8 sheets of paper,
- authors are asked to present their lecture for not more than 20 minutes including 16 mm film show, slides, pictures and other aids. If the author wishes to use any audio-visual equipment while presenting lecture, please let us know in advance by stating your requirements;
- The paper should be concise but at the same time easy to understand by non specialists.
- Please attach short list of professional activities, scholarly achievements, etc. and the abstract of the paper. All that information should not exceed one page.
- The printed area on each sheet of paper is maximum 15 cm x 22,5 cm which is equivalent to 6 inches x 9 inches.

5. Registration fees

Registration fee for participants in the conference is \$ 150. - This fee covers participation in all sessions, an unbound copy of the conference materials, participation in the folk dance and song show, the sightseeing of Cracow and Wawel castle, the reception on Monday evening and refreshments during the breaks, the sightseeing of Oświęcim and the fashion show.

The registration fee for accompanying persons is \$.75 per person. This fee covers all the above mentioned services and activities except the Conference materials.

The participants and accompanying persons are requested to fill in the enclosed application form and send it direct to PBP Orbis, as soon as possible, but not later than June 15, 1975.

Registration fees after that date are \$ 200 and \$ 100, respectively.

6. Hotel and touring services

The Organizing SCommittee is happy to offer a series of hotel and tour services to be expertly arranged by the worldwide travel organization PBP "Orbis". Appropriate standard of services will be provided for, including a selection of interesting trips across this country and abroad, hotel accomodation transfer-escorts, as well as medical treatment in health resorts.

For your further guidance you are recommended to examine the Information Leaflet attached herewith.

For your convenience the registration fee for your membership in the Conference along with other payments will be remitted further on to the account of the Polish Travel Agency - PBP "Orbis".

6.1. Hotel accommodation and meals

The costs in different hotels as per person per day are as follows:

Category	single room		occupancy in double room	
	with bath	without bath	with bath	without bath
"Cracovia" hotel	28.0	--	24.0	---
1a category	21.0	18.0	17.0	15.0
1b category	18.0	16.0	15.0	13.50
II category	17.0	14.0	14.50	12.0
Students hotels	---	----	----	10.0

The above quoted charges cover lodging and a full board. In order to enable you to have a free choice of a restaurant, each Participant will receive

a certain equivalent in zlotys to cover whole-day meals according to the anticipated number of days.

A daily rate is as follows:

"Cracovia" hotel - zls 250.0 per person,

other hotels and students hostels - zls 200.0 per person.

Both the name and address of the hotel, in which a room has been booked, will be announced in our confirmation card within a month starting from the date your Registration Form is in hands. The Participants will also be able to check particular hotel accomadation on their own in the Main Conference Reception Centre which will open on September 6, 1975 at 9 a.m. at the Cracow Academy of Mining and Metallurgy.

All the Participants, who would at any time during the Conference like to stay in Warszawa, will probably find it most convenient to avail themselves of the reservation service made available by the Bureau of Congresses "Orbis". We can offer you accomodation in the 1st category hotels or in the "Forum-Intercontinental" hotel. Approximate charges per person a day alongwith a whole-day meals are listed below:

Category	single room		occupancy in double room	
	with bath	without bath	with bath	without bath
"Forum"	38.0	---	27.0	--
I category	21.0	18.0	17. 0	15.0

A daily rate for meals is as follows:

"Forum-Intercontinental" hotel - zls 300.0 per person per day,

I category hotel - zls 200.0 per person per day.

6.2. Transfers

All guests from abroad, if so requested, may be met upon their arrival in Warszawa and thereafter escorted from railway stations or airport to their hotels, or another railway station and vice versa /charge in one

Direction being \$ 5.0 per person/, or from the international airport to the domestic airport/charge, then, being \$ 2.0 per person in one direction/.

Our car and guide will be awaiting you at an appointed place of your arrival. Please note that the necessary guidance in Kraków may be ensured by the Organizing Committee of the Conference.

6.3. Passages from Warszawa to Kraków.

Warszawa and Kraków are served by a series of convenient railway and air connections. Some may wish to make their reservations direct in their own country, and should of course feel free to do so. However, "Orbis" will be pleased to assist in the arrangements.

On September 7, 1915 a direct trip transportation by coach from Warszawa to Kraków, under the guidance, will be arranged by the Bureau of Congresses "Orbis".

Saturday, September 6, 1975

- accomodation in Warszawa at a 1st category hotel,
- dinner, night's rest.

Sunday, September 7, 1975

- breakfast served at hotel,
- after breakfast departure of the coach direct to Kraków,
/the route takes you through the picturesque land of Kiekie/.
- dinner served in the ancient monastery hall 17th century in Chęciny
- arrival in Kraków at approx. 5 p.m.

Cost US \$ 30.0 per Person

6.4. Pre-conference Tour

We are also happy to offer a selection of tours, combining sight-seeing and places of interest in widely separated areas across Poland, to those guests who would like to get acquainted with this country just before the Conference. We would like to suggest a four-day trip:

Thursday, September 4, 1975

- meeting of participants in "Forum" hotel,
- departure by bus from Warszawa at approx. 3p.m.,
- arrival in Toruń,
- dinner, night's rest.

Friday, September 5, 1975

- breakfast,
- sight-seeing under the guidance / Toruń, the town where Nicolaus Copernicus was born, one of the oldest and most beautiful places in Poland. Old Town and Market are built in gothic style,
- dinner,
- departure for Poznań,
- on the route, sight-seeing of the Cathedral in the first capital of Poland, Gniezno,
- accommodation in Poznań,
- dinner, night's rest.

Saturday, September 6, 1975

- breakfast,
- sight-seeing under guidance / the town is known for its trading tradition the site of the famous Poznań International Fair,
- one of the most important industrial, cultural and scientific centres in Wielkopolska/,
- after sight-seeing in Poznań lunch in Rogalin,
- in Rogalin, the castle of the 17th century / at present, a branch of the National Museum in Poznań / - numismatic collections, antique furniture gobelins, portrait paintings. The castle is surrounded by magnificent old oak trees.

- a visit to the castle in Kórnik /the castle of the 16th century, built in the gothic style.

In the castle there are collections of paintings, antique furniture and library with a large collection of manuscripts/. Around the castle there is wonderful park extending to 10,000 trees and shrubs of great many varieties including the most exotic ones.

- return to Poznań, dinner, night' s rest.

Saturday, September 7, 1975

- breakfast,
- departure for Kraków,
- dinner served in Częstochowa, after dinner a visit to the world – famous monastery/with the painting of Schwarz-Madonna/and treasury.
- arrival in Kraków at approx. 7 p.m. Cost US \$ 93.0 per person.

6.5 Programme of optional turns and activities during the Conference

Bureau of Congresses would like to offer:

- on Thursday, September 11, 1975 - a coach trip to Pieskowa Skala /about 30km far south of Kraków/. During the excursion a visit to the castle will be arranged, and a dinner served afterwards.
Cost US \$ 9.0 per person.
- on Thursday, September 11, 1975 - an afternoon excursion by coach to Wieliczka. Sight-seeing of the ancient salt-mines/now museum/built in 9th century.
Cost US \$ 3.0 per person
- on Friday, September 12, 1975 - we will welcome the participants in the Conference to a closing dinner for which there will be a charge of US \$ 18.0 per person.

A journey by motor-coach to cover the distance Kraków - Warszawa under the guidance may be assured by the Bureau of Congresses "Orbis" for those of the guests who are willing to end up their stay in Poland in Warszawa:

Sunday, September 14, 1975

- 10 a.m. departure from Kraków for Częstochowa,
- in Częstochowa sight -seeing of the world famous monastery and treasury will be arranged,
- arrival in Warszawa, accommodation in the 1st category hotel,
- dinner, night 's rest.

Monday, September 15, 1975

- breakfast, departures of participants to be arranged on their own.

Cost US \$ 2S.0 per person

6.6 Post-conference Tours

We are happy to offer you a selection of 4 tours to be arranged after the Conference:

a 5-day excursion across Poland called "South"

Sunday, September 14, 1975

- after breakfast departure by coach from Krakow to Zakopane,
- accommodation, lunch,
- sight-seeing in Zakopane - winter capital of Poland,
- dinner, night 's rest.

Monday, September 15, 1975

- a breakfast, departure by coach to Czorsztyn,
- a raft journey along the Dunajec river to Szczawnica,
- dinner at Szczawnica/a well-know health resort /,
- journey to Rzeszów,
- dinner, night 's rest,

Tuesday, September 16, 1975

- breakfast, afterwards a visit to the castle and the museum of ancient house driven coachees at Łańcut will be arranged,
- after sight-seeing passage by bus to Baranów - a visit to a Renaissance 16th century monumental castle and the museum of sulphur, - journey to Sandomierz, lunch
- journey to Warszawa, dinner, night's rest.

Wednesday, September 17, 1975

- breakfast,
- sight-seeing in Warsaw under the guide,
- lunch,
- after lunch free time / devoted to shopping /,
- at approx. 5 p.m. departure by bus to Zelazowa Wola /Frederick Chopin's birth place/.
A concert will be given at Chopin's house. Supper will be served in the local inn,
accompanied by a performance of the folk music-band,
- return to Warsaw, night's rest.

Note: The trip to Zelazowa Wola will be conducted with the conducted with the participants of the "West" excursion jointly.

Thursday, September 18, 1975

- breakfast,
- individual departures of participants.
Cost US \$ 119.0 per person.
a 5-day excursion called "West"

Sunday, September 14, 1975

- after breakfast served in Cracow departure by bus to Częstochowa,
- sight-seeing of the world famous monastery in Częstochowa and the local treasury,
- lunch served in Częstochowa,
- after lunch a journey to Poznań,
- accommodation, supper, night's rest.

Monday, September 15, 1975

- breakfast,
- sight-seeing in Poznań with guide / Poznań is known thanks to the Poznań international Fair held twice a year, one of the most important cultural industrial and scientific centres of the country/.
- after sight- seeing ride to Rogalin by coach, lunch served in Rogalin, afterwards a visit to the monumental castle.

- passage from Rogalin to Kórnik /a distance of about 10 km/,
- in Kórnik a visit to the castle of the 16th century /Gothic style/, collections of paintings, antique furniture, and library with a plentiful collection of manuscripts. Around the castle there is a wonderful park extending to 10.000 trees and shrubs of great many varieties and kinds including the most exotic ones,
- return to Poznań,
- dinner, night's rest.

Tuesday, September 16, 1975

- after breakfast served in Poznań departure by coach to Toruń,
- on the route a visit to the Old Cathedral in Gniezno - the first capital of Poland,
- dinner served in Toruń,
- afterwards a brief sight-seeing in the town /the home town of Nicolaus Copernicus worth visiting for its large number of monuments of art, and, in particular, a well-preserved complex of Gothic houses situated within the bloats of old buildings /,
- dinner night's rest.

Wednesday, September 17, 1975

- breakfast, departure for Warsaw,
- lunch served in Warsaw, free time, 5 p.m.
- departure by coach to Zelazowa Wola - jointly with participants of the "South tour, in Zelazowa Wola / birth place of Frederick Chopin/ a concert will be given in the Chopin's countryhouse. Afterwards dinner in the local inn accompanied by a performance of the folk music-band,
- after dinner return to Warsaw,
- night's rest.

Thursday, September 18-, 1975

- breakfast,
- after breakfast individual departures of participants.

Cost US \$ 113.0 per person.

Through the arrangement reached with the Travel Agencies of the Socialist Republic of Czechoslovakia – “ edok”, and The Hungarian People's Republic - "Ibusz", there will be two excursions conducted:

1. Trip to Prague

Sunday, September 14, 1975

- after breakfast served in Cracow departure by bus to Wroclaw,
- lunch will be served on the route in Opole, afterwards a brief sight-seeing of the town,
- journey to Wroclaw,
- dinner night's rest,

Monday, September 15, 1975

-
- breakfast,
- sight-seeing in Wroclaw /Old Market with its great many monuments/,
- departure for Kudowa,
- lunch served in Kudowa. After lunch - crossing Czechoslovakia's frontier at Kudowa - Nachod,
- journey to Prague,
- dinner, accomodation,

Tuesday, September 16, 1975

- breakfast,
- sight-seeing,
- lunch,
- a visit to the castle in Hradczany,
- dinner" night's ,rest ,

Wednesday, September 17, 1975

- breakfast,
- trip to the well-known castle of Karlstein outside Prague,
- lunch served at Barrandov, afterwards return to Prague,
- free time,
- supper, after supper a visit to an ale-house will be arranged,
- night's rest,

Thursday, September 18, 1975

- breakfast,
- after breakfast participants are free leave Prague on their own.

Cost US \$ 138.0 per person /accommodation in doubles/ US \$ 17.0 - surcharge to a single for the duration of the trip per person.

2. Trip to Budapest - capital of Hungary

Sunday, September 14, 1975

- after breakfast departure by coach from Ceacow to Zakopane,
- in Zakopane entry by rope railway to Kasprowy Wierch summit,
- lunch served in Zakopane,
- journey to Katowice,
- supper, night's rest.

Monday, September 15, 1975

- breakfast. After breakfast departure for the border town - Cieszyn,
- crossing the frontier,
- travel across Czechoslovakia along Wag valley up to the border point
- between Czechoslovakia and Hungary,
- lunch served on the territory of Czechoslovakia,
- arrival in Budapest,
- dinner, night's rest.

Tuesday, September 16, 1975

- breakfast,
- all-day sight-seeing with a break for lunch,
- lunch - "goulash party",
- supper, accomodation in a hotel,

Wednesday, September 17, 1975

- after breakfast a trip to Balaton Lake /lunch will be served during the trip/,
- after lunch return to Budapest, free time,
- dinner, with wine, night' s rest.

Thursday, September 18, 1975

- after breakfast participants are free to leave Budapest on their own.
Cost US \$ 154.0 per person /accomodation in doubles/ US \$ 46.0 - surcharge per person to a single for t he duration of the trip.

Notice:

The cost of all both pre- and post-conference trips cover accomodation charges in the 1st category hotels all -day meals, a guide assisted sight-seeing trips and any admission fees according to the programme, round-trip transportation by motor-coach and an "Orbis" interpreter. The arrangement of particular tours depends the number of participants thus, the right is reserved to cancel any tour because of the insufficient number of participant s or for any other unforeseen reasons. On the other hand, since the number of participant is limited, in case of along number of applications the right is reserved to take participants on the "first come first served" basis..

Health resorts

As follows from the preliminary inquiries you are also interested in health resorts in, Poland. We are, thus, happy to offer 3 health resorts selected out of many such places:

1. Ciechocinek - the largest health resort in Poland.

Category LUX It is served by very convenient transportation service from Warsaw /distance of about 200 km/. Diseases of organs, nervous system, perspiratory organ, circulatory system and rheumatism are treated there. Basic treatments include salt-baths, mud-baths and inhalations /large inhalators of Ciechocinek/.

2. Busko-Zdrój - situated about 100 km north of Cracow. It is served by very convenient transportation service from Warsaw and from Cracow, Diseases of the nervous system, rheumatism, skin and women diseases are treated here. /salt-baths, mineral-springs/.

3. Szczawnica - the pearl of Polish health resorts due to its beautiful location in a mountain valley. Situated about 100 km south of Cracow - a very convenient transportation service from Cracow. Diseases of the perspiratory system, and particularly bronchial asthma are treated here. Microclimate of medical value. Alkalic springs.

Notice: The category of the health resort depends upon the medical treatment applied, technical facilities and accomodation available.

Please send your application as early as possible so as to secure a medical treatment for you in a selected health resort.

A diagnosis issued in Latin ought to be presented to the Manager of a sanatorium right after arrival.

Dates of possible medical treatments in health resorts, not coinciding with the date of the Conference, are as follows:

August 15, 1975 - September 7, 1975 /prior to the Conference/

September 19, 1975 - October 12, 1975 /after the Conference/

The minimum duration of the treatment - 21 days.

Charges for stay in health resort per person per day in US \$ are given below:

Health resort	a single room		occupancy in a double room	
	with bath	without bath	with bath	without bath
Ciechocinek	17,0	----	15.0	----
Busko-Zdrój	----	14.0	----	12,0
Szczawnica	----	12.0	----	10.0

The above quoted charges include the following services: accommodation in sanatorium, all-day meals/a diet according the doctor's recommendations/, examinations, analyses, physical therapy, medicines, as well as, help from the railway station to sanatorium and vice-versa.

Participation Fee

If application is received not later than June 15, 1975 the participation fee for the membership in the Conference is US \$ 150.0 per person and \$ 75.0 for accompanying persons.

After this date the said participation fee will be US \$ 200.0 per person and \$ 100 for accompanying persons respectively.

Travel and monetary arrangements

All the participant sin t he Conference are kindly requested to settle on their own the necessary formalities connected with their arrival in Poland. Bearing in mind a great number of tourists coming to this country in the touring season, it is strongly recommended that applications be made to travel agencies - our corresponding travel agencies abroad - in order to help us make reservations on time. A list of selected travel agencies correspondents of the Polish Travel Agency "Orbis" - is attached here with.

You are reminded that earlier payment of charges covering your stay in Poland is indispensable before applying for the Polish visa.

You may apply for the participation in the Conference either through the

mediation of a corresponding travel agency in your own country or directly to the address of the Bureau of Congresses "Orbis" provided a declaration fee is remitted by cheque or bank transfer to our bank account no .1532-6-876122 in Narodowy Bank Polski not later than July 31, 1975. When remitting the above fee we please quote as follows: "Payment concerning 4th ICWES".

Any extra payments to be made in Poland be effected solely in exchangeable currency. Both traveler cheques and cash are equally honoured. Payments ought to be made at the "Orbis" cashdesks in the place of accomodation, or in Main Conference Reception Centre.

All guests from abroad are free to enter into Poland with unrestricted currency provided the value is declared in the Polish Customs Declaration. It is forbidden to leave Poland with the value of currency exceeding the one declared at the entry.

Exchange of currency into Polish zloty for individual needs of participants can be made at exchange desks situated at the airport, stations, hotels, as well as Main Conference Reception.

Cancellation

If a cancellation is received by the Bureau of Congresses "Orbis" not later than August 15, 1975, full-money refund will be made. However, the right is reserved that after the above stated date no refund will be possible. Hotel reservations can be cancelled with no charges to be borne unless cancellation is received 2 weeks before the Conference. Yet, after that time we shall be compelled to burden the participant with the actual costs due to the delayed cancellation.

Correspondence

Participants in the Conference are kindly requested to fill in the enclosed Registration Form and send 2 copies same direct to the address of:

Polish Travel Agency "Orbis" - Bureau of Congresses
00-950 Warszawa, POBox 146
telex no. 814728 bkorb pl.

or through our corresponding travel agency in your country. Please mark all your correspondence as below:

"4th ICWES"

All participants will promptly receive confirmation to the service ordered.

We wish you a pleasant and most fruitful stay in Poland

Bureau of Congresses "Orbis"

The Organizing Committee of the
4th IC WE 5

IV Międzynarodowa Konferencja Kobiet Inżynierów
i Naukowców

IVth International Conference of Women Engineers
and Scientists

IV^{è me} Conference Internationale des Femmes
Ingenieurs et Scientifiques

IV MeXAYHpoAHЯ KоHфepHUMЯ MeMMH
IHX дHOB MЯHНХ рѢHKOВ

Patron: Minister of Science, Higher Education and Technology
prof. dr Sylwester Kaliski

Organizer : The Central Technical Organization./ N.O. T./and The National
Council of Polish Women

Arrangements: The Center for Progress in Technology - N.O. T Warsaw N.O. T.
Cracow Division

EXECUTIVE COMMITTEE OF THE CONFERENCE

FARJASZEWSKI Stefan	President of the Executive Committee/Polish Union of Civil Engineers/
ZACHWATPWICZ Izabela	President of the Co-ordination Team/Association of Polish Architects/
SAWICZ Anna	President of the Organization Team/Polish Association of Chemical Engineers/
WAWRYNKIEWICZ Jacek	President of the Host Committee in Cracow/Polish Association of Metallurgical Industry Engineers/
PODWAPIŃSKI Wojciech	Secretary of the Executive Committee/Polish Association of Mechanical Engineer/The Center of Progress in Technology/

Co-ORDINATION TEAM

KIETLIŃSKA Zofia	for Section I	Institute of Scientific Politics and Higher Education
KULPIŃSKA Jolanta	for Section I	Warsaw University
KOTELA Irena	for Section II	Association of Polish Architects
PEŁENIK Alicja	for Section II	Polish Association of Transport Engineers
ROZKWITALSKA Cecylia	for Section II	Polish Association of Transport Engineers
GRABCZEWSKA Maria	for Section II	Polish Union of Civil Engineers
RAKOWSKA Maria	for Section III	Polish Association of Agricultural Industry Engineers
AMBROŹ Hanna	for Section IV	Polish Association of Chemical Engineers
GRUSZKIEWICZ Barbara	for Section V	Polish Association of Mechanical Engineers
PLESKACZ Janina	for Section VI	Polish Association of Sanitary Engineers

MEMBERS OF THE COMMITTEE

ANGIELSKA Urszula	Polish Union of Civil Engineers
BĄCZEK Maria	Polish Association of Water Plant Construction and Land Improvement Engineers
CZERWINSKA Jadwiga	Polish Union of Civil Engineers
FAFIUS Zofia	Headquarters of the Polish Ligue of Women, Association of Polish Architects
GÓRNIAK Krystyna	Polish Association of Textile Industry Engineers
GROMEK Krystyna	National Council of Polish Women
METERA Jerzy	Polish Association of Electrical Engineers, The Center of Progress in Technology
RYDEL Adela	Association of Building Materials Industry Engineers
SYPNIEWSKA Janina	Polish Association of Electrical Engineers, Headquarters of N.O.T.
SZYDŁOWSKA Zofia	Headquarters of the Polish Ligue of Women

GENERAL INFORMATION

Main Reception Center	- Academy of Mining and Metallurgy
open 8 am to 9 pm from 6-th to 13-th September 1975	
Plenary sessions	at "Kijów" Theatre
Section sessions	- at Academy of Mining and Metallurgy
Translation	a. Simultaneous translation in English, French Russian and Polish is available at plenary sessions b. Direct translation from French, Russian, Spanish and Polish into English is available at section sessions
Transport	- Transport will be provided according to the programme of events
Exchange	- at Main Reception and hotels
Medical assistance	- at Academy of Mining and Metallurgy
Meals	- individually in restaurants indicated by the organizers
	hours: breakfast 8,00 - 9,15 lunch 13,00 - 15,00 dinner 19,30 - 21,00

CONFERENCE PROGRAMME

Monday 08.09.1975

-theatre "Kijów"

Opening Ceremony of the IVth International Conference of Women Engineers and Scientists

10, 00 - Opening of the Conference appointment of the presiding officers

- Isabel HARDWICH, president of the International Organizing Committee of the Conference of Women Engineers and Scientists

- Speeches of welcome

- prof. dr Jan KACZMAREK
Scientific Secretary of the Polish Academy of Sciences
President, of the Chief Council of the Central Technical Organization / N .O. T. /

- Maria MILCZAREK
President of the National Council of Polish Women

- Jerzy PEKALA
President of the town Cracow

- Occasional speech

- prof. dr Roman NEY
Vice-minister of Science, Higher Education and Technology

- Lecture on the subject:
"Humanization of Technology"

- prof. dr Jan SZCZEPAŃSKI
Vice-president of the Polish Academy of Sciences

12, 00 End of the plenary session

13, 00 Polish fashion show

- theatre "Kijów"

19, 30-22, 00

- Reception by the Organizing Committee on the occasion of the opening ceremony of the Conference at the banquet hall "TV -ardowska"

During the reception - bringing of greetings

Tuesday 09.09.1975

9, 30 - 11, 00	Section sessions at Academy of Mining and Metallurgy
1, 00 - 11, 00	Break
1, 30 - 13, 00	Section sessions
5, 00 - 19, 00	Sightseeing of Cracow and the Wawel Castle
0, 00 - 22, 0	Meeting of the heads of national delegations at N .O. T. building, Straszewskiego 28 St.
1, 00 - 22, 00	Technical films at Academy of Mining and Metallurgy

Wednesday 10.09.1975

9, 30 - 11, 00	Section sessions
1, 00 - 11, 30	Break
1, 30 - 13, 00	Section sessions
5, 00 - 19, 00	Visit to Oświęcim Museum
1, 00 - 22, 00	Technical films - Academy of Mining and Metallurgy

Thursday 11.09.1975

9, 30 - 13, 30	Technical visits - departure from Academy of Mining and Metallurgy
3, 30 - 19, 30	Free time, or coach excursion to Wieliczka or to Pieskowa Skala
0, 00 - 22, 00	Folk dance and song show-Theatre "Bagatela"

Friday 12.09.1975

9, 30 - 11, 00	Section sessions
1, 00 - 11, 30	Break
1, 30 - 13, 00	Section sessions
3, 30 - 18, 30	Free time, or coach excursion to Wieliczka or to Pieskowa Skala
0, 00 - 22, 00	Closing dinner at hotel "Cracovia"

Saturday 13.09.1975

	Plenary session- "Theatre "Kijów"
10, 00	Section Reports
12, 00	information about the next Conference
12, 15	Close of Conference

Sekcja - Sections - Section – **Секции**

1. Współczesne problemy socjologiczne kobiet inżynierów i naukowców Contemporary sociological problems of women engineers and scientists Problèmes sociologiques actuels des femmes ingénieurs et scientifiques

Современные Социологические проблемы женщин – инженеров и научных работников

2. Układy przestrzenne bytu człowieka i problemy transportu Spatial arrangement of human environment and transport problems Environnement de l'homme et problèmes de transport

Пространственные проблемы человека и проблемы транспорта

3. Problemy żywienia
Problems of nutrition
Problèmes d'alimentation

проблемы питания

4. Problem zaopatrzenia materialowego i wyposażenia
Material supply and equipment problems
Problèmes de approvisionnement des matériaux et équipements

проблемы материального снабжения

5. Problemy automatyki i informatyki
Automation and computer science problems
Problèmes d'automatique et informatique

проблемы автоматизации и информатики

6. Problemy surowców i energetyki
Raw materials and power engineering
Problèmes de matières premières et énergétiques

проблемы сырья и энергетики

	PROGRAM WORK	OBRAD SESSIONS	SEKCYJNYCH PROGRAMME	
	Wtorek Tuesday	09.09.75	Sekcja nr 1 Section no.	
Godz. Hour	Tytuł referatu Title of the paper		Autor Author	Kraj Country
9,30	Społeczne problemy roli kobiet w postępie technicznym i naukowym. Social problems of women's role in technical and scientific progress		J. Kulpińska	Poland
	Present and future of the Mexican Women		A. Perez Lopez	Mexico
	Praca zawodowa kobiet w państwie socjalistycznym/problemy wybrane/ Feminine occupational work in a socialist state / selected problems /		H. Mortimer Szymczak	Poland
11,00	Przerwa – break			
11,30	Career guidance: a significant factor in opening engineering to women		C. Wiśniewska	USA
	Contemporary sociological problems of Women Engineers and Scientists in India		R.J. Begum K.Balaraman	India
	Education and experience in engineering as an undergraduate program for women			
	The education and training of professional engineers in the United Kingdom and its influence on women engineers		E. Laverick	United Kingdom
13,00	Koniec sesji - End of session			

Środa Wednesday	10.09.75	Sekcja nr Section no.	1
Godz Hour	Tytuł referatu Title of the paper	Autor Author	Kraj Country
9,30	Women's presence in the engineering field	A. Amour	Italy
	Kobiety wśród inżynierów w Polsce	W. Padowicz	Poland
	Les femmes parmi les ingenieurs en Pologne		
	The working career of women engineers in the People's Republic of Bulgaria	S. Todorowa	Bulgaria
	Situation de la femme ingenieur en 1975 son role dans la formation professionnelle	G. Hugues	France
11,00	Przerwa - break		
11,30	10 lat w przedsiębiorstwie drogowym	J. Miśków	Poland
	10 years in road building company		
	Perspektywy rozszerzania aktywności zawodowej kobiet inżynierów w warunkach zmian technicznych w przemyśle włókienniczym	Z Bnińska	Poland
	Perspectives of broadening professional activities of women under the conditions of technical changes in the textile industry		
	The effect of legislation on the status of women in the Work office force	E.Murray-Lenthall	USA
13,00	Koniec sesji – End of session		

Platek Friday	12.09.75	Sekcja nr Section no.	1
Godz, Hour	Tytuł referatu Title of the paper	Autor Author	Kraj Country
9,30	Kobiety na wyższych uczelniach technicznych Krakowa w XXX- leciu Polski Ludowej Women at the higher technical schools in Cracow in the thirty years period of Poland Women engineers in American Universities	D. Mischke I.C. Peden	Poland USA
	Kariery kobiet – naukowców w Polsce Careers of women-scientists in Poland	E. Kassyk	Poland
11,00	Przerwa – break		
11,30	The necessity of the combined efforts of the engineer and other professional individuals in solving the major problems that exist in the present - day world Teoria psychoanalityczna: przeszkoda w osiągnięciu równouprawnienia kobiet The psychoanalytic theory - an important barrier to equal rights for women	W. Smith M. Sokołowska	USA Poland
13,00	Koniec sesji - End of Session		

Wtorek Tuesday	09.09.75	Sekcja nr Section no.	2
Godz, Hour	Tytuł referatu Title of the paper	Autor Author	Kraj Country
9,30	Model nowego miasta w świetle przeciwnych tendencji urbanistycznych	H. Adamczewska-Wejchert	Poland
	Le modèle d'une nouvelle ville dans la lumière des tendances opposées d'urbanisme		
	A heuristic method for the synthesis of single storey layouts	G. Saglamer	Turkey
	Problemy rekreacji codziennej w dużym mieście, na podstawie badań prowadzonych dla Krakowa	B. Bartkowicz	Poland
	Problèmes de la recreation quotidienne dans une grande ville d'après les recherches effectuées à Cracovie		
	Human and socio-economic values in the integrated conservation of historic centres	T. Colletta	Italy
11,00	Przerwa - break		
11,30	The air we breathe-- a blueprint for survival	R. Stone	USA
	Techniczne kształtowanie mikrośrodowiska mieszkalnego	M. Grabczewska	Poland
	Technical shaping of the accommodation micro-environment		
	Rationale for safety and health standards	C. F. Phillips	USA
	Rola zieleni osiedlowej i jej wpływ na kształtowanie środowiska zamieszkania	A. Lipińska	Poland
	Le rôle de la verdure de quartier et son influence sur la formation de l'environnement du domicile		
13,00	Koniec sesji - End of session		

Godz, Hour	Środa Wednesday Tytuł referatu Title of the paper	10.09.75	Sekcja nr Section no. Autor Author	2, Kraj Country
9,30	The future environmental problems associated to land use and urbanism through industrial expansions in developing countries		M. Rahmani	Iran
	Zagadnienie ochrony środowiska naturalnego w ramach realizacji Portu Północnego w Gdańsku		D. Grajewska	Poland
	L'implantation du Port du Nord, l'endettement des investissements et les plans perspectives			
	The integration of the Human Settlement Program into the Philippine industrialization and investment policies		A. B. Kalalo	Philippine
	Wpływ realizacji systemów hydrotechnicznych na zagospodarowanie przestrzenne terenów górskich		W. Pencakowska	Poland
	Influence des réalisations des systèmes hydrotechniques sur l'aménagement des territoires montagneux			
	La requalification et la reutilisation du patrimoine architectural des villes et la rencontre entre ancien et nouveau		S. Casiello de Martino	Italy
	Rola zieleni przyrodznej w nowoczesnym Projektowaniu i budowie dróg		I. Graffstein A. Pecenik	Poland
	Le rôle de la verdure routière dans la planification moderne et la construction des routes			
	Removal of Cd, Cu, Ni, and Pb from irrigation wastewaters by forest and woodworking residues		J. E. Sadadell	USA
	Wpływ nowych tendencji projektowania Wodociągów i kanalizacji na planowanie przestrzenne jednostek osadniczych Impact of new water - conduit and sewerage design on space planning of settlement units		A. Nowakowska Błaszczak	Poland
13,00	Koniec sesji – End of session			

Godz, Hour	Piatek Friday	12.09.75	Sekcja nr Section no.	2,
		Tytuł referatu Title of the paper	Autor Author	Kraj Country
9,30		The functions of law and engineering in promoting the safe construction of motor vehicles	E. H. Blount	United Kingdom
		Rola autostrad w kształtowaniu środowiska człowieka i zagospodarowania przestrzennego	H. Wałęcka	Poland
		Le role des autoroutes dans la formation de l'environnement de l'homme et l'aménagement de l'espace		
		Satellites and the geodynamics project in global land use planning	M.E.Russell	USA
		Rola kartografii w ochronie środowiska jako środek przekazu informacji	L. Poteralska Walczyńska	Poland
		The role of cartography in environmental protection as a mean of information transmission	K. Podlacha	
11,00		Przerwa – break		
11,30		Badania ruchu jako źródło informacji przemysłu	I. Chitulescu	Poland
		Traffic study as a source of information		
		Fotoinventaryzacja dróg Le photoinventaire des routes	M. Czerniewska	Poland
		Nowoczesna technika w projektowaniu dróg	B. Borodzik	Poland
		Modern technique in road designing		
		Prognoza rozwoju komunikacji miejskiej w Polsce	C. Rozkwitalska	Poland
		Prognostication of the development of municipal transport in Poland		
		Wstępne wyniki kompleksowego badania ruchu osób w Łodzi	Z., Chitulescu, M. Grzybowska	Poland
		Preliminary results of a comprehensive survey of person movement in Łódź		
13,00		Koniec sesji – End of session		

	Wtorek Tuesday	09.09.75	Sekcja nr 3, Section no.	
Godz, Hour	Tytuł referatu Title of the paper		Autor Author	Kraj Country
9,30	Hunger and malnutrition: a psychological, physiological and sociological survey		L.G.Murad-Bablanian	USA
	Upowszechnienie wiedzy o żywności i żywieniu w Polsce		M. Szczygłowa	Poland
	Nutrition extension activities in Poland			
11,00	Przerwa – break			
11,30	Problemy racjonalnego żywienia we współczesnych warunkach życia		M. Rakowska	Poland
	Problems of balanced nutrition under present-day living conditions			
	Tiamina - problemy żywieniowe i technologiczne		B. Secomska	Poland
	Thiamine - problems of nutrition and technology			
13,00	Koniec sesji. – End of session			

Środa Wednesday		10.09.75	Sekcja nr 3, Section no.	
Godz, Hour	Tytuł referatu Title of the paper	Autor Author	Kraj Country	
9,30	The production of quick frozen foods in the service of households and public supply	J. Asbóth	Hungary	
	Żywność dzisiaj i jutro: odpowiedzialność technologów żywności, za kontrolę jakościową żywności konwencjonalnej i jakości procesu nowych produktów żywnościowych	N. Barylko Piekielna	Poland	
	Food of today and tomorrow' responsability of food technologists for quality control of conventional food and quality engineering of new products			
11,00	Przerwa - break			
11,30	Kształtowanie spożycia owoców i warzyw przez przemysł w Polsce	H. Konczewska	Poland	
	Shaping of industrial consumption of fruits and vegetables in Poland			
	Konserwatyzm w zakresie wprowadzenia nowych odmian owoców i warzyw w codziennym spożyciu	J. Pieniążek	Poland	
	Conservatism in introduction new fruits and vegetables in the family diet			
13,00	Koniec sesji - End of session			

Piatek Friday		10.09.75	Sekcja nr Section no.	3,	
Godz, Hour	Tytuł referatu Title of the paper	Autor Author	Kraj Country		
9,30	A new, effective and simple technique for enhancing production of calorierich protein food – fish	K.Chandrasekhar	India		
	Kierunki poszerzenia naturalnej bazy biał ek paszowych	A. Woźnicka	Poland		
	Les directions d 'é1argissements de 1a base naturelledes albumines du fourrage				
11,00	Przerwll break				
11,30	Przyprawy roślinne w żywieniu Plant condiments in nutrition	A. Rumińska	Poland		
	Polski e róze owocowe o wysokiej zawartości naturalnej.witaminy C	J. Grabczewska	Poland		
	Polish fruit roses with high concentration of natural Vitamin C				
13,00	Koniec sesji - End of session				

Wtorek Tuesday		09.09.75	Sekcja nr 4, Section no.	
Godz, Hour	Tytuł referatu Title of the paper		Autor Author	Kraj Country
9,30	Badania nad warunkami pracy w przemysle lekkim		M. Wasowicz	Poland
	Investigation into the working conditions in the light industry state and problems			
11,00	Przerwa - break.			
11,30	Rationalization of the Philippine apparel textile industry		O.Vito Bulaong A.B. Kalalo	Philippines
	Poprawa walorów użytkowych tkanin z włókien wiskozowych przez sieciowanie ze zwilżkami N- metylowymi		L. Jackiewicz Kazanecka	Poland
	Improvement in the properties of viscose fabrics by the crosslinking with N – methylol compounds			
13,00	Koniec sesji - End of session			

Środa Wednesday		10.09.75	Sekcja nr Section no.	4,
Godz, Hour	Tytuł referatu Title of the paper		Autor Author	Kraj Country
9,30	Wpływ rozpuszczalników organicznych na strukturę i właściwość włókien chemicznych Impact of organic solvents on the structure and properties of chemical fibres		M. Wędałowicz	Poland
	Mechanizm zmian strukturalnych wywołanych we włóknach polietylenotereftalowych procesem barwienia barwnika mi zawieszinowymi The mechanism of structure alterations produced in polythyleneterephthalate fibres by dyeing with dispersed dyestuffs		B. Lipp Symonowicz	Poland
11,00	Przerwa - break			
11,30	Aspekty surowcowe kształtowania odzieży pod kątem maksymalnego zaspokajania potrzeb materialnych, estetycznych i fizjologicznych użytkownika Raw material aspects of garment shaping from the point of view of the maximum satisfaction of user's material, aesthetic and physiological needs		K.Rawa	Poland
	New diagnostics in field of engineering		M.J.B. Thomas	USA
13,00	Koniec sesji - End of session			

Piatek Friday	12.09.75	Sekcja nr 4, Section no.	
Godz, Hour	Tytuł referatu Title of the paper	Autor Author	Kraj Country
9,30	Zastosowanie energii ultradźwiękowej w procesach włókienniczych Application of ultrasonic energy to the textile processes	W. Wiśniewska	Poland
	Ultrasonic technique-advanced, promising noninvasive diagnostic tool in medicine	M. Vuković-Satrapa	Austria
11,00	Przerwa - break		
11,30	Medical application of X-ray photogrammetry	E. Baj-Agnoletto	Italy
	Tworzywa sztuczne w medycynie	D. Kalińska	Poland
	Les plastiques en medicine	J. Kołucka	
13,00	Koniec sesji - End of session		

	Wtorek Tuesday	09.09.75	Sekcja nr Section no.	5
Godz, Hour		Tytuł referatu Title of the paper	Autor Author	Kraj Country
9,30		Computing technique and social responsibility	Z. Szentgyörgyi	Hungary
		Configuration management	L. Pickup	USA
11,00		Przerwa - break		
11,30		System zarządzania resortem przemysłu maszynowego	M. Adach	Poland
		Management system in machine industry and its units		
		System informatyczny handlu zagranic- znego resortu przemysłu maszynowego	K. Cwynar	Poland
		The information services system of foreign trade-machine industry division		
13,00		Koniec sesji - End of session		

Środa Wednesday		10.09.75	Sekcja nr 5 Section no.	
Godz, Hour	Tytuł referatu Title of the paper		Autor Author	Kraj Country
9,30	Komputerowy system kontroli dyspoz- torskiej w kopalni węgla		M. Garncarz	Poland
	Disepthcing controle systéme à ordinateur dans la mine de charbon			
	Design of a 16-Bit Data Processor		R. Rastogi	India
11,00	Przerwa - break			
11,30	Maszyna cyfrowa w służbie pomiarowców w przemyśle chemicznym		Z. Szczepanik	Poland
	Computer in service of measures in chemical industry			
	Macro facility for BESM-6 Assembler		S.M.Mahajan R. Rastogi	India
13,00	Koniec sesji - End of session			

	Piatek Friday	12.09.75	Sekcja nr Section no.	5
Godz, Hour		Tytuł referatu Title of the paper	Autor Author	Kraj Country
9,30		Planing studies in benchmarking: Application benchmark feasibility study	P.L. Loring	USA
		Systemy cyfrowe kontroli dyspozy- torskiej i sterowania kopalni Digital systems of dispatch control and steering of mines	Anna Dec	Poland
11,00		Przerwa - break		
11,30		Remote sensing and its application to human needs	H.W. Chryssaopoulos	USA
		Information retrieval systems for science and technology in India	K. Balaraman R.I. Begum	India
13,00		Koniec sesji - End of session		

	Wtorek Tuesday	09.09.75	Sekcja nr Section no.	6	
Godz, Hour	Tytuł referatu Title of the paper		Autor Author		Kraj Country
9,30	Eksploatacja węgla kamiennego w Polsce i związane z nią problemy zwalczania zagrożenia metanowego i pyłowego		R. Cybulska		Poland
	The exploitation of hard coal in Poland and the problems of suppressing methane and coal dust explosion hazards				
	Oczyszczanie wód obiegowych w procesie utylizacji pirytowych odpadów węgla energetycznego		Z. Blaschke		Poland
	Flocculation of suspensions in processing pyrite-bearing waste of power coal				
	Produkcja stałych paliw bezdymnych jako czynnik ochrony atmosfery		A. Kijewska		Poland
	Production of solid smoke-free fuels as a factor of atmospheric protection				
11,00	Przerwa - break				
11,30	New uses and safety factors for microwave energy in the service of mankind		E.I. Piatkowski		USA
	Najstarsza technologia odlewnicza w produkcji nowoczesnych maszyn i urządzeń		L.Luśniak-Lech		Poland
	The oldest foundry technology in the production of modern machines and apparatus				
13,00	Koniec sesji-End of session				

Środa 10.09.75 Wednesday		Sekcja nr 6 Section no.	
Godz, Hour	Tytuł referatu Title of the paper	Autor Author	Kraj Country
9,30	Nuclear power in a mixed fuel economy	C. Thompson	United Kingdom
	The test reactor - basic to U. S. breeder reactor development	B.J. Miller A.J. Harness	USA
	Problemy ochrony środowiska przy przeróbce węgla na paliwa gazowe	J. Pasynkiewicz	Poland
	Les problèmes de la protection de l' environnement au cours de la transformation du charbon en combustible gazeux		
11,00	Przerwa – break		
11,30	Problemy chemicznej przeróbki węgla w Polsce	H. Gwiner	Poland
	Problems connected with chemical coal processing in Poland	I. Kaziszyn	
	Harmony of colour and shape in iron carbon alloys	A. Carlini	Italy
13,00	Koniec sesji – End of session		

	Piatek Friday	12.09.75	Sekcja nr Section no.	6
Godz, Hour	Tytuł referatu Title of the paper		Autor Author	Kraj Country
9,30	Energy research and development in the Philippines		L.G. Tansinsin	Philippines
	Ressources minerals de l' Uruguay		L .Chebataroff	Uruguay
	Perspektywy wykorzystania mikroorgain zmów w niektóryc;:h dziedzinach przemysł u górniczego		A.Malik B. Rożek	Poland
	Perspectives of making use of micro-organisms in some fields of mining industry			
11.00	Przerwa - break			
11,30	Surowce i pół fabrykaty dla potrze b nowoczesnej techniki		I.Ciszewska E. Furmańczyk	Poland
	Matières premié' res et semi-produits au service de la technique moderne			
13,00	Koniec sesji - End of session			

LEGEND

1. - Hotel "CRACOVIA"
2. - Hotel "M. H. S."
3. - Central Technical Organization – NOT
4. - Theatre "KI JÓW"
5. - Restaurant "ERMITAŻ"
6. - Restaurant "WARSZAWIANKA"
7. - Restaurant "HAWEŁKA"
8. - Railway Station
9. - Polish airlines "LOT" – office
10. - Academy of Mining and Metallurgy

LEGENDA

- (1) HOTEL „ CRACOVIA”
- (2) HOTEL „ MHS”
- (3) NACZELNA ORGANIZACJA TECHNICZNA
- (4) KINO „ KIJÓW”
- (5) REST. „ ERMITAŻ”
- (6) REST. „ WARSZAWIANKA
- (7) REST. „ HAWEŁKA”
- (8) DWORZEC GŁ. PKD
- (9) BIURO LOT
- (10) AKADEMIA GORNICZO-HUTNICZA





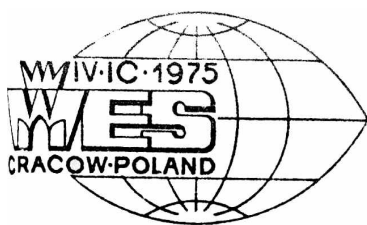
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Cracow, 08-13.09. 1975

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Country	Surname and name
Kraj	Nazwisko i imię
Australia	1. Manton Elizabeth 2. Stewart Anne
Austria	1. Schumer Meta
Belgium	1. Dzulynski Monique 2. Talpaert Paula 3. Wei Amy Hua.
Brazil	1. Steinberg Clara 2. Brand Rosalina 3. Portela Machado 4. Ballariny Marlsa 5. Alves-Marques Evelina
Bulgaria	1. Bożimowa Olga 2. Markowa Liliana 3. Rusewa Marita 4. Buzina-Todorowa Sasha
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Cuba	1. Ojeda-Mimbro Leenor 2. Sendra Bertha 3. Acosta Lilian

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Federal Republic of Germany	1. Künneth Hildegard
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Jugoslavia	1. Jamakovic Malda 2. Vukovic-Satrapa Mirjana 3. Grljusic Branka 4. Adzemowic Slide
Malaysia	1. Abu Bakar Fatiman 2. Jfan M.E.
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Netherlands	1. Endert Maria Christiana 2. Zwartz Judith A.
Nigeria	1. Jacobs Yeside Eniola 2. Jfah M.E

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Switzerland	1. Rahm Berta
Sweden	1. Ericsson Kerstin 2. Holm. Karin 3. Wallin Ragnhild
Tanzania	1. Kiame Margaret
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3. Berg Marian
4. Di Francesco Diane
5. Chryssaopoulos Hanka
6. Fletcaer Ann W.
7. Graham Lois
8. Hamilton Judith
9. Harer Kathleen
10. Harness Arminta J.
11. Hicks Beatrice A.
12. Klumb Ada
13. Kremski Helen Theresa
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16. Murray-Lenthall Evely Mary E.
17. Orndorff Nancy
18. Owen Marion D.
19. Peden Irene C.
20. Phillips Carolyn F.
21. Pickup Lydia I.
22. Piatkowski-nojtaszex Eliza I.
23. Poultney Georgine
24. Russell Mary Ellen
25. Sabadell J. Eleonora
26. Smith Wilma A.
27. Steel Mary Nan
28. Stone Renee
29. Thoms Meredith Ethel
30. Wilson Grace
31. Wisniewski Charmaine
32. Lane Betty J.
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34. Eaves Elsie
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36. Christansen Connie
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Viet-Nam

1. Tran Thi An
2. Trinh Hang Quy

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France	1. Brylinski Michel 2. Hoppilliard Jacquee 3. Chevalier 4. Hocquenghem 5. Martin
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1. ADACH Mieczysława
 2. ADAMCZEWSKA-WEJCHERT Hanna
 3. AMAS-AMIRBEKOWA Natella
 4. AMBROŹ Hanna
 5. ANASIEWICZ Anna
 6. ANGIELSKA Urszula
 7. BANAŚ Krystyna
 8. BARAN Felicja
 9. BARGIELA Elżbieta
 10. BATORY Maria
 11. BARTKOWIAK Eugenia
 12. BARTKOWICZ Barbara
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 14. BARSKA Krystyna
 15. BACHMAN Stefania
 16. BĄCZEK Maria
 17. BARYŁKO-PIKIELNA Nina
 18. BERNARCZYK-SŁOŃSKA Danuta
 19. BERNAT Halina
 20. BIEGUSZEWSKA Cecylia
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75. CZYŻ Gertruda

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204. XRZYŻKOWSKA -SZABLEWSKA Gabriela
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206. KRYSLAK Aleksandra
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208. KURYŁOWICZ Ewa
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213. KUZNOWICZ Maria
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216. KWIATKOWSKA Alina
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218. KWAPULINSKA Wanda
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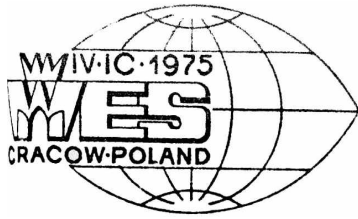
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FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Betty J. Miller
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THE TEST REACTOR-
BASIC TO U. S.
BREEDER REACTOR
DEVELOPMENT

Section 6: Raw materials and power engineering

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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THE TEST REACTOR - BASIC TO U.S.BREEDER REACTOR DEVELOPMENT

INTRODUCTION

A wide range of critical assessments of the United States long-range energy planning has been spurred by the world's energy crisis. Prominent industry and government studies have confirmed the need for ample supplies of reasonably priced electrical energy and have identified nuclear reactors as a key source for producing that energy. Because breeder reactors use about 60 percent of the energy available in uranium, compared to 1 to 2 percent in water reactors, the U.S. Energy Research and Development Administration, like similar agencies in France, Japan, England, Germany and the USSR, is progressing toward the goal of a national commercial breeder reactor program. United States development of the Liquid Metal Fast Breeder Reactor, LMFBFR, differs from other nations in that it is following a conservative sequence of extensive technology development through use of experimental reactors and demonstration plants prior to construction of commercial plants. This sequence allows reasonable engineering, extrapolation at each phase and progressive increases in fabrication and construction capabilities. Primarily, however, it results in the assurances of safety, reliability and environmental protection demanded by the American public prior to commercial operation.

Because materials and fuel technology development is considered the first vital step leading to the ultimate development of a successful commercial LMFBR, initial U.S. efforts have been directed to the design and construction of a unique test reactor at the Hanford site, near Richland, Washington. The Fast Flux Test Facility, FFTF / Figure 1 /, is a 400 MW /t/ reactor with driver fuel locations, and closed loops for higher risk experiments. In addition to the primary objective of providing a test bed for fuel s and materials, The FFTF program is developing the basic system and equipment necessary for future commercial plants; and by utilization of highly disciplined standards in the procurement of equipment, is developing workable standards and an industry capable of producing equipment tot hose standards. The second phase of U.S. breeder reactor development, construction of a demonstration breeder reactor plant. on the Clinch River near Oak Ridge, Tennessee, is already benefiting from the development of detailed FFTF system design descriptions, construction experience, development and use of standards, and equipment design and fabrication experiences.

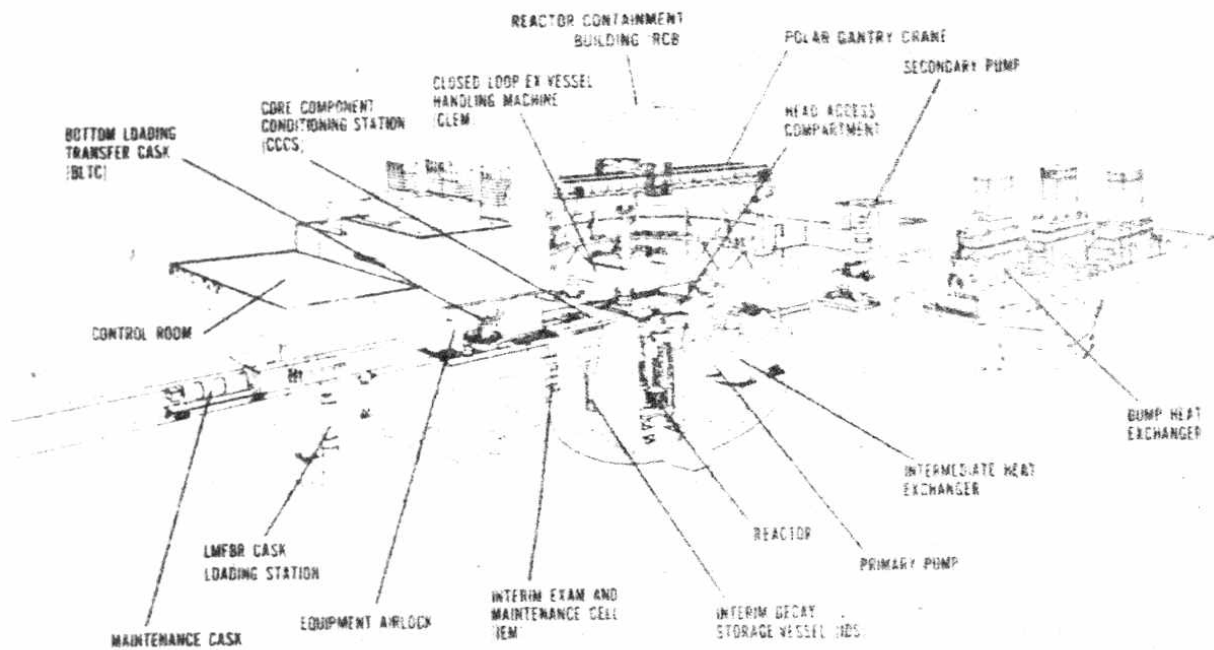


FIGURE 1. FFTF Cutaway

BREEDING

Liquid Metal Fast Breeder Reactors are termed “breeder” reactors because, the neutron bombardment which results from the fissioning of fuel in a LMFBR is used to convert otherwise nonfissile but fertile materials to fissile material. Thus, as original fuel is consumed, a new fuel is produced or “bred”.

Uranium in its natural state contains only 7/10 of 1 percent of U-235, the fissile material used to fuel most water reactors, the rest being largely nonfissile U-238. In an LMFBR this U-238 is “blanketed” around a core containing plutonium-239 and uranium-235. As each atom of Pu-239 or U-235 disintegrates, it gives off several high speed neutrons along with the release of heat energy. Since only one of the new neutrons is required to sustain the chain reaction by causing another fission, most of the extra neutrons will hit and be absorbed by fertile U-238 atoms, transmuting them to fissile Pu-239 atoms. A common analogy to this breeding concept is the practice followed by many campers of surrounding a campfire with the wood. As the fire burns creating heat, it is also converting non usable wet wood into usable dry wood by evaporating the moisture from the wood.

In the breeder reactor, 12 to 14 new plutonium atoms are produced for every 10 plutonium atoms that disintegrate. This is known as the “breeding ratio”. Other terminology used is “doubling time”, which is the time required for a breeder reactor to produce as much new fissile material as the amount normally contained in its core, plus the amount included in its fuel cycle-fabrication, reprocessing, etc.

In the FFTF, the test capability discussed below is substituted for the breeder capability.

SODIUM COOLANT

Sodium in its liquid state is the Liquid Metal coolant for the

LMFBR's and is thus used the FFTF. Sodium was chosen for its excellent heat transfer characteristics, low melting and high boiling temperature points, acceptable pumping power and system pressure requirements, tendency to react with or to absorb many fission products, and relative low cost. Use of sodium at elevated temperatures allows neutrons, during the neutron bombardment which results from the fissioning of fuel, to be used at or near their original high speed / energy / instead of being slowed down as in water reactors. LMFBR's are thus called "fast" reactors.

The use of sodium as the reactor coolant requires special precautions. Sodium is very reactive with water, producing hydrogen and sodium hydroxide, or lye, with potential resultant explosions. Because of this, no water is introduced into the FFTF containment building, virtually eliminating any chance of a water-sodium reaction. Sodium also readily reacts with oxygen and at elevated temperatures fire results. Wherever sodium exists in the FFTF or where there is potential for its existence, an inert gas atmosphere is provided in most cases, the inert gas used in the FFTF is argon, with nitrogen being used in some areas.

STRUCTURAL MATERIALS

A compromise between high coolant outlet temperatures and the ability to build large, highly reliable structures dictated the use of conventional austenitic stainless steels as the structural material for LMFBR's. In the U.S., Types 304 and 316 stainless steel are generally used. These choices limit temperatures to about 1300-1400°F /978 to 1033°K/ and coolant outlet temperatures to about 1100°F /867° K/.

The principal structural material in the FFTF reactor plant system is Type 304 stainless steel. This grade was chosen because of its adequate high temperature strength, weldability for heavy sections, and low cost relative to other austenitic grades. However, Type 316 was selected for the outlet piping because it undergoes especially stringent operating con

ditions-temperatures as high as 1050⁰F / 839⁰K /, wide temperature transients and significant stresses over the 20-year lifetime of the plant. Type 316, with its superior high temperature strength, offers a greater safety margin than Type 304.

CONTAINMENT BUILDING

The containment building / Figure 2 / provides an additional margin of safety against the inadvertent release of radioactivity from the FFTF. In addition to providing normal protection for the equipment and personnel working in this area, requirements have been imposed on the containment building to ensure that it remains intact as a barrier under all postulated environmental disturbances. Maximum seismic and tornado conditions for the FFTF site are factored into the design, as are stringent pressure and leakage requirements. The main construction material is 1-3/8 inch /3,49 centimeter / thick steel plate, which has been subjected to extensive testing, including impact testing and ultrasonic examination. All welds were either radiographed, magnetic particle examined or liquid penetrant examined, depending on the type of weld. Final acceptance of the containment building was given after pressure and leak rate testing.

FUEL, TEST AND ABSORBER ASSEMBLIES

The heart of the is the reactor core / Figure 3/ which contains fuel assemblies to drive the reactor, test assemblies for testing of advanced fuels and materials, absorber for control of the reactions, and reflect or assemblies which direct the neutrons toward the fueled region of the core. The reflector assemblies in the FFTF are substituted for assemblies that would contain

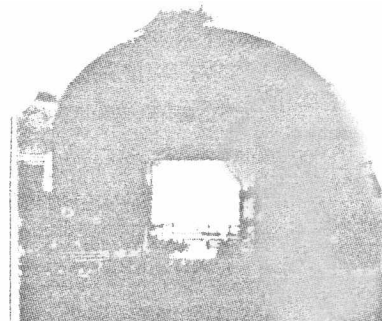


FIGURE 2. Containment Building
During Construction

U-238 in a breeder reactor.

The fuel assemblies are 12 feet / 3.66 meters / long, hexagonally shaped with an across the flats distance of slightly over 4-1/2 inches 11.43 centimeters/, and are composed of 217 fuel pins. The fuel pins are stainless steel tubes less than 1/4 - inch /6.35 millimeters / in diameter and 94 inches /2.39 meters / in length. Each fuel pin contains a 36-inch /91.44 centimeters/ stack of 150 fuel pellets. In the FFTF, these pellets will generate heat at a rate as high as 1,000 watts per inch / 2.54 centimeters / at the core center. /A conservative fuel design has been used to provide reliable and stable core conditions/. Spacing of the pins within the bundle is accomplished with a wire wrap. The pin bundle is covered with a hexagonal duct.

Most instrumented test assemblies are approximately 40 feet /12.2 meters/ long, extend through the reactor head, and occupy core positions of equal cross-sectional area to the fuel assemblies. The test locations in the core form a Y, extending outward from

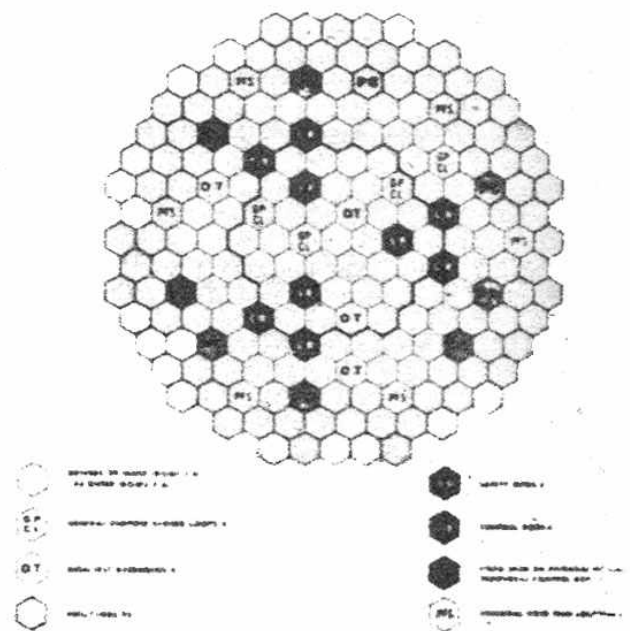


FIGURE 3. FFTF Core Map, Showing Initial Conditions

the center of the core, dividing it into trisectors. Absorber assemblies are bundles of 61 pins containing boron carbide pellets which are housed in ducts similar to those of the fuel assemblies. Location of the absorber assemblies is dictated by reactor physics requirements for control or shutdown of the reactor.

CORE RESTRAINT

Due to the intense neutron flux in the FFTF core, atoms in the core are frequently knocked from their crystal lattice sites. Most displaced atoms return to their lattice sites, but others become trapped in crystal defects, bringing about a change in the properties of the metal. The metals in the core region actually increase in volume or "swell" due to the formation and growth of microscopic voids in the material. The core restraint mechanism offsets the potential effects of this swelling, in addition to thermal bowing and creep, by controlling the radial core configuration and location, assuring safe and predictable operation of the reactor. It applies a force to the peripheral reflector assemblies at two elevations above the active core. The assemblies are also restrained below the active core by the core support structure.

MONITORING INSTRUMENTATION

The majority of the instrumentation for the FFTF is provided by three instrument trees/ Figure 4/ mounted on the reactor head, each servicing a trisector

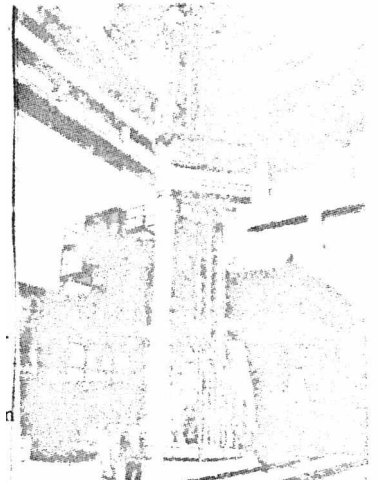


FIGURE 4: Instrument Tree During Testing

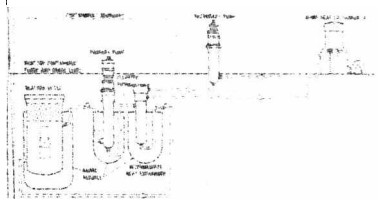


FIGURE 5: FFTF Heat Transport System

of the core. The trees position the core outlet instrumentation sensors above the fuel, absorber, and selected reflector assemblies to monitor temperature and flow as well as to provide a secondary hold down for the core. Instrumentation for the test assemblies extends through the reactor head, and disconnects at the top of the assemblies for changeout.

HEAT TRANSPORT SYSTEM

Reactor heat transfer is accomplished by use of three separate, identical heat transport systems. The primary loops transport radioactive sodium from the reactor to the intermediate heat exchangers which, in turn, transfer the heat to the secondary, nonradioactive sodium loops. Ultimate heat rejection is by 12 sodium-to-air dump heat exchangers, in lieu of passage through steam generators as in commercial plants.

Figure 5 is a simplified schematic of one of these loops. Sodium from the reactor vessel flows through a hot leg isolation valve to the suction side of a primary circulating pump. Flow from the pump is downward through the shell side of the intermediate heat exchanger, transferring heat to the tube-side secondary sodium. The sodium flows back to the reactor vessel through a flowmeter, check valve, and cold leg isolation valve. The secondary loop circulates the nonradioactive sodium from the tube-side of the intermediate heat exchanger to the dump heat exchangers and back through a secondary pump.

Guard tanks surround the main components of the primary system.

In the event of a leak in any one of the components, the guard vessels would maintain the sodium level in the system above the elevation of the reactor vessel outlet pipe. The hydraulic profile of the primary and secondary heat transport loops will maintain natural circulation in the event of a complete loss of electrical power, thus meeting an emergency core cooling requirement. In addition, 8 percent of normal flow could be maintained by operating pony motors on the circulation pumps with on

site emergency power.

Certain of the test assemblies, called open test assemblies, are cooled by this main reactor cooling system. However, other test assemblies, called closed loop assemblies, are cooled by sodium loops that are essentially miniature reactor cooling systems but are totally isolated from the reactor sodium environment. The isolation provided by the closed loop assemblies permits the experimenter to achieve temperature, pressure, and flow conditions for testing which are independent of the reactor conditions, and, if desired, permits the testing of fuel pins to failure/ rupture / or under defected conditions without contaminating the main FFTF cooling systems.

FUEL HANDLING

Because of the reactor head penetration of the special in-reactor testing components, and because of their length, new and unique equipment has been developed for FFTF fuel handling. Within the reactor, three in vessel handling machines operate in the trisectors created by the arrangement of the test assemblies. These machines /Figure 6/ transfer fuel assemblies and other 12 foot / 3.66meters / long assemblies between the core and the sodium-filled transfer pots located in in-vessel storage locations.

The ex-vessel handing machine /Figure 7/ lift s the pots from the in-vessel storage positions, through ports in the reactor

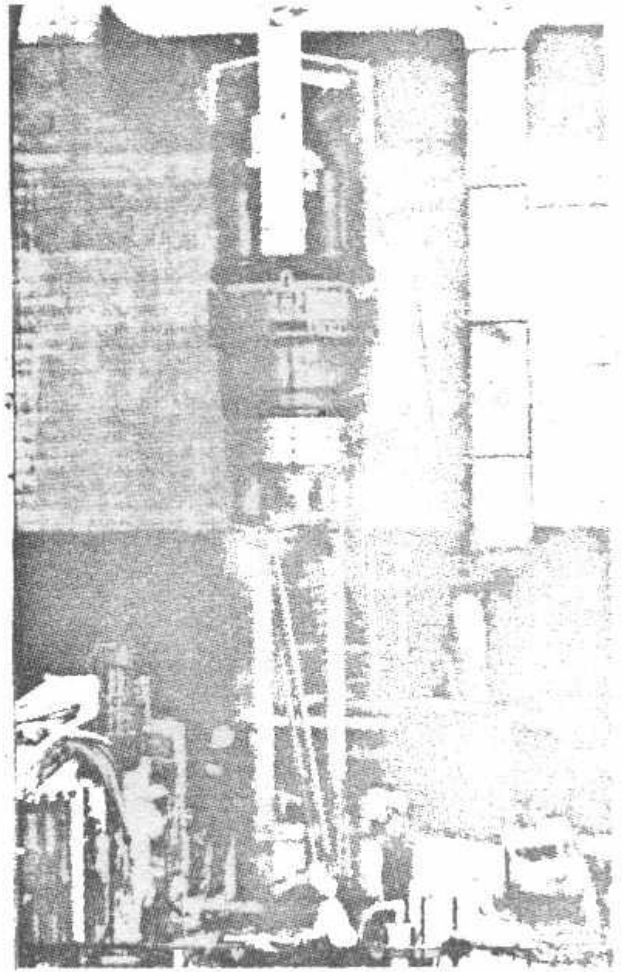


FIGURE 6. In-Vessel Handling Machine
During Testing

head, and transfers them to the interim decay storage vessel, where the spent fuel is allowed to decay before off-site shipment. The off-site transfer of fuel is accomplished by a transfer cask which moves fuel from decay storage to the service building, where it is loaded into a shipping cask. The ex-vessel handling machine is also used to transport the long test assemblies within reactor containment.

CONCLUSION

This paper has covered, in general terms, the major aspects of a highly complex subject and the facilities and hardware associated with it.

To date, reliability and safety have dominated development of the stainless steel-clad mixed oxide, LMFBR fuel, with breeding gain secondary to those considerations. The unique comprehensive fuel and materials testing capability of the FFTF will be key to achieving the longer range objectives of increased power density, improved breeding gain and shorter doubling times. The benefit of such changes will be the timely development of a viable LMFBR industry, helping to meet United States energy demands.

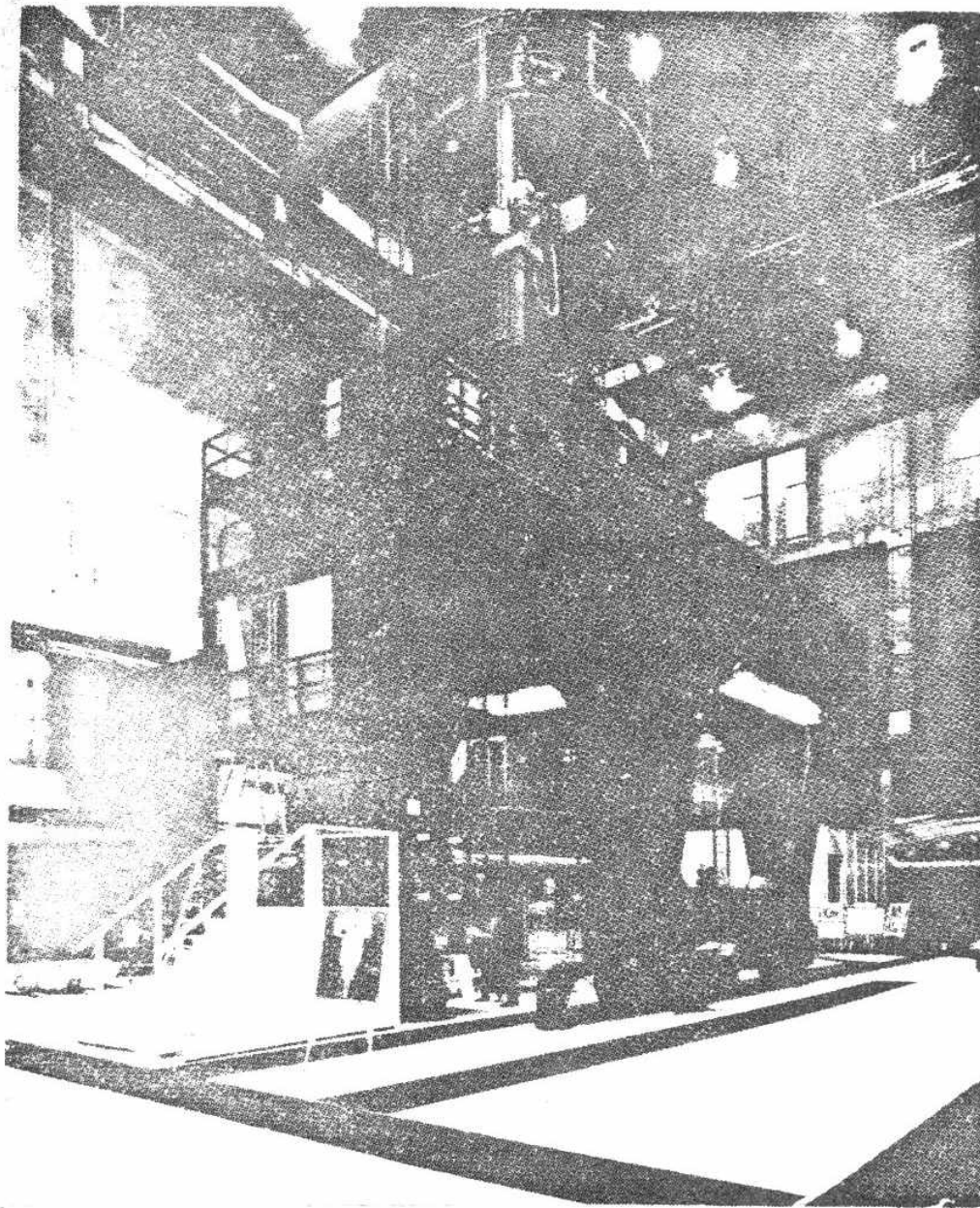


FIGURE 7. Ex-Vessel Handling Machine During Testing

Proc. GP2-K02
729/75 600+1



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Cicely Thompson

NUCLEAR POWER IN
A MIXED FUEL
ECONOMY

Section 6: Raw materials and power engineering

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
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NUCLEAR POWER IN A MIXED FUEL ECONOMY

1. Introduction

In the last 20 years, nuclear power has established itself both technically and economically as an alternative fuel which may be seriously considered in planning how to meet public demands for heat, light and power. During the same period, however, there has been a rapid and vigorous growth in public awareness of ecology and the importance of the environment; an awareness which has tended to concentrate on nuclear power rather than coal or oil.

An elimination of the available energy resources shows an increasing opportunity for uranium to fill the gap between energy demand and availability of low cost fuels, provided public attitudes permit. From this point of view safety and environmental considerations have not so far disclosed insuperable technical problems in the nuclear field which cannot either be avoided, solved, or accepted, although there is usually an adverse effect on the economics.

There is at present a multiplicity of reactor designs but they share the common characteristic of high capital cost and low fuel cost which is reversed at coal and oil power stations.

2. Alternative fuels

Present day civilisation is built on foundations which are being steadily eroded to maintain the superstructure or, in other words, irreplaceable reserves of fuel are being consumed to meet energy demands. Renewable fuels such as water power, annual vegetation, and the direct use of sunshine are used to some extent but their contribution to the total demand is small. There is undoubtedly scope for further exploitation of these resources and others which are only dependent on inexhaustible naturally occurring effects, and for conservation of energy, but for the foreseeable future most heat, light and power will come from the big three: coal, oil, natural gas, and the newcomer uranium.

These fuels are sporadically scattered around the world in large but finite amounts. Taking as the basic unit of energy 1 million MW years the known reserves of these fuels are as follows:

	Immediately available	Possibly available ultimately
Coal	600	4000-7000
Crude oil	100	300
Oil from tar sands and shale		600-1200
Natural gas	60	300
Uranium from ore		
In thermal reactors	60	200
In breeder reactors	6000	20000
Uranium from sea water		9, 000, 000

Present day annual world consumption is of the order of 7 million MW years, and is tending to rise.

This shows that the immediately available resources have a total life of not more than about 100 years at the present rate of use, with the exception of uranium used in breeder reactors. If present consumption is to be maintained or increased it will, therefore, be necessary either to develop the ultimate resources or to rely on breeder reactors.

Prototype breeder reactors have already been built and their problems are being studied in operation. Development of ultimate resources of coal and crude oil is, perhaps, mainly a matter of cost, but the extraction of oil from tar sands or shale on a commercial basis has not yet been established. In the UK, the fuel component of the cost of electricity generations is over 60% at a coal or oil fired power station but only about 22% at a nuclear station. The effect of rising primary fuel cost is, consequently, going to be heavy where the fuel is coal or oil but will be much less when the fuel is uranium.

The proportions of each primary fuel used will vary from place to place depending on the convenience of use, the availability of indigenous supplies, the corporate costs of imported fuels, and the need to spread dependence over several supplies for strategic reasons. On a world energy basis today, coal supplies approximately one third of the total demand, oil one half, natural gas one sixth and nuclear and other resources only a very small percentage, but locally the picture can be quite

different. In the UK, nuclear power stations now supply approximately one fifth of the electrical demand and the cheapest electricity is produced in the early nuclear power stations.

3 Nuclear power and the environment

Everyone is exposed to radiation from the naturally occurring radioactivity in the environment. To safeguard people from manmade activity, the International Atomic Energy Commission has laid down standards for maximum permissible exposure, both as a dose rate and as a cumulative dose. Standards, at least as stringent as these, have to be applied at all nuclear power stations, fuel fabrication or fuel reprocessing works.

Radiation from fully 'contained' material, such as radiation from a reactor core contained in a sealed pressure vessel, although it may be intense at its source, is not difficult to bring to safe levels. Many sources of activity have a short life, so that a time delay in approaching the material may be sufficient. Radiation intensity reduces with distance, so it may be sufficient to restrict access. Alternatively, shielding may be provided: water, concrete, steel, lead and graphite being the most common materials used.

The reactor core and primary heat transfer circuit are fully contained and shielded and, as far as possible, components are designed to last for the intended reactor life of 25-30 years without maintenance. On the other hand, fission products limit the life of the fuel, so that a regular pattern of fuel changing is necessary, and certain components, particularly those with moving parts, have to be serviced or replaced. It is not simple to carry out all the operations of charging and discharging fuel and servicing or replacing components behind a barrier of thick shielding but mechanical ingenuity, shielding windows, closed circuit television and so on have been so developed that the techniques of remote operations are well established.

Radiation from 'uncontained' material, particularly if dispersed in small particles, is capable of being taken up by the body either directly or through a biological food chain and it is, therefore, a major concern of anyone associated with radioactive material to prevent entirely, or to restrict to very low limits, the escape of active material from containment which could give rise to activity contamination. Escape may occur by leakage through an imperfect containment, particularly where a seal has to be broken for a routine reason such as fuel changing, or if it becomes necessary to open up a containment for servicing. There is also the possibility of an accidental rupture of the containment releasing contaminated material.

Day to day leakage is controlled first, by high standards of design and construction and secondly, by continual monitoring by health physicists. Leakage discharges from British nuclear power stations are not only monitored at the power station, but district surveys are carried out routinely in the surrounding neighbourhoods to, check activity levels of airborne dust, water supplies, vegetation and milk.

When a containment has to be opened up, it may be possible by vacuuming or hosing to trap loose contamination before it has a chance to escape. In addition, special local enclosures may be fitted which effectively extend or replace the normal containment. Alternatively, work may be carried out by operators wearing protective clothing which, in the limit, may be a complete air conditioned 'space suit'.

The task of health physicists in controlling contamination is made easier by rigorous good housekeeping-and by clean conditions techniques including the use of easily decontaminated materials where contamination is inevitable.

Risk is an inevitable part of the pattern of life and there is no such thing as absolute safety. When considering release of activity from an accidental rupture of the containment it is, therefore, necessary first to establish what degree of risk is acceptable. From the beginning, nuclear engineers have striven to make their plants 'safe' and to guard against all conceivable accidents. As time has passed, the techniques for assessing safety and risk have been refined and all safety studies are carried out now on the basis of assessing the probability of an occurrence leading to an accidental release of activity. In the UK, it is now necessary to convince the Nuclear Installations Inspectorate that the probability of any occurrence which could lead to an accidental release of activity from a reactor is in the range of 10^{-7} to 10^{-8} before the reactor will be licensed to operate. This means that the likelihood of such an event occurring in the reactor lifetime is less than one in a million.

To prevent illicit stockpiling of nuclear fuel, international standards call for strict accounts to be kept of all fissile material both at reactors and at processing installations.

An important aspect of nuclear reactors is that after irradiation some of the fission products have very long radioactive lives and that similar activity is induced in some of the materials from which the reactor is built. The long term management of these active wastes is as crucial as the day to day control of contamination. Current philosophy is based on the separation of long life products from short life items, concentration of the long life products into as small a volume

as possible and then containment in shielded vaults.

Nuclear power stations have their own shielded vaults into which go active metal components, graphite, and active residues from liquid effluent treatment plants and gas and air filtration systems, all of which arise during the normal operation of the station. At the end of the reactor life, it is the present intention to dismantle and remove as much equipment as possible and to entomb the rest, again compressed or concentrated as far as is practicable, within shielded containment.

The active waste arising at a nuclear power station does not generate appreciable amounts of heat whilst decaying but the active waste fission products from the reprocessing of fuel include elements which have both a long decay time and an appreciable heat production. Fortunately, the amounts involved are very small. At the UK reprocessing plant, these elements from fuel from all the UK reactors and a number of overseas reactors, are concentrated into a liquor which is held in shielded steel tanks with duplicate cooling systems. A method of fixing the elements into solid vitreous form, which is incapable of leaching, is in the development phase and if it proves successful it would allow more freedom in locating the final store.

Present methods of retaining and guarding active waste arisings depend on vigilance not only now, but for generations ahead. This is not ideal. These methods should be regarded as a temporary solution to the problem until a better one is discovered. For instance, it has been suggested that long life active waste could be bombarded with atomic particles, to change the active elements into inactive ones, and as an extension of this idea it has recently been reported by some physicists that a nuclear reactor which converts its own fission products into harmless elements is theoretically possible. Another idea has been to take advantage of the geological convection currents below the earth's crust to deposit long term waste where the convection movement will carry it into the centre of the earth for millennia. Whether any of these ideas are capable of economic development remains to be seen.

4 Reactor types

Since uranium resources are increased by two orders of magnitude by the use of breeder reactors, it must be the aim to bring this type of reactor into commercial use as soon as possible. The breeder reactor is fuelled by plutonium which is produced in thermal reactors, so that any programme of breeder reactors must rest on a corresponding programme of thermal reactors, which will also use the extra fissile material produced by the breeders.

There are two main groups of thermal reactor, the water reactors and the gas cooled reactors. Except in the UK and France, the great majority of reactors in operation or under construction are water reactors, and of these, almost all are light water reactors in which both moderator and fuel coolant are light water. The other type of water reactor is the heavy water reactor in which the moderator is heavy water with light water coolant. Reactors of both types have now been operating successfully for many years, and although there have been technical problems, there is no reason to suppose that they cannot be satisfactorily resolved.

The UK and French programmes have been based on graphite moderated gas cooled reactors. In the UK, the first group of Magnox reactors has performed extremely well. The second phase of Advanced Gas Cooled reactors ('AGR's) is not yet in operation due to a series of technical problems (not all connected with the reactors). These reactors are a development of the first group and approach much nearer the frontiers of technical knowledge. It may be that the size of the technological step being taken was underestimated. Nevertheless, the first of these reactors should be in operation in 1976.

The total generation cost of power from either type of reactor is broadly comparable, but, although its fuel cost is higher, the capital cost of the light water reactor, has, in the past, shown a significant advantage. As larger reactors are developed, more sophisticated methods of ensuring core cooling are required and with an increase in the total number of reactors, higher safety standards are necessary in each individual case to maintain the same overall standard. These factors may tend to raise the capital cost of light water reactors relative to other types.

There is nothing like the same variety in present designs of fast breeder reactors. All have their small highly rated cores cooled by sodium and all interpose a second sodium circuit between the core coolant and the steam generating circuit. Russia, the UK, and France are all in the early stages of operating full size prototype fast reactors, and designing even larger units for commercial operation, with other countries following suit. For the first generation of fast reactors, breeding ratio is not of first importance, but, theoretically, it appears feasible to achieve higher ratios in gas cooled fast reactors and a line of development in this direction from the present gas cooled thermal reactors is being maintained. If successful, this would lead more complete use of the uranium fuel and extend the life of the world's uranium resources.

5 Conclusion

It has been shown in Section 2, that, if it is desired to maintain or increase the present use of energy, there are, for the time being, only two options open: either to develop the more inaccessible coal, oil and gas resources or to turn to nuclear reactors and in particular fast reactors.

Section 3 dealt with the safety and environmental aspects of nuclear power. There is not space to consider coal, oil and gas in detail from the same point of view, but some points should be remembered. Sulphur and lead have been identified as harmful emissions from coal, oil and gas burning installations and there is current controversy as to whether carbon dioxide in substantial volumes is not also detrimental to the atmosphere. Uranium is a very concentrated fuel and even at a thermal power station the lifetime fuel requirements can be carried in the same amount of transport that will only keep a coal fired power station running for a few days. Dirt and smell are certainly unpleasant accompaniments of coal and oil and coal, at least, produces large volumes of ash which have to be adequately disposed of.

Coal and oil are both sources of valuable chemicals as well as fuels, and as they become more inaccessible and costly there will be a greater incentive to restrict their use as fuels.

The Secretariate of the G.E.C.D. published a report at the end of 1974 reviewing energy prospects for the G.E.C.D. countries up to 1985 which forecasts that by that time nuclear energy will be supplying over 10% of the primary energy needs of these countries compared with only about 1% today. There seems every likelihood that this trend will be reflected elsewhere and continue into the future.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Eliza L Piatkowski

NEW USES SAFETY
ACTORS FOR MICROWAVE
ENERGY IN THE SERVICE
OF MANKIND

Section 6: Raw materials and power engineering

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She is a member of IEEE (Institute of Electrical and Electronics Engineer, SWE (Society of Women Engineers).

NEW USES & SAFETY FACTORS FOR MICROWAVE ENERGY IN THE SERVICE OF MANKIND*

Scope and Definition

This paper presents a survey of the microwave energy uses in the service of mankind and stresses the need for cooperation of engineers and scientists throughout the world in ensuring its safe usages.

Microwaves are electromagnetic waves with the range of frequency between about 3×10^8 Hertz and 10^{12} Hertz. This portion of the electromagnetic spectrum lies above the frequencies used in television broadcasting and below those of infrared and visible light as indicated in Figure 1.

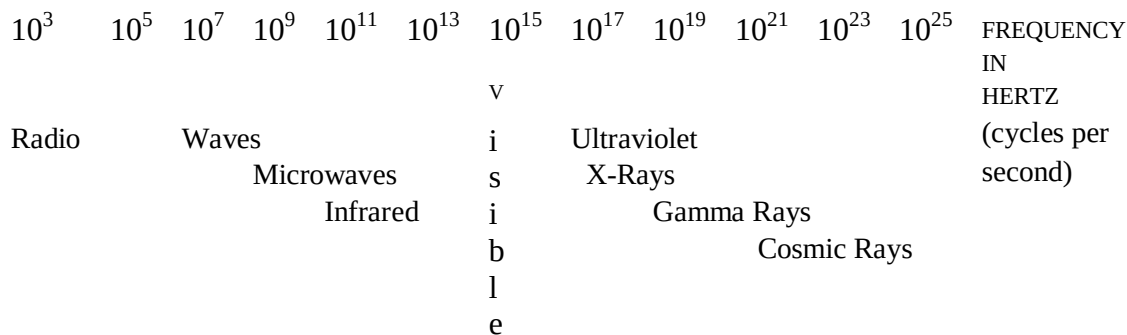


Figure 1 A Portion of the Electromagnetic Frequency Spectrum

Although the general nature of microwaves has been known since the time of Maxwell (the founder of the electromagnetic field theory) it was not until the development of radar during the World War II that the microwave technology started to develop rapidly.

Over the past three decades, the history of microwaves has been, to large extent, dominated by the developments in the fields of telecommunication and radar. In more recent years, however, microwaves are being increasingly applied in quite different and nonconventional domains. The advances in generating microwaves efficiently and inexpensively along with advances in microwaves circuitry and technology have largely contributed to these rapid changes. This, coupled with other important factors, such as necessity for improving or replacing existing industrial processes and control methods, have stimulated the development of new

* This work was supported by the Boeing Aerospace Company, Seattle, Washington. The author acknowledges her indebtedness and extends her special thanks to professors: P.J. Khan from the University of Michigan and A.W. Guy from the University of Washington for their assistance and encouragements in this work

application and detection techniques. Among the new important areas of microwave usage are: remote sensing,; food metallurgy, and wood industries; pollution control; detection and evaluation of non-electrical quantities in industrial processes; meteorology; medicine; and power transmission.

This presentation emphasizes the newest and most promising applications of microwaves. For this paper the microwave usages are classified into four areas: (1) remote sensing; (2) industry; (3) communications and power transmission; and (4) medicine.

As the use of microwaves in the service of mankind enters an increasing number of disciplines, so must there be an awareness for human safety and environmental concern. The need to establish meaningful safety standards for microwave exposure is essential for the wellbeing of all people.

Uses Of Microwave

1. REMOTE SENSING

Remote sensing is a broad discipline where different techniques are employed in surveying from a distance large areas of the earth and the near-earth environment. Two microwave techniques are employed un remote sensing: radiometry and scatterometry, [1], [2]. Radiometry is based on the fact that all bodies emit a noise-like thermal radiation which at the microwave frequencies can be easily detected with sensitive sensors. In radiometry, microwave sensors or radiometers measure this temperature.

Scatterometry is based on the same principles as employed in radar; namely, determination of the surface, shape, and state of an object from the scattered microwave signals. In scatterometry, microwave sensors or scattetometers measure the scattering coefficient of the object, a standard parameter measured by radar. Choice of suitable microwave remote sensing technique depends upon the particular application. For example, radiometry would be the choice in determine temperature distribution of the atmosphere or the sea since radiometers measure temperature directly. [2], [3].

The use of microwave frequencies for remote sensing of land masses, oceans, and the atmosphere has increased considerably as a result of several important unique properties of microwaves which are not available when sensing is performed at visual or infrared frequencies. These properties include: cloud, rain, fog, and snow penetration; strong interaction with compounds such as water at distance frequencies; operation through darkness; excellent altitude and global coverage; and the capability to provide information on the characteristics of the subsurface areas.

The desirable characteristic pf cloud, rain, fog, and snow penetration has been of great importance in the global data collection of atmospheric temperature profile measurements for numerical weather

forecasts. Similar meteorological measurements utilizing infrared or visible spectral bands are very sensitive to clouds; this sensitivity poses limitation on the usefulness of both these bands for detailed, long-termed weather forecasts, particularly in the sounding of the troposphere.

The existence of distinct water and oxygen resonances at microwave frequencies has been utilized in composition profile measurements of the atmosphere and in storm cell detection (due to the high content of water vapor in storm cells).

Remote sensing with microwaves allows for excellent global coverage in earth resources applications and in monitoring sea conditions. Successful experiments in the detection of oil spills on the ocean's surface and determining the thickness of the spills have been performed recently in the U.S. and promise routine usage of microwave sensors in pollution control in the near future. [4]. In this application, the spill smoothes the water surface causing the water to radiate lower temperature which increase proportionally to the density of the spill. The type of spilled material can often be determined from the density.

Finally, microwave sensing allows the detection of soil moisture down to a few centimeters below the earth surface. This property is useful in distinguishing irrigated from non-irrigated fields and in geological applications. [5].

INDUSTRY

The need for new methods and techniques to measure nonelectrical quantities in industrial applications has arisen in recent years. Existing methods for taking measurements in extremes of temperature and pressure of different types of radiation were inadequate.

Microwaves possess many properties which are attractive from both the technical and economic points of view. These properties can be effectively utilized in measuring nonelectrical quantities in extreme environmental conditions.

Due to the ability of microwaves to penetrate matter and heat it uniformly throughout, microwaves are being used in drying wood, drying glue lines in a high speed book binder and in the drying of printed paper. [5]. In the consumer area, a microwave clothes dryer has been constructed and found superior because of cost and size considerations. [6]. It is noiseless and extremely efficient and also sterilizes the fabric. The heating characteristics of microwave energy have also been readily utilized in the food industry for cooking (microwave ovens), thawing, dehydration, sterilization and drying and freeze-drying. [7], [8], [9], [10].

The advantages of microwave processing are cleanliness, savings in energy, labor and time, and exceptional efficiency. In Japan, rapid heating with microwaves is being experimented with to crack and break

rocks for tunnel construction. [11]. The advantages of this technique over present methods such as boring or dynamiting are: lack of noise and vibration; and the ability to remotely control a microwave tunneling apparatus.

Microwaves have been used effectively to measure the moisture content of different materials due to the extreme sensitivity of microwave signal propagation to the presence of moisture. [12]. Moisture measurements with microwaves offer long-term stability and are not affected by such factors as temperature, pH, and salt content. [13]. Successful on-line water content measurements have been performed on consumer products such as margarine [14] and in the paper industry for determination of water content of paper and pulp. [15]. The applications of microwave moisture measurements can be extended to the chemical and pharmaceutical industries where continuous measurement of water content and the strength of water solutions are very critical. [16].

Microwaves have been employed in the nondestructive detection and localization of voids, cracks and flaws in materials. [17]. The use of microwaves in diagnostics allows for nondestructive material testing. This is particularly suitable for measurements when the access to the material is not available and where contactless measurement: are desirable. The method is based on deducing the material state from the characteristics of the reflected or transmitted signals. This technique was applied to the measurement porosity in the rubber components of engine suppressor units and mountings [18] and to the detection of 100microinch cracks in a metal surface. [19].

Other industrial applications of microwaves include: on-line measurement of the wire diameter for use in the wire and cable industry [20]; detection of small length changes for use in seismology to detect seismic waves of long period; and in metallography to detect dislocation jump in slow cooling steel. [21].

3. COMMUNICATIONS AND POWER TRANSMISSION

In the area of communications, microwaves present an attractive solution to the growing need to send live television across the ocean, and to expand telephone and data transmission services. Increasingly higher frequencies are being utilized in the microwave spectral band since more bandwidth is available at the frequencies. Suitable techniques are being developed for signal processing in the higher frequencies.

The earliest successful use of microwaves is communication came to the U.S. in the 1940's with the development of point-to-point microwave communications links which were installed along gas and oil pipelines [22]. Since that time the use of point-to point communication has continually grown, and today is well established as a practical and economical means of communication, particularly over rough terrain.

The point-to-point microwave communications systems has limitations in adverse climate and geography because of transmissions signal losses when propogation occurs over distances. A successful and reliable

technique for long-range communication systems was developed by scattering the microwave signal off the troposphere. [22], [23].

Another established area where microwaves are extremely useful is in communication satellites. This use of microwave began with the launching of Sputnik in 1957. As of 1974, global system of communication satellites consist of five main satellites and four spare satellites operating over the Atlantic Pacific, and Indian oceans. [25]. They provide communications pathways between 55 countries with earth station facilities. Other countries which do not have earth station facilities can still use the satellite services by terrestrial links from countries with stations. Since the satellites have a multipoint communications capability, it is possible for countries within an area of approximately one-third of the globe to communicate with each other directly.

The growing need for more television, data, and telephone lines increased the number of point-to-point and satellite communication systems. This has led to serious problems of mutual interference and crowding at lower frequencies. In going to higher frequencies which offer more capacity for information serious atmospheric absorption becomes a problem. Both systems depend on the propagation of microwave signals in the atmosphere. This has led to the search for transmission media other than atmosphere to propagate communication signals. Circular waveguides buried underground provided a solution. [22], [23]. This mode of signal transmission offers unlimited capacity for information, has low loss and provides the ability to control the amount of signal attenuation simply by increasing the diameter of the cylindrical waveguide.

A new and emerging application for microwave energy is in power transmission. [26]. Microwaves can be used to efficiently transfer power between two points. In such a system. The D.C. power at the transmitting end is converted into a highly collimated microwave beam which is then sent to the receiving end and converted into the desired form of energy. Several unique properties of free space microwave beam transmission make this possible. It is a very efficient system (90% efficiency), where the energy between the transmitted and the receiver travels at the speed of light. Furthermore, the transfer of energy does not require wires or waveguides for power transmission. This technique can be used in applications where it is impossible to run wires, for example between points in space where power transfer is desired.

Recent experiments in the U.S. with the microwave-powered helicopter [26] showed that the microwave beam could not only supply propulsive power to the helicopter but also could be used by the helicopter as a reference to keep itself positioned accurately.

NASA has conducted initial studies on establishing a central power source in space which could Service the energy needs of several satellites by simply redirecting the microwave beam to that satellite. The immediate use for a central power station is in communication satellites. The most important application area of free space microwave beam transmission

however is in supplying the world with a pollution free source of energy. [26], [27]. This is an ever urging issue in view of diminishing fossil-fuel reserves, growing population and the unavailability of an alternative readily available and waste free source of energy.

Solar energy fulfills these qualifications when trapped and transmitted undiffused to earth. The solution as originally proposed by Glaser in 1968. In his proposal, satellites placed in a space orbit would collect sun's radiant energy and convert it into a microwave beam. Microwave beams would then be transmitted efficiently to the earth's surface where it would be converted back into another form of usable energy.

Recent feasibility studies a similar solar energy-microwave system conducted at the Boeing Company [28] point out that the development of such a system is nearing the stage where in pilot plants are needed to establish design practically and confidence. The system is projected to be operational by the year 1990.

4. MEDICINE

Heat treatment with electromagnetic energy at high frequencies, or diathermy, is at present one of the major therapeutic techniques in uses in clinical practice. [29]. Controlled heating of the tissue cells causes many desirable physiological responses such as an increase in blood flow, relaxation in muscles, and reduction of pain. The advantages of diathermy over other methods such as hot pads lies in the unique property of high frequency electromagnetic energy to affect deep tissue layers. In particular, theoretical and experimental studies have shown that electromagnetic energy at microwave frequencies, when compared with lower frequencies, can heat deeper tissue layers better and more uniformly without damaging the intervening fat layers. Not all microwave frequencies exhibit characteristics of uniformly heating deep tissue layers without overheating fat or skin layers.

The optimal microwave frequency of 915 MHz for diathermy was theoretically found by Schwann and confirmed experimentally by Guy. [29]. However, in the U.S.A., the 915 MHz frequency has not yet been assigned by the Federal Communication Commission (FCC) for this medical purpose. Furthermore, there are at present no commercially available microwave sources and diathermy applicators operating at that frequency. The majority of microwave equipment operates at 2450 MHz frequency because this frequency has been originally assigned by the FCC for industrial, scientific and medical purposes.

Microwave diathermy is presently the best available therapeutic techniques which can ease a patient's pain in pathologic conditions and chronic diseases such as arthritics, muscle trauma be reserved for this beneficial medical purpose.

The principle of microwave radiometry, the same one as radio astronomy and remote sensing, [30], [31], [32], [33] has recently found

another useful application area in medical diagnostics. The principle is based on the fact that the human body emits noise-like thermal radiation in the microwave frequency region. In the past few years, medical diagnostics with microwave radiometry has become feasible because of the development of apparatus with sufficient sensitivity to detect the relatively weak signal involved. There are a number of potential applications of microwave radiometry. Pathological conditions such as cancer, tumors and circulatory disturbances, which today are investigated with the help of thermography that operates in the infrared frequency region, could be more easily detected by using microwave radiometry technique. The advantage of microwave radiometry over thermography lies in the fact that it can furnish information about temperature distribution from the depth of several centimeters into the muscle while thermograph cameras sense only the temperatures in a very thin surface layer. Scanning of the human body by microwave radiometry should make it possible to obtain in vivo information about internal organs and their location the characteristics of surrounding tissue, blood flow rate and temperature distribution. Microwave radiometry can also be used to monitor respiration and deposition of water (sweat) and hence furnish information about the state of anxiety, emotional stress and states of relaxation of the organism. Immediate application is in studies of the effect of environmental parameters like noise and sound on the functional state of the organism.

Another potential therapeutic application of microwave energy is in the transmission of power into tissues for various useful purposes. [29] For example, by implanting a diode into the tissue, microwave energy could be converted to D.C. current and used to control the rate of tissue growth or to stimulate a nerve tissue to control pain.

Safety Factors And Regulations

We can see that microwaves have numerous applications which help mankind solve many problems. Microwaves, due to their useful and unique properties, are quickly entering into all phases of life in industrialized countries. However, with the increased usage of microwave devices, we are faced with a problem of microwave hazard and pollution. For example microwave power in therapeutic applications may be harmful to the human health instead of being beneficial when inappropriately applied. Spurious radiation field existing around microwave devices can be hazardous not only to the personnel servicing the equipment, but also to the inhabitants of the surrounding areas. This may be the case with radiocommunication apparatus. Controls must be exercised on the use of this new scientific tool to be truly beneficial to the people. The scientific and industrial community has learned the importance in exercising the controls on microwave usage. Points to consider are:

1. Scientists, engineers, physicians, and other professionals who make use of microwave energy must closely cooperate with each other. Only then can we hope to understand and use to our advantage this new and powerful tool. The need for close cooperation among different professionals can best be illustrated by the following example [23]:

The FCC (Federal Communications Commission) assigned a 2450 MHz frequency to physical medicine based on the research conducted by the medical scientists during World War II in the U.S. indicating that microwaves at that frequency possess superior therapeutic values. Engineering in later years showed that the 2450 MHz frequency was actually a poor choice for the patient. Diathermy operating at 2450 MHz frequency produces excessive heating in the fat body layers, it exhibits the characteristics of poor penetration into muscle, and most importantly, the amount of energy absorbed by the patient is not known and cannot be effectively controlled. An optimum beneficial frequency was found to be 915 MHz; however, no suitable equipment operating at this frequency is currently available. Dr. A. W. Guy from the University of Washington states, "This is a classic example of how the historic lack of engineering in medicine has pro-longated ill-conceived practices, not only in medicine, but also in nonrelated industrial applications. Today, after 28 years, there is no commercial microwave diathermy apparatus available other than that which was conceived at that time. As a matter of fact, the majority of the microwave ovens and industrial food processing units being manufactured and used today operate on 2450 MHz based on the historic microwave diathermy frequency allocation."

2. Scientists, engineers, and other professionals in different countries must closely cooperate with each other. Such a cooperation in recent years between East European and American scientists and engineers has been extremely fruitful.

First of all, the scientific and engineering community has learned that the safety standards regulating the allowable maximum level of microwave radiation to which the human body can be exposed without detrimental effects differed significantly between East European countries and the U. S. (allowable power density levels: 10^{-3} W/cm² for the U.S. versus 10^{-6} W/cm² for East Europe). [34].

East Europeans have adopted a more conservative criterion based on their studies of long-term effects of microwave exposure on behavioral, metabolic, and genetic changes. American Scientists, on the other hand, have used the lack of thermal effects at higher power density levels as the basis for acceptable levels of exposure; consequently, their standards allow "higher: levels of exposure to microwaves.

The existence of this discrepancy has triggered an intensive research at the present time in all countries aimed at quantifying biological effects of microwaves. The scientists and engineers have learned a great deal about the nature of microwave action, still a great deal more needs to be understood and agreed on or confirmed experimentally. For example, further studies should be made on the nature of nonthermal effects of microwave radiation at low power densities (below

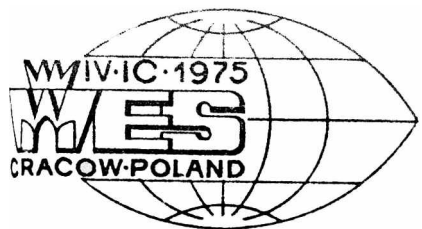
lmW/cm²) on behavioral changes. Only then can the workable and meaningful rules and standards for maximum safe exposure to microwave energy be formulated and accepted internationally to protect people anywhere in the world. [35].

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**IV^{ème} CONFERENCE INTERNATIONALE
DES FEMMES INGENIEURS SCIENTIFIQUES**

Jadwiga Pasynkiewicz

**LES PROBLÈMES DE LA
PROTECTION DE
L'ENVIRONNEMENT AU COURS
DE LA TRANSFORMATION DU
CHARBON EN COMBUSTIBLE
GAZEUX**

Section 6: Problèmes de matières premières et énergétique .

Imprimè d 'après 1 'original
de 1 ' auteur

Organisateur de 1a Confèrence
et editeur:

Ośrodek Postępu Technicznego NOT
ul. Świętojerska 5/7 .
00-236 Warszawa

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En 1966 elle a fini son travail de doctor et en 1969 a pris la poste du professeur sans chaire.

Depuis plusieurs annèe elle est le chef du labolatoire de Puzification du Gaz et de Protection de l'Environement.

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**LES PROBLÈMES DE LA PROTECTION DE L'ENVIRONNEMENT AU COURS DE LA
TRANSFORMATION DU CHARBON EN COMBUSTIBLE GAZEUX.**

Les besoins pour les matières énergétiques augmentant de plus en plus et aussi les manques locaux du gaz avec la tendance à la hausse de son prix, ont provoqué l'apparition de l'intérêt de la production du gaz dont les combustibles permanents constituent sa base. Précédemment, depuis 1950-1960 le gaz du charbon a été produit uniquement pour satisfaire les besoins locaux des récepteurs communaux /usines municipales à gaz/ et aussi pour l'industrie chimique, mais avec des limites/gaz de synthèse/. Actuellement on prend en considération la mise en marche sur une grande échelle, de la production du gaz du charbon pour obtenir le gaz de synthèse/ mld Nm³/ an-très calorifique, sert comme le supplément des besoins des usines actuelles et celles qui sont en train de se développer/ et aussi pour recevoir le gaz pour l'électroénergie professionnelle.

Le rôle des processus de la production du gaz provenant du combustible permanent est dépendant non seulement

des conditions économiques mais aussi des possibilités d'une propre protection de l'environnement. Un grand accent exercé pour rendre toutes ces règles sur la protection de l'environnement plus rigoureuses et aussi la sévérité de ces règles peuvent jouer un rôle important dans la définition de la qualité de la gazéification et des processus supplémentaires. Le tableau 1 donne toutes les données qui caractérisent la demande d'eau et la quantité des déchets / avec des égouts/ sur l'exemple d'une usine à gaz 1/qui produit le gaz moyennement calorifique; l'autre exemple c'est une usine, qui est en train d'être construite et qui produit le gaz artificiel naturel /SGZ/.

D'après ce résumé cité ci-dessus, on peut constater qu'avec le règlement de la protection de l'environnement et les tendances actuelles le problème de la mise en marche de la production du gaz au besoin de l'industrie, seront limités par deux facteurs:

- la demande d'eau
- la possibilité de l'utilisation des produits secondaires

La demande d'eau

Dans la gazéification classique la demande moyenne d'eau a été $0,5 \text{ m}^3/100 \text{ Nm}^3$ du gaz, et durant la transformation des produits secondaires $2,5 \text{ m}^3/100 \text{ Nm}^3$ du gaz. Le traitement d'eau/outre l'eau de chaudière/ n'a pas joué un grand rôle; on n'utilisait non plus la circulation de l'eau refroidissement et souvent les effluents ont été déchargés directement à la canalisation.

Le règlement actuel qui normalise de plus en plus souvent la demande d' eau utilisée dans la production fait fermer les conduits d' eau et le travail de l' usine dans le système sans égouts. Cette situation provoque une nécessité du traitement aussi bien de l'eau fraîche / complément des manques dans la circulation/ que du traitement des eaux d' égouts pour obtenir les propriétés de l' eau de circulation.

Toutes les recherches ont comme le but le perfectionnement du système de circulation des eaux de refroidissement et l' amélioration des méthodes préparatoires de l'eau utilisées dans ce but. Les procédés de préparation de l'eau fraîche parmi lesquels nous comptons sédimentation, coagulation de contact ou volumétrique, filtration et décarbonisation deviennent insuffisants.

Très souvent il est nécessaire d' ajouter la chloration, les inhibiteurs de corrosion, les biocides et enfin la sorption sur le charbon actif.

Dans le tableau 2 nous voyons la liste de la demande d' eau pour l'un de processus SGZ /elle concerne la production 2 mld Nm³SGZ/an/.On peut constater de ce tableau que la demande d'eau irréversible et totale pourrait atteindre la valeur 0,35 m³/sec.

C'est pourquoi on fait attention à la possibilité d'utiliser plusieurs fois des eaux de circulation et aussi la possibilité de l'utilisation plus générale des moyens de rafraichissements d' air.^{5/}

Le problème tout à fait à part c'est le traitement d'eau qui sert à la production de la vapeur à haute pression

dont la demande pour la gazéification est grande la méthode de Lurgi-1,62 kg de vapeur/kgC; la méthode de BI-GAZ-1,415 kg de vapeur/kgC.

La demande moyenne de l'eau minéralisée pour produire la vapeur nécessaire uniquement à la gazification /la production de SGZ: 2 mld Nm³/an/ sera 20mil m³. Le problème secondaire est le traitement des égouts pour atteindre les propriétés de l'eau de circulation. Ce problème est difficile surtout pour les condensats qui viennent de la transformation thermique des combustibles appartenant aux égouts très difficiles à traiter du point de vue de cette difficulté. Le tableau 3 donne l'exemple de la composition du condensat de l'eau /égouts/ que l'on a reçu au cours de la gazéification du charbon à l'aide de la méthode de synthane /Honois nr6/. Le traitement de ces égouts exigera le processus de traitement à quelques étapes / méthodes physiques, chimiques et biologiques / et aussi la choix des inhibiteurs de corrosion. Après le traitement biologique et pour empêcher la formation des sédiments biologiques, il serait obligatoire de les chloriner et aussi de faire la liquidation efficace des sédiments provenant du traitement biologique.

Pendant la gazéification à haute température nous aurons la pollution des égouts considérablement plus petite.

L' utilisation des produits de côté.

La gazification des combustibles permanents résulte plusieurs produits de côté et déchets dans la forme stable et liquide ou bien gazeuse.

Du point de vue de la protection de l'environnement le problème le plus facile est l'utilisation des déchets stables et liquides. Les déchets stables ce sont surtout: la scorie, la poussière et dans les cas spéciaux-le coke.

Pendant la transformation du charbon avec beaucoup de cendre on reçoit une quantité la plus grande de la scorie qui peut être servie pour la construction des chemins, pour la production des matières à construire ou bien elle peut être déchargée de nouveau dans la mine. La même chose devint avec la poussière. Au cours de l'utilisation du coke il faut prendre en considération sa gazéification ou sa combustion. Les déchets liquides, le goudron et les huiles peuvent être les produits auxiliaires pour la suite de la transformation, ou bien le combustible peut être utilisations l'établissement énergétique.

Parmi ce processus il faut noter la gazéification à haute température où n'y a pas/ou dans des quantités minimum/de hydrocarbures et de substances, aromatiques-les constituant principales des goudrons et des huiles.

Les produits gazeux de côté sont les plus difficiles à l'utilisation et sont en même temps dangereux pour la protection de l'environnement.

Parmi ces produits il faut souligner avant tout l'hydrogène sulfuré, le braxide de charbon et l'ammoniac. Les plus toxiques et nuisibles pour l'entourage sont l'hydrogène sulfuré et les produits de combustion de l'hydrogène sulfuré et de l'ammoniac/le gaz sulfureux et l'oxyde azotique/.

Le tableau 4 donne la concentration admissible de ces combinaisons dans l'air.

Le problème le plus important dans la gazeification est l'utilisation des gaz. acides / H_2S et CO_2 / aussi bien vu la qualité des matières primaires /le charbon avec une grande concentration de sulfure/ que la transformation du gaz et aussi une grande quantité de ces gaz /20-25% de volume du gaz non-transformé/.

Cependant les deux groupes de méthodes du désoufrage des combustibles gazeux possèdent les défauts assez significatifs.

L'un des défauts du premier groupe consiste à ce que les compositions de sulfure éliminées du gaz passent aux gaz volatiles provoquant la nécessité de l'utilisation à 2 étapes de ces gaz. La deuxième méthode consiste à la transformation des gaz acides en sulfure élémentaire; elle est formée pendant l'oxydation d'une certaine quantité de produits de côté, ce qui complique la transformation des eaux de ruissellement.

Si nous prenons la 1ère ou la 2ème méthode, on voit que le bioxyde de charbon passe dans l'atmosphère presque totalement, c'est-à-dire 1/4 - 1/3 du contenu du dépôt par la gazeification.

Il n'y a pas longtemps on a considéré le bioxyde de charbon comme le gaz inerte qui peut, être déchargé dans l'atmosphère sans aucun danger pour l'entourage. Mais les dernières données prouvent que le contenu du bioxyde de

charbon dans l'atmosphère a commencé à augmenter d'une manière inquiétante /en 1966-10% par rapport au début de notre siècle en 2000 on attend une augmentation de 26% ce qui dépasse une quantité qui peut être assimilée par les plantes.^{7/}

Le problème considéré à part est la récupération et l'utilisation de l'ammoniac aussi bien des gaz que des condensats liquides.

La façon la plus simple est la production de l'ammoniac liquide à haute concentration ou des engrais sur la base de cet ammoniac.

Mais une faible rentabilité de ses méthodes et le manque de prompt écoulement ont augmenté l'intérêt l'élimination de l'ammoniac à l'aide de la combustion. Actuellement les recherches sur l'élimination de l'ammoniac ont pour le but sa combustion, qui n'est pas dangereuse /les produits libres des oxydes azotiques/. Les processus à haute température réduisent aussi effectivement le contenu de l'ammoniac dans le gaz.

Conclusion

Dans cet article on a essayé de donner l'opinion sur quelques aspects de la protection de l'environnement durant la production du gaz, à partir des combustibles permanents. Comme les problèmes les plus significatifs on a pris la diminution de la demande d'eau par l'intermédiaire de la fermeture complète des circuits d'eau et le traitement des égouts pour atteindre les propriétés de l'eau de circulation et enfin la solution de l'utilisation des gaz acides et de l'ammoniac par le moyen qui garantit la protection de l'atmosphère.

Les paramètres techniques de l'usine classique à gaz et de l'établissement productif SGZ.

Tab. 1

Spécification	Production du gaz dans l'usine à gaz ^{x/}	Production SGZ ^{xx}
transformation du charbon t/jour	500	20.000
production du gaz m ³ /jour	300	5.800
eau à la proc. Du vapeur t. du vapeur/jour		
eau du traitement du gaz et des égouts m ³ /jour	3000	20.000
goudron et les huiles t/jour	30	500
phénol naturel t/jour	0.25	95
ammoniaque t/jour	0.20	180
soufre t/jour	non récupérer	181,5
cendre t/jour	-	5.330
égouts m ³ /jour	3000	14.500

x/ le four de kopfer d'une circulation continue-le gaz moyennement calorique

xx/le projet de l'installation de Lurgi à New Mexico-le gaz calorique

La demande et l' utilisation d' eau au cours de la production de SGZ.

Spécification	gal/min gal=3,785 dm ³	%
utilisation aux processus technol.		
la production de hydrogène	1120	
metanisation	<u>600</u>	
utilisation net.	520	10,2
passage à l' atmosphère par:		
évaporation: etanga d' eau		
naturelle	420	
tours de refroidissement	1760	
action d' éteindre de scorie	150	
granulation dessoufre	250	
arrosage des chemins minères etedes		
sections du transport	<u>730</u>	
	3310	
gaz de combustion:		
de four	200	
de scrubber SO ₂	<u>40</u>	
èvaporation totale à l' atmosphère	240	69,6
passage à la mine avec:		
le limon	100	
le cendre de four	30	
le cendre de gènérateur	<u>300</u>	
totals	430	8,4
Autres:		
L' eau dans le limon d' ètagn	20	
L' utilisation dans la mine	<u>580</u>	
total	600	11,8
Utilisation totale de l' eau	5100	100

Tab. 3

L' analyse des égouts de la gazification du charbon á l'aide de la méthode de Synthane

Désignation	contenu/mg/l/
pH	8,6
suspension	600
phénols	2600
6h ZT	15000
	152
cyanure	0,6
ammoniacale	8100
chlorure	500
carbonate	17000
soufre totale	1400

Tab. 4

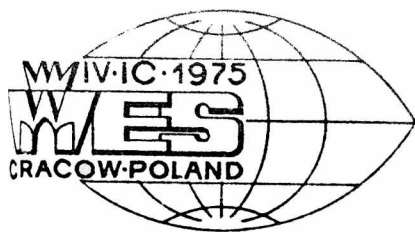
La concentration admissible du sulfure d'hydrogène, du gaz sulfureux des oxydes azotiaux dans l' atmosphere

Nom de la combinaison	concentration admissible dans l' atmosphere mg/m ³	
	moyen	max,
H ₂ S	0,02	0,06
H ₂ S ^{x/}	0,008	0,008
/NO/x	0,2	0,6
/NO/x ^{x/}	0,25	0,15
SO ₂	0,19	0,75
SO ₂ ^{x/}		0,35

x/ pour les territoires spéciaux de la protection

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**IV^{ème} CONFERENCE INTERNATIONALE
DES FEMMES INGENIEURS ET SCIENTIFIQUES**

Luisa Chebataroff

RESSOURCES MINÉRALES
DE L ' URUGUAY

Problèmes de matières
Section 6:
Premières et énergétique

Imprimè d' après l' original
de l' auteur

Organisateur de la Confèrence
et éditeur:

Ośrodek Postępu Technicznego NOT
ul. Świętojerska 5/7
00-236 Warszawa

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RESSOURCES MINERALES DE L 'URUGUAY

GENERALITES

Le territoire de l 'Uruguay, situé au SE de l'Amérique a ses côtes sur l'océan Atlantique et sur le Rio de la Plata, ample estuaire fluvial navigable. Il est compris entre les parallèles 30 et 35 de latitude sud et les méridiens 53 et 58 de longitude ouest.

La dimension en ces deux sens ne dépasse pas les 550 kmtrs. La surface, de 187.000 km² abrite 2:000.000 habitants. Son climat est tempéré, son sol de doux relief, possède un bon réseau hydrographique, des abondants p tures, des côtes amples et abordables avec très belles plages d'une étendue de 300 kmtrs.

Les caractères physiques du territoire uruguayen l'ont prédestinés à devenir essentiellement éleveur. L'agriculture extensive s'est aussi bien développée. Aujourd'hui, il manque de bois, comme aussi de minéraux métalliques *et* de combustibles naturels.

Les côtes du pays occupent une des premières places dans le monde par sa richesse ichtyologique, encore peu exploitée. L'heure est arrivée de commencer l'étude systématique de ses ressources géologiques.

Nous ne devons pas faire l'étude d'une ressource comme si elle fut un bien statique mais, au contraire, comme un bien vital; nous ne devons pas la considérer en *forme* isolée mais comme un élément lié aux autres ressources et aux objectifs du développement.

Les caractéristiques physiques du territoire uruguayen l'ont signalé à devenir essentiellement un pays d'élevage. L'agriculture extensive s'est bien développée aussi. Les côtes du pays occupent une des premières places dans le monde par sa richesse ichtyologique, encore peu exploitée. Il manque du bois, ainsi que des minéraux métalliques et des combustibles naturels, mais l'heure est arrivée de commencer l'étude systématique de ses ressources géologiques.

Les ressources minérales de l'Uruguay sont encore peu connues. Les matériaux de construction et d'ornementation provenant des gisements du sous-sol sont exploités avec plus d'intérêt et confiance.

Les limitations sont dues principalement à la manque d'une étude géologique systématique du sous-sol ce que ferait nécessaire l'existence d'un organisme assesseur pour la recherche, exploitation et usage des minéraux.

Si bien les ressources minérales sont peu connues et

lea exigent une préalable classification.

1. Gisements de minéraux métalliques

1.1 METAUX PRECIEUX	L'OR /Lavalleja, Rivera, Oreinta y Tres/
1.2 METAUX NON FERREUX	CUIVRE /Lavalleja, Maldonado/ PLOMB et ZINC /Lavalleja/
1.3 METAUX FERREUX.....	FER /Rivera, Florida/MANGANESSE / S. Josè, Rivera/

2. Gisements de minéraux non métalliques

2.1 MINÉRAUX ARGILEUX	KAOLIN /Durazno/MONTMORILLONITE / Cé ro Largo/
2.2 MATÉRIAUX PRIMES SILICATES	/FELDSPATH /Florida, Canelones/ QUARTZ /Florida/ ESTEATITE et TALC /Colonia, Lavalleja/ LIMONS /Montevideo, S. José, Maldonado/
2.3 ROCHES CARBONATES	CALCAIRES /Lavalleja, T. Tres, Paysand / DOLOMITES /Lavalleja, Maldonado/
2.4 PIGMENTS.....	ILMENITE /Rocha/

BARYTINE /Lavalleja/

2.5 PIERRES DE TAILLE... AGATES /Artigas, Salto, paysand /
AMETISTES/Artigas/

2.6 MATERIAUX DE CONSTRUCTION GRANIT NOIR
PIERRES
SABLE
BALLAST
ARDOISE
MARBERS

3. Materiaux primes energetiques

3.1 CHARBON /Cerro Largo/
3. 2 TOURBE /Rocha/
3. 3.URANIUM

/Classification de Ladoo et Myers, structurè par Bossi, URUGUAYEN/.

1. Mineraux metaliques

1.1 Mineraux precieux

L'OR. Selon l' information de Wright, la principale zone aurifère de l'Uruguay est la "bande d' or" de Rivera, qui commence au Cunapir et s'étend 40 kms vers l'est.. L' or se trouve en filons quartzeux qui remplissent des fractures de roches. Il peut apparaitre seul ou associé avec de la pyrite, chalcopyrite et galène. Recemment des indices d' or ont été décou-

vertes en Isla Patrulla /Treinta y Tres/, San Gregorio y Zapucay /Rivera/.

Selon MacMillan, jusqu'á 1930, on avait fait l'extraction de 400.000 tonnes de matériel et 3:000.000 grs d'or; la moyenne était de 7,5 grs/ton.

En gènèral, les conditions des gisements et les méthodes appliquées déterminèrent que son exploitation fut antiéconomique ce qui unie a la connaissance insuffisante que l'on possède, lui donna peu de valeur rentable: au plus 12 grs/ton.

1.2 Minéraux non ferreux

CUIVRE PLOMB ZINC Ces éléments sont très importants dans la technologie actuelle et ses qualités les font irremplaçables dans la plupart de ses usages. Ils se trouvent associés entr'eux dans la zone des phyllithes, calcaires et quartzites en Minas et Pande Az car. Ils ont une origine hydrothermal liée á un phénomène magmatique pas bien défini.

Les gisements sont de faible épaisseur et avec pauvre minéralisation. Les minéraux sont principalement des sulphures: chalkopirite /cuivre/, galène /plomb/ et blende /zinc/. Ils se trouvent associés á des filons á gangue quartzeuse et calcaire ou l'on trouve des phyllithes et des calcaires cristallins.

1.3 Minéraux ferreux

FER L'Uruguay possède des gisements d'un volume important de minéral qui peut fournir jusqu'à un 60% de fer. Pour cela il faut le soumettre à un processus de réduction avec charbon dans des hauts fourneaux.

Le plus important gisement se trouve à Valentines /Florida/ 260 kms de Montevideo.

Il y a 19:000.000 tonnes de minerai avec un contenu de fer de 38% qui équivalent à 7:000.000 de tonnes de fer métallique.

L'Uruguay a trois alternatives:

- l'exportation de pellets, matière première qui alimente le haut fourneau qui la transformera en fer métallique.
- l'utilisation dans l'industrie sidérurgique nationale.
- l'exportation de pellets et l'utilisation dans la sidérurgie nationale.

Notre pays consomme 125.000 tonnes de fer/année. Le pays peut produire seulement 75.000 tonnes. Les pellets se placent toujours sur le marché mondial parce qu'ils constituent une matière semi-élaborée qui économise beaucoup d'argent dans le processus sidérurgique et augmente le rendement du fourneau. La production annuelle de pellets est de 500.000 tonnes. Une fois approvisionnées les nécessités nationales

portations.

L'ing. Ibarlucea /Uruguay/ propose situer la plante industrielle sur notre côte océanique pour obtenir une plus grande salinité des eaux. La dolomite proviendra de la Zanja del Tigre/Maldonado/ ou de Rocha, et on utilisera l'évaporation solaire.

On pourra obtenir 12.000 tonnes/année de gypse, 80.000 ton/a de sel, 15.000 tonnes/année de magnésie et 2.000 tonnes/année de potassium. C'est un bon exemple d'inversion que peut faire l'Etat qui pourrait vite/en deux ans/ récupérer son capital et qui donnerait du travail à 250 ouvriers.

2.4 Pigments

ILMENITE. Cet oxyde de fer et titane est la matière première par excellence pour l'élaboration d'oxydes de titane: pigment blanc. L'Uruguay possède des gisements très étendus d'ilmenite concentrée dans les sables de la côte de Aguas Dulces /Rocha/ avec un volume de 3:000.000 tonnes de minéraux denses et une concentration du 3% qui a la suivante proportion: ilménite 50%, magnétite 20%, zirconium 50%, rutile 1%, monacite 0,6%.

Le processus d'utilisation des sables noirs de

vra accomplir les suivantes étapes:

1. Extraction et separation de concentrès. On y obtient de l'ilmènite, du rutile, du zirconium et de la monacite de grande pureté.
2. Traitement de l'ilmènite avec production de fer métallique et scorie titanifère.
3. Obtention de pigment blanc d'oxyde de titanium.
4. Obtention de phosphate de sodium, oxydes de terres rares et oxydes de thorium.

Pour de meilleurs résultats économiques, il faudrait construire un port á l'est de celui de Montevideo qui est trop éloigné de la zone des gisements.

LA BARYTINE, ou sulfate de barium est aussi un pigment blanc. Sa plus importante application c'est la fabrication de litophon pigment blanc qui contient 30% de sulfure de zinc et 70% de sulfate de barium. Il se trouve á Minas une petite exploitation de barytine.

2.5 Pierres de taille

AGATES ET AMETISTES. Ce sont des variétés de calcedoine et quartz respectivement de l'espèce de la silice. Elles sont constituées par des oxydes de silicium. On les emploie comme matériaux industriels ou comme pierres demi-

précieuses ce qui dépend de ses propriétés de résistance mécanique au frottement.

Il y a d'importants gisements au nord-est du pays, dans la zone basaltique.

AGATES ORNEMENTALES sont celles qui possèdent un dessin attrayant et une porosité qui permet absorber des matières colorantes artificielles qui rehaussent leur beauté. Elles ont des bandes parallèles ou concentriques. Avec les agates on fait des cendriers, des camées, des boîtes à bijoux, des coupes, des vases et des pierres de bijouterie.

Les AGATES INDUSTRIELLES doivent présenter une grande homogénéité, dureté et ténacité. Les AMETISTES sont une variété de quartz de couleur violette tournant au bleu foncé, ce que les a fait extrêmement appréciées dans le marché d'Europe.

Notre pays exporte 20 tonnes/année d'ametistes destinées à l'ornementation, aux collections, musées, etc. Son exploitation ne se fait pas d'une façon systématique. Une mesure importante à prendre sera de rendre propice sa taille pour augmenter sa valeur agrégée.

L'Uruguay exporte 80 tonnes/année d'agates en brut. La capacité de production est plus gra-

nde que la demande.

L'Allemagne est le principal pays importateur.

2.6 Matériaux de construction

Dans ce champ l'Uruguay est un pays privilégié: il possède tous les matériaux indispensables pour la construction et l'ornementation et il les exporte en grande quantité. Il possède de la pierre, du ballast et du sable de bonne qualité. Ses gisements de granit noir sont notables: les ardoises sont de différentes couleurs, les marbres sont beaux et d'une grande variation.

GRANIT NOIR. Il y a une grande demande mondiale. On trouve des carrières à Canelones, Colonia, Flores, S. José et Florida. On peut obtenir des blocs d'appréciables dimensions provenant de gisements de 30 mtrs de large par 500 mtrs de longueur. Nos granits rouges de Piriapolis étaient très demandés pendant les années 30. Il faudrait faire son laminage et polissage pour augmenter sa valeur. L'Uruguay peut produire 10.000 m³ de granit noir laminé et poli.

MARBRES. Ils se trouvent dans diverses zones du pays. Le volume potentiel est énorme. Les types sont variés, beaux et avec d'intéressants dessins. Le marbre gris peut se couper en blocs d'énormes dimensions. On les emploie pour le re

vêtement de la façade des maisons à cause de grande valeur esthétique, pour faire des fontaines, des tables, des planches, des escaliers. Son exportation est importante mais ils ne sont pas suffisamment industrialisés.

3. Matières primes énergétiques

Les combustibles naturels sont très rares. Le charbon existant ne peut pas s'exploiter dans de bonnes conditions économiques car il se limite à de petits gisements. On a prouvé l'existence d'uranium en proportions importantes. En ce qui a rapport au pétrole, l'Uruguay est à l'étape des recherches jusqu'aujourd'hui, on ne connaît pas de dépôts de pétrole.

L'application d'une politique énergétique appropriée se base dans les suivants pas:

1. Construction de barrages hydroélectriques.
2. Recherche d'uranium.
3. Prospection du pétrole d'une façon scientifique.

Utilisation des ressources minérales

Les richesses minérales sont des ressources non renouvelables. Il faut que chaque matière prime donne lieu à une industrie. Le produit élaboré est toujours plus cher que la matière prime; la possession de celle-là ne donne pas de ri-

chesse. Le pays qui possède de la matière prime, la vend à bas prix aux pays industrialisés et achète après plus cher le produit élaboré. Il est essentiel avoir de l'énergie pour industrialiser les matières premières. Les industries ont besoin de plus de main d'oeuvre.

L'Uruguay possède des ressources minérales en volume et quantité suffisantes pour installer des industries de diverses espèces.

Celles ci sont les suggestions de Bossi pour les priorités

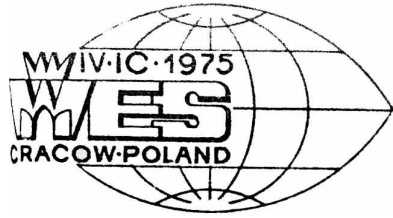
1. Accroissement de la production de ciment portland.
2. Mettre en fonctionnement le projet d'élaboration de sels de magnésium à partir de la dolomite calcinée et de l'eau de mer.
3. Exploitation, concentration et pelletisation du minerai de fer.
4. Exploitation d'améthistes et d'agates avec contrôle de l'état.
5. Idem granit noir.
6. Exploitation des sables noirs.
7. Idem monmorillonite.
8. Idem calcaires /Rivera/.

Programme d'investigation

Il faut indiquer les priorités de la programmation de l'investigation des ressources naturelles en considérant son intégration aux objectifs du développement.

Les sources d'énergie jouent un rôle décisif dans la politique d'industrialisation. Après, on procédera à rechercher les principaux gisements et les techniques appropriées pour leur exploitation. De cette façon on tiendra compte de ce qui est nécessaire pour le développement des ressources minérales et le potentiel scientifique et technique.

Les résultats de cette interconnexion auront une plus grande influence dans le niveau de la vie future que tout le reste des facteurs économiques, parce que la planification, le développement et la mise en ordre des ressources minérales sont plus efficaces s'ils sont réalisés en forme intégrée.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Lydia G. Tansinsin

ENERGY RESEARCH AND
DEVELOPMENT IN THE
PHILIPPINES

Section 6: Raw materials and power engineering.

Printed according
to the author's original

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Miss Lydia G. TANSINSIN was born in Manila on 27 October 1933. Her parents come from two different regions, Central Luzon and Western Visayas, and are both Catholics and university educated. She grew up and was educated Manila, finishing her elementary education in a public in school and her secondary education at Holy Ghost College. Attracted to Chemical Engineering, she enrolled at the University of Santo Tomas and graduated in April 1954. She placed 2nd in the Philippine Chemical Engineers examination given by the Board of Chemical Engineers to all chemical engineering graduates who would like to practice in the Philippines. In order to supplement her knowledge, she studied law and graduated in 1960. While taking up law, she was recruited to join the National Science Development Board /NSDB/ in 1958 in the position of Assistant Scientist. Her main duties and functions are to assist in the planning, evaluation and supervision of research and financially by the NSDB. In 1961 she was a recipient of a Japanese government scholarship for graduate studies. She took up Japanese language for one year and later worked fully for 2 years on her studies on High Polymer Chemistry graduating on March 1964 with the degree of Master of En-

gineering. She returned to her country and in August 1, 1965 she was promoted to the position of Senior Scientist in-charge of planning, programming and evaluating research projects. In addition to her regular work at the NSDB, she was detailed to work with the Program Implementation Agency/PIA/ an office under the direct supervision of the President of the Philippines from 1964 to 1965. She worked on industrial estate projects and the rationalization of the establishment of different industrial projects in the different regions of the Philippines. Later, on November 26, 1970, she was promoted to the position of Supervising Scientist doing more or less the same functions. In January 16, 1974, she became the Acting Chief of the Division. However with the Reorganization plan being implemented, she was appointed Chief, Planning and Programming Division last June 1974. Aside from the stated duties she is the Chief of the Energy Research and Development Staff whose primary function is to plan, supervise and coordinate all energy researches by the NSDB, its agencies and other research institutions.

In addition to her regular duties, she is also a consultant on Science and Technology at the National Economic and Development Authority /NEDA/, primary economic planning body of the Philippine Government from June 1973 to the present. She is also the representative of the NSDB to the UNIDO Technical Committee since 1970. She is

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She is an active member of the Philippine Institute of Chemical Engineers and presently Vice President and Director. She has been the President of the Women Chemical engineers of the Philippines from 1970-73. She is a Director in the Consumer's Movement of the Philippine and member of other organization, either connected with her office or not.

She has attended various conferences and was a recipient of the Deutsche Akademischer Austauschdienst/DAAD/.

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Lydia G. TANSINSIN
National Science
Development Board
P h i l i p p i n e s

ENERGY RESEARCH AND DEVELOPMENT IN THE PHILIPPINES

INTRODUCTION

A global crisis caused by escalating prices and uncertainty of supply is threatening to cripple the social and economic machinery of all countries which are heavily dependent on oil for their power needs. The Philippines is no exception. It derives 93 percent of its energy requirement from its oil imports and the government has been increasingly aware of the adverse repercussions which could result should the impending crisis reach its zero hour. In anticipation of this, the government has adopted precautionary measures which are intended not only to ensure a constant supply of oil but also to reduce oil dependency and avert the spiraling prices of oil products. As a further step, the government has also embarked on a research and development program that aims to develop and exploit alternative sources of energy such as geothermal, nu-

clear, coal, other indigeneous and non-conventional materials and to carry out certain policies - necessary for fuel conservation. These precautionary measures and policies will be implemented through the integrated efforts of government agencies involved in energy development, control and utilization.

BACKGROUND INFORMATION

The gravity of the energy situation is very apparent from Table 1. The demand of petroleum oil at 50.30 million barrels in 1972 would be 91.70 million barrels by 1985 almost double, if the projection is based on growth alone, with the uncertainty of supply and the ever-accelerating prices, the Philippines is indeed in a grave predicament. The economic chaos that will result the moment there is a retrenchment in oil supply is beyond measure.

At present, the Philippines energy requirements are filled up from three sources: fuel oil, hydropower and a very negligible amount of coal. It cannot be overemphasized that the Philippines is very oil dependent. Recent developments have shown that this procacious situation must be reversed to avert serious economic and technological setbacks. Consequently, research and development projects on-conventional sources of energy have been stepped-up. Cresh programs are being undertaken to reduce oil dependency as early as possible. Of course, there is hope that there will be an oil strike in the country in the

near future, but the energy plan is rather pessimistic in the sense that it discounts this possibility. Anyway, supposing that the implementation of this plan will not suffer any drawbacks and that explorations will prove fruitful, the energy sources picture will radically change from its lopsided date in 1972 to an increasingly balanced distribution in the 1990's as indicated by Table II.

**Table II. Installed Power Capacities /by source/
/Present and Projected/**

	1972	1980-85	1980-95
Thermal	1890 MW/74%/	3690 MW/40.5%/	2800 MW/23.2%/
Hydro	640 MW/25 %/	2140 MW/32.0%/	2790 MW/22.0%/
Geothermal	-	500 MW 2.5%/	2500 MW/20.0%/
Nuclear	-	1200 MW/18.5%/	5200 MW/32.3%/
Coal, others	25 MW/1%/	100 MW/1.5%/	1000 MW/8.0%/
Natural Gas	-	-	300 MW/2.5%/
Total	<u>2055 MW/100%/</u>	<u>1,130 MW/100%/</u>	<u>1, 2590 MW/100%/</u>

‘ Projector's based on growth with suggested resources considered from NEDA.

Energy Plan and Policies

As a basic guideline for the implementation of research and development programs, the National Energy Plan and Policies was drafted as per instruction by no less than the President of the Republic of the Philippines. In turn, this was appended to the Fouryear Development Plant FY

1974-77. A brief summary of the objectives and strategy of the Plan is given below:

Four Fold Objectives

1. To decrease or to curb demand for oil and oil products
2. To ensure constant supply of petroleum crude
3. To avert spiralling of prices for oil and oil products
4. To look into the institutional arrangements needed.

Strategy

A. Institutional Arrangements -

1. Power development program to be re-oriented
2. Transportation program to be integrated into Energy Plan
3. R and D programs for energy to be accelerated.
4. Oil Industry Commission's functions to be restudied
5. Industry rationalization program to consider energy usage.

B. Short-term Measures -

1. Further acceleration of oil operation program
2. Ensuing long-term supplies of oil exploration program
3. Increased stockpiling of petroleum oil
4. Fuel allocation program

5. Stepped-up research and development program
6. Enforcement of tax and price mechanism
7. Public information drive

C. Long-term Measures-

1. Development and utilization of alternative sources of power
2. Fuel conservation and substitution.

Guideposts

1. Savings in energy not to be achieved at the sacrifice of industrial growth
2. Government assistance in the form of subsidies and soft loans
3. Ecological equilibrium to be maintained but not at the expense of the energy program or economic growth.

Research and Development Program

The backbone of the Energy Plan is a bold energy research and development program intended to achieve the aforementioned goals with emphasis on fuel substitution. All government agencies concerned with the energy aspect of industrial development are pooling their manpower and financial resources together to make this crash program really responsive to the needs of the times. These include the National Economic Development Authority, the National Power Corporation, the Power Development Council, the Bureau of Mines, the Oil Subsidy Commission, the National

Science Development Board, the Commission on Volcanology, the Philippine Atomic Energy Commission, and the its various agencies and other institutes which are directly involved in research. The University of the Philippines has also greatly contributed to the program in terms of manpower and facilities.

GEOHERMAL ENERGY EXPLORATION

Geothermal potentials are very promising in the following areas:

1/ Los Banos Thermal Area – This is located in the northern base of Mt. Makiling, a dormant volcano in Los Banos. It is characterized by hot spring manifestations and at present, hot bath resorts have been developed. This has become a priority area in view of the fact that it is near the city. There is an existing power transmission line passing through the area, and the demand for power, already exists in the vicinity.

2/ Tiwi Geothermal Area – This is located at the foot of Mount Malinao, a dormant volcano in Albay. It is characterized by boiling springs of mud or clear water pools Geological and geo-physical investigations were undertaken and six exploratory holes have been drilled. Presence of steam was indicated at 150 to 200 meter depth. A seventh well presently supplies steam to a 2.5 kilowatt turbine generator set. One advantage of this area is its proximity to the sea, thus facilitating disposal problems. At

present, arrangements have been made for its commercial development.

3/Leyte Teothermal Fields - There are two areas of geothermal potential in Leyte, namely, the Ormoc thermal area and the Bureau Thermal Area. The former's hot springs with boiling temperature and geysering activities are however, more impressive. The development of the area assisted by the New Zealand government under the Colombo Plan.

In addition to this, several other areas are being investigated as potential geothermal energy sources.

Nuclear Energy

The go-signal has been given to commence institutional arrangements and preparatory planning for the commissioning of a 600 MW nuclear power plant in Batangas of Bataan. The second is in the planning board.

Coal Resources

The estimated total reserves have reached up to 120 million tons. Mineable reserves have been found in Malangas, Zamboanga del Sur, /7.8 million tons and 12,000 BTU coking and non-coking and in Semirara, Antique /6 million tons and 8,000 QTV, non-coking/ of reserves have been found in Cebu, Polillo, Catanduanes and other areas.

The problem is that Philippine coal reserve is not presently suitable for power generation. It is a must to "buy" the latest foreign technology –coal gasification. There is a good prospect for a large scale /100MW/coal

power plant in Cebu being planned by the National Power Corporation.

Natural gas deposits have been examined North of Cebu City and in Southern Isabela and are known to exist in Mindanao, Iloilo and Bicol. Small deposits occur in several other localities. One possibility of utilizing those small pockets is to use movable plants that will collect these scattered natural gas deposits.

Onshore and offshore exploration for oil's petroliferous gas is being undertaken. Minor investigations are underway on the gas deposit in Cebu and deposit prospect in the Cagayan Valley.

The National Science Development Board with the help of its various agencies, is responsible for a total of twenty-two /22/ projects. Seven /7/ of these have already been completed while most of the remaining on-going ones are nearing completion. These projects are enumerated below together with some relevant information on their progress and in case of the completed ones, on the results and conclusions.

1/ Design and Development of an Improved Prototype Windmill for Pumping Water for Domestic Purposes and Low-Power Electricity Generation.

At present, there are two /2/ designs of windmill structure being tried by researchers in order to collect comparative data and, on the basis of these, to determine

the better design. One is using the conventional blade, the other is using the anemometer shape or the cone shaped blade.

2/ Fuel gas production from agricultural wastes and Garbages'

It has been established that methane-producing bacteria can be isolated into pure cultures. The starter composed of 10 bacterial shortened by 50% the waiting period from seeding to the production of flame. Fuel gas production in both multiple and single digester was successfully carried out. With the fabricated gas burner, a hole diameter of 1/8" and a distance of 1/2" are necessary to effect good combustion. Chicken dung produced gas the earliest and with faster rate compared with hog, carabao, cow, horse or rabbit manure. The highest percentage of methane produced is 70% with 30% carbon dioxide and trace amounts of carbon monoxide. The period of production is 1 hour and 35 minutes per liter of gas from 5 kg manure for 2-28 days. The flammable gas can be produced within 4 days.

3/ Alcohol Production from Industrial and Agricultural wastes –

Two materials, cassava bagasse and cassava starch are being separately studied as possible sources/of alcohol.

4/ Coconut oil and Derivatives as Fuel - for Internal Combustion Engines' .

Tests have been made on the flammability and viscosity of various chemical derivatives and results show that the residue after fractionation steamsmost promising as a diesel substitute, its viscosity approximating the standard specifications for commercial diesel fuel. Pilot plant activities and test runs are being started.

5/ Sawdust, rich hulls and coir dust as fuel household and industrial uses.

Results indicated that molded sawdust fuel is more suitable than either molded coconut co1r dust or rice hull because of the high flue temperature exhibited during and the long effective cooking time and molding properties. A suitable stove than can maximize heat utilization is being designed.

6/ Design of charcoal-making equipment" and promotion of charcoal production.

7/ Producer Gas from Indigenous fuels'

A bench-type medium size experimental gas producer was designed and fabricated. The experimental reactor has a grade area of 2.4 sq. ft. and is convertible from updraft operation to downdraft and viceversa. Various kinds of solid waste fuels such as coconut shells and ipil-ipil chips were used in a number of experimental runs. Results showed that the updraft gas produce appears to produce quality gas.

8/ Hydrogenation of solid fuels'

The selection of catalysts for the hydrogenation is based mainly on a compromise between high catalytic activity and low cost. The catalysts prepared were Fe_2O_3 and Adkin's copper chromite. Both can be prepared from readily available local materials.

9/ Liquid fuel Synthesis of wastes products'

The synthesis gas used can be obtained directly from the closed carbonization of coconut /coir/ dust, an abundant waste product. The gas is free from sulfur and therefore can be used directly in the converter. Considering that the synthesis gas can be produced cheaply, an economical process from methane synthesis might be obtained.

10/ Conversion of Oil-lined Boilers to Solid-fuel Boilers'

The conversion of a 100 hp boiler to utilize producer gas from a reactor of 10 sq. ft. grate area is a partial success in that a steady steam engine-generator load of 55 KW was maintained for some 5 hours of operation.

11/ Production's Utilization of Coco Gas for Mechanical Power'

Production of coco-gas from carbonization retort using coir dust as fuel and produce gas from complete gasification of coconut shells were attempted. More investigation is needed due to some problems that came up in the process.

12/ Producer gas generation for automative and hous-

hold fuel.

13/ Conversion of a Dodge six-cylinder Engine from Gasoline to Alcohol Burning

14/ Feasibility of Utilization of Natural man-made Forest Generating Electricity.

The technical feasibility of wood fired steam Power plants has been shown. The critical factor in the use of wood as a fuel competitive or cheaper than bunker oil hinges on its extraction from the forest which is the biggest item in the production cost of wood. The economic feasibility have to be looked into. Tentatively, ipil-ipil wood appears to be the cheapest fuel for an independend wood priced power plant.

15/ Solar Power for Agro-Industrial Purposes

A contraption has been designed and completed and initial tests being made.

16/ NSDB Utility Model Coirmill as Source of Power for Electrical Light and Water System /see 1/

17/ Pilot-Plant production of alcohol from Molsasses, Cassava and other carbohydrates sources

18/ Science Project as source for Methane Gas Production

19/ Design of an Experimental Engine to tap the Potential of Ocean waves for power production.

20/ Study on the Utilization of low-reserves Natural Gas

21/ Research, Development and fabrication of devices equipment to utilize Solar Energy for Water Heating, Environmental Heating, Cooking and Drying for Domestic, Commercial and Industrial/Purposes.

It is true that most projects are still exploratory in nature and that technical difficulties still bar the way for long-term and efficient operation of devices designed and operated, but there is no doubt that after commercial scale application is initiated, they will have their share in paving the way for fuel sufficiency.

Conclusions and Recommendations

It can be said that the Philippines is leaving no untrodden path in its pursuit of fuel sufficiency. Although not a few difficulties, most of them technical, have been met, the energy research and development program is locally but surely realizing the goals it has set out to accomplish. And in all its researches the manpower scientists and engineers are capable participants.

It must be emphasized, however, that to make program implementation easier, faster, and more productive assistance in planning and technical matters is very welcome, it not necessary technological knowledge from abroad would be a big boost and cooperation by the private sector is greatly desired. In all aspects, the Philippines is looking forward with optimism to the time when, through the advent of fuel sufficiency; the economic stability of the country will be firmly established.

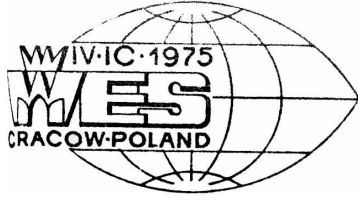
TABLE I. FORECAST OF ENERGY DEMAND/from petroleum oil/

POWER GENERATION	1972	1980		1985	
		FORECAST A'	FORECAST B'	FORECAST A'	FORECAST B'
Vol. in million barrels	7.52	11.21	9.46	13.30	10.67
Percentage	15.00%	14.70%	14.5 %	14.50%	14.32%
TRANSPORTATION					
Volume	22.36	31.87	27.09	37.20	29.98
Percentage	44.40%	41.80%	41.53%	40.60%	40.23%
INDUSTRIAL					
Volume	16.04	27.62	23.89	34.40	25.52
Percentage	31.80%	36.20%	36.63%	37.50%	38.28%
OTHERS					
Volume	4.38	5.63	4.79	6.80	5.34
Percentage	<u>8.80%</u>	<u>7.30%</u>	<u>7.30%</u>	<u>7.40%</u>	<u>7.17%</u>
TOTAL	50.30	76.33	65.22	91.70	74.50
	100.00%	100.00%	100.00%	100.00%	100.00%

'FORECAST A: Based on normal growth alone

'FORECAST B: Based on growth with suggested measures considered

National Economic and Development Authority-National Energy Plan and Policies.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Rashmi Rastogi

DESIGN OF A 16 – BIT
DATA PROCESSOR

**Section 5: Automation and computer
science problems..**

Printed according
to the author 's original

Organizer and Editor:
The Center for Progress
in Technology

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DESIGN OF A 16-BIT DATA PROCESSOR

Introduction

The design of a data processor was undertaken with the following objectives, which led to a relevant choice of various system features and technology.

I/ It would be used as a general purpose processor for computations involved in on-line process monitoring and control, data acquisition and logging, and other real-time applications.

II/ The processor should provide extensive input/output control and data transfer capability with multilevel interrupt priorities to communicate asynchronously with a gamut of external devices.

III/ It should have adequate data word length for the applications in view, high speed memory access and internal operations, and a fast response interrupt handling mechanism.

IV/ The technology used should be such as to ensure

high reliability, easy maintainability and minimum production problems.

In view of these considerations, the system included the following features: 16-bit word length core memory expandable to 32K words, 4-accumulator organisation, parallel synchronous working of CPU, incorporating micro coded structure, 16-level input/output interrupt priorities, a hardware push down stack and direct memory access channel for communication with high speed devices.

System organisation

The block diagram of the Data Processor is shown in fig.1, depicting various registers, functional units and inter-communication paths as described below:

1. ACCUMULATORS: The four accumulators ACO-AC3 are 16-bit long general purpose program addressable registers, used for memory load and store functions and stack operations, as operand registers for arithmetic and logic operations, and index registers /only 2 accumulators/ and for programmed data transfers with input/output device buffers.
2. MAIN MEMORY: with the 16-bit Address Register /MAR/ and 16-bit Data Register /MDR/, having 16-bit word length and 1 μ sec cycle time.
3. PROGRAM COUNTER: A 16-bit register, which points to the next instruction to be executed.
4. STACK POINTER /SP/ A 16-bit register pointing to

the top empty location of the Push Down Stack. The stack pointer can be set by an instruction, thus relocating the stack anywhere in memory.

5. INSTRUCTION REGISTER/IR/: A 10-bit register used to store the operation-code part of the instruction during its execution.

6. ARITHMETIC AND LOGICAL UNIT /ALU/: This unit is designed for parallel high speed operation on full word operands /16-bit/ with built in carry look-ahead feature. This unit is used for all arithmetic, logical and shift operations, and also for effective address calculation during instruction fetch phase, as well as Add Data and Increment operations provided with direct memory access transfers.

7. CONTROL: This unit generates appropriate micro-functions /control signals/constituting all CPU operations. The micro - functions control various micro-operations in the computer, such as interregister transfers, communications with memory, arithmetic/logical unit functions and input/output control operations.

8. T-BUS: It consists of 16 parallel data paths. It is a pipe line which is used for inter-register transfers. All the register outputs are multiplexed on to the T-Bus, and the T-Bus is demultiplexed to the inputs of all registers. The data transfer is controlled by the micro-functions generated in the control unit.

9. INPUT/OUTPUT CONTROL UNIT: This unit receives input/output commands, and provides communication of control and status signals, and data paths between peripheral devices and CPU.

10. CONSOLE AND SWITCH REGISTER: The Console consists of status and data indicators, 16-bit Switch Register and various functional switches to provide operator communication with the data processor. The Switch Register can be read into any accumulator by an instruction, and serves for reading parameters during program execution, as well as for manual loading of programs, addresses and data.

SYSTEM FEATURES

Instruction Formats:

The instructions are single word instructions, and are divided into 3 groups:

- I/ Memory Reference Instructions
- II/ Arithmetic and logical instructions
- III/ Input Output Instructions

MEMORY REFERENCE INSTRUCTIONS /MRI/: The instructions in this group include memory Load and Store, Increment and Decrement Memory with Skip on Zero result, Jump and Jump to-Subroutine. The Jump-to Subroutine instruction automatically uses the push down stack for storing return address, and provides for easy subroutine nesting. These instructions refer to a memory location, whose address can be specified in the instruction word in a variety of modes.

ADDRESSING MODES: In direct addressing. The effective address is given by 8-bit displacement as the absolute address 10 to 255₁₀/, or relative address/PC + displacement in 2's Complement/, or indexed address /contents of AC2 or AC3 + displacement in 2's Complement/. Alternatively, the address so calculated may be specified in the instruction as Indirect address.

In the indirect addressing mode, the indirect address gives the address of a location containing the actual address of operand /one-level indirect addressing/ or an other indirect address / multilevel indirect addressing/ which must be accessed for the operand address. The multi level indirect addressing is indicated by a particular bit in the contents of the indirectly addressed location. If this bit is 1, it represents another level of indirect addressing, and thus a chain of indirect addressing may be set. Finally, the chain is terminated with the address having the indirect addressing bit equal to 0. This is then the actual address of the operand. Indirect addressing and indexing are useful tools for implementing table-look up and provides easy access to different elements of data structures.

AUTO-INDEXING: When locations 100₈-107₈ are addressed indirectly their contents are automatically incremented by one, while in case of locations 0110₈ to 0117₈ the contents are decremented by one, and the results are used as

the effective address. This auto-indexing feature is a convenient and inexpensive means of addressing successive elements of arrays.

ARITHMETIC AND LOGICAL INSTRUCTIONS /ALP'S/: These are non-memory reference instructions, and employ immediate operand addressing. That is, they take the operands from the contents of any one or two of the accumulators. The result of the arithmetic/logical operation may be stored in accumulator, if a NOLOAD is not indicated in the instruction.

Since ALP's do not reference memory, the arithmetic/logical operations are fully executed in one cycle, and the remaining bits of the instruction word are employed to micro-code the SHIFT, Carry initialization and SKIP operations. The SHIFT and SKIP operations are performed on the result of the arithmetic/logical operation within the same cycle. The micro-coded structure of arithmetic/logical, shift, and skip sensing operations alongwith option to NO LOAD result provides a powerful set of arithmetic and logical instructions.

The arithmetic/logic unit treats the operands for arithmetic operations as single precision 2's complement binary numbers, and the logical operations are carried out bit-by-bit on all the bits of the word. The arithmetic operations include ADD, ADD COMPLEMENT, SUBTRACT, NAGATE/2's complementation/, INCREMENT, MOVE /between accumu-

Lators/, and logical operations include COMPLEMENT and AND. Besides, micro operations include Shift Left or Right/rotate by 1 bit /, Byte swap, and Skip on Zero, on Non –zero Result or carry or both.

INPUT/OUTPUT INSTRUCTIONS: These instructions perform data transfers between accumulators and peripheral device buffers /a device may have up to three buffers/, control and sense the status of devices, perform communication with console switches and operations connected with interrupt servicing.

The data transfer instructions and the device control instructions /such as Start, Sense Status/ are micro-coded in the same instruction-word, and are executable in one cycle. The I/O instructions can access up to 62 external devices, the device code being indicated in the instruction.

COMMUNICATION WITH EXTERNAL DEVICES: Slow peripheral devices communicate with the CPU by programmed data transfers, which can be done in the following two ways:

1/ The program can sense the device flags and effect data transfer when the device is ready. This mode is easy to program, but makes the program execution dependent on the device speed.

2/The device may send a request to interrupt the CPU whenever it is ready for data transfer. The CPU acknowledges the interrupt request, identifies the device re-

questing interrupt and transfers control to the relevant servicing by the CPU is called the “response time” and is kept minimum by suitable design of interrupt handling mechanism in the processor. The response time is an important parameter for real-time applications.

Each peripheral device is assigned a fixed location in memory to avoid polling of the devices/which delays the response/for servicing an interrupt request. The Interrupt System stores the current program counter on stack, and transfers control to the memory location assigned to the particular device. This location generally contains a Jump to the appropriate device servicing routine. Return from the interrupt servicing routine may be made by an instruction, which automatically restores the program counter from the stack, and returns control to the place of interrupt in the programme being executed.

INTERRUPT PRIORITIES: A 16-level hardware interrupt priority structure has been built into the system. The external devices are distributed amongst the 16 priority levels depending upon the urgency of device-service. Higher priority device can interrupt servicing routines of devices having lower priorities. The relative device priorities can also be altered by program by suitably masking higher priority interrupts.

DIRECT MEMORY ACCESS/DMA/DATA CHANNEL: Data communication with external devices under program control em-

playing interrupt mode or otherwise, involves execution of several instruction for each word transferred, and their respective servicing routines have to keep track of the accumulators used, and this consume considerable CPU time. High speed devices such as magnetic tapes, drums, discs etc are connected to the data channel, which is a special data transfer circuitry, and permits data transfers directly between the main memory and the device without involving CPU registers and no program intervention is required for data transfers. The devices connected to the data channel once initiated by an input/output instruction, gain direct access to memory on a CPU cycle "stealing" basis. When the device requests a data transfer on DMA channel, the CPU "stalls" or "pauses" for one cycle, and the data transfer is done. Cycle stealing does not disturb the program sequence. In case of continuous requests for transfer, CPU will stall until the transfers are completed. The devices connected to the data channel have a fixed priority assignment amongst themselves, and have a higher priority than the devices connected to the programmed channel.

The response time for devices over the data channel depends on when its request is made within execution of an instruction and the number of devices of higher priority requesting access at that time. A device must wait until the higher priority devices have been serviced.

Four mode of access are permitted on the data channel:

- I/ Data input from the device to memory.
- II/ Data out from memory to the device.
- III/ Increment the memory and output the result to the device.
- IV/ Add-to-memory: Add the data from the device to the memory contents, and output the result to the device.

If an overflow occurs while performing the data channel arithmetic, a signal is sent to the device. The memory increment feature is useful for amplitude distribution measurements and will effectively generate a model of the input/output voltage amplitude distribution in the computer. Add-to-memory feature can be usefully employed for signal and data averaging applications.

All the Input-Output transfers are carried out over an I/O bus. The I/O bus consists of 48 lines which include bidirectional data lines, device selection lines and control lines.

PUSH DOWN STACK: The hardware push down stack is an arbitrary set of consecutive memory locations. The Stack Pointer, which can be preset by an instruction, points to the top empty location of the stack. The ~tack instructions store in, or fetch from, the top location on LIFO /Last-In-First-Out/ basis.

The stack can be effectively used for the following purposes.

1/ Storing and restoring data in LIFO manner, which is useful for saving important information in case of interrupts, and also for system programming applications.

2/ Nesting of Subroutines: Normally a branch to a subroutine from the main program is effected by a Jump-to-Subroutine Instruction./JSB/. The JSB stores the contents of AC3 on top of stack, the contents of PC in AC3 and transfers control to the specified subroutine. Control will be returned to the calling program at the end of the subroutine by a Jump-Indirect instruction referring to AC3. This facilitates nesting of subroutines.

3/ Nesting of interrupts: When an interrupt occurs, the contents of PC are automatically stored on stack and control is transferred to an appropriate device serving routine. If during the device service routine, a higher level interrupt occurs, PC is again stored on stack and control is transferred to higher priority device service routine, and so on, providing nesting of interrupts. A return from interrupt instruction /RTI/ restores the contents of PC from stack and control returns to the previous point of interrupt.

LOGIC DESIGN

Logic design considerations:

The data processor logic design was carried out with

the following considerations in view:

1. **Modular design:** Logic design as aimed at making the system modular i.e. consisting of functional blocks for ease of adding additional memory blocks and peripheral interfaces to facilitate testing and easy maintenance by quick replacement of modules in case of breakdowns.
2. **Regular logic:** The instruction set designed around multiaccumulators and parallel synchronous design render the logic to be more regular, and easy to build around MSI chips used for registers, counters arithmetic/logic units, multiplexers used in parallel data paths etc. The portion of logic required for generating control signals is built around small IC's such as gates and flip flops, and is referred to as irregular logic. The irregular logic is to be kept minimum.

The regular logic implemented using MSI's reduces interconnections within and between modules considerably, resulting in greater reliability and lower cost per function.

3. **Choice of Logic:** An optimal choice of the logic family was made by considering factors such as range of functional chips, cost availability from several sources, noise immunity and speed. These factors have been compared for different logic families /ECL, RTL, DTL, TTL/, and the results are published in literature /9/. The conclusions arrived at are summarized as follows:

ECL is fastest and has best noise immunity but has a limited range of availability.

RTL is least expensive, but has low speed, low noise immunity and smallest range.

DTL and TTL are quite close to one another in speed and cost, but TTL has better noise immunity, wider range of products and availability.

Other considerations were that new designs in RTL and DTL were fast declining, which would result in their increased cost and reduced availability, whereas an extensive range of MSI's was available in the TTL circuits family.

In view of the above considerations, TTL circuits were found to have the best combination of characteristics desirable for the design of the Data Processor.

DESIGN APPROACH: All the operations in the data processor are synchronous and parallel on all the bits of data words. They are timed with respect, to a 1 μ sec period master clock which corresponds to one memory cycle time. This clock time is referred to as a major cycle. The major cycle is divided into eight minor cycle times T_1 to T_8 of 125 usec duration. Memory access can be made once in a major cycle. Memory reference instructions involving memory references for instruction fetch, indirect addressing and operand access, may require several major cycles for execution. The arithmetic/logical and the input/output instructions refer to memory only for instruction fetch and are

executed fully in the same major cycle.

The CPU operations viz. instruction execution, response to data channel, and interrupt request are carried out in one or more major cycles. Each cycle characterizes a function, and termed as a phase. Various CPU phases are described here.

I/ Fetch: All the instructions are 'fetched' from main memory in this phase. The non-memory reference instructions namely the arithmetic and logical instructions and the Input/Output instructions and the memory reference instruction Jump with direct addressing are completely executed in this phase.

II/ Indirect: The indirect address in memory reference instructions using the indirect addressing mode, is retrieved from memory in this phase. The number of memory references required will depend upon the level of indirect addressing used, and the indirect phase will remain set for several major cycles until the actual address of operand is determined.

III/ Execute: The execution of memory reference instructions involving operands is completed during this phase.

IV/ Interrupt: This phase is set when CPU attends to an interrupt request from peripheral devices after the current instruction is completed. The point of return /PC/ is stored on stack and control is transferred to the servicing routine of the interrupting device.

V/ Data Channel: The direct memory access operations via the data channel are carried out in this phase. This phase is set when a Data Channel Request is received by CPU, and the current instruction is completed.

Each of these phases remains set for one major cycle duration except in case of add and increment data modes of Direct Memory Access, for which cycle extension is required since the 1 μ sec time of the major cycle is insufficient.

At the end of each phase, conditions are checked to determine the next phase to be set. Particularly, the conditions for final cycle of an instruction are significant, at the end of which normal incrementing of Program counter /PC/ is done /for Jump Instructions the PC is set to the effective address/, and Interrupt Phase or Channel phase is set if either interrupt or data channel request has been received during the current instruction. The final cycle of memory reference instructions /except Jump with direct addressing/ is Execute phase; that of other instructions /except Jump Indirect/ is fetch phase, and for Jump Indirect instructions, the final cycle is the Indirect phase. The Data Channel phase can be set after a final cycle of an instruction, or after the interrupt phase or a data channel, if a data channel request comes. The interrupt phase is set after the final cycle of an instruction if an interrupt request is received by

CPU and no data channel request is pending or received along with the interrupt request.

The processor logic design approach consisted in defining basic micro-operations which formed control signals for inter-register transfers, setting or resetting phases, incrementing/decrementing counters, selecting functions of arithmetic/logic unit, input/output communication, selecting memory access mode /READ/WRITE/READ-MODIFY-WRITE/ etc. The function of each instruction was logically defined in terms of the necessary micro-operations in a proper sequence during each cycle. Finally, the logical equations for each micro-operation were formed using conditions /phase, minor cycle within the phase, instruction-code being executed, interrupt/data channel requests etc./ required for generating each of the minimal logic forms were combined using gates /NAND, NOR, AND-OR-INVERTS/. The implementation of the logic equations using IC's was governed by various factors, such as propagation delays through the chips, fan-in and fan-out of the chips used, placement and grouping of chips so as to have minimum and short interconnections. The propagation delay is important due to the fact that the logic tree of a micro-operation may consist of several levels resulting in additive propagation delay.

The T-Bus which is pipe-line of communication from any register to every other register may connect at any

time only one source to one or more destinations, and this is ensured by proper timing and selection of the control signals.

CONCLUSION

The design of the 16-bit Data Processor was carried out as described briefly in this paper. The detailed description of system organisation, instructions and design implementation is covered in another publication, which is under preparation.

ACKNOWLEDGEMENT

The author is grateful to Dr. N.K. Ganguly for his encouragement to publish this paper, and thankfully acknowledges Dr. P.K. Patwardhan's guidance in the project. She acknowledges the participation of her colleague Mr. A. K. Agrawal in the design of the data processor, and wishes to express her sincere thanks to him and Mr. K.S. Kane for their valuable suggestions in writing this paper. The author is also thankful to Mr. N.K. Chellappan and to Mr.K. I. S. Namboodiri for typing this paper and to Shri A. Swami Durai for cyclostyling.

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FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

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COMPUTING TECHNIQUE
AND SOCIAL
RESPONSIBILITY

**Section 5: Automation and computer
Science problems.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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COMPUTING TECHNIQUE AND SOCIAL RESPONSIBILITY

Industrial production of computers started at the beginning of the fifties, i.e. about 25 years ago. Nowadays computers of first generation are but of museum value and machines and systems of third generation are working. The production of computers and their peripheral apparatus represent a significant share of electronic industry in the advanced countries. A similarly important branch employing a lot of people, is the production of programs/software/for the installation and application of computers. A new branch of industry came into existence which is even blooming in the present slum. This is computing technology that consists of the production of hardware and software. The estimated number of people concerned with computers namely with their production, installation and application/ is for instance, at present in Hungary being relatively not too advanced in computing and a rather small country-as high as some thousands.

Computers were developed by the need of solving highly complicated tasks in physics and mathematics involving an enormous volume of computation work. Furthermore computing technique has a reaction on science, especially on mathematics. A new branch of science arose: computer science, difficult enough to be determined, dealing among others with operating mathematical machines /automata theory/, mathematical foundation of logical design, properties of languages /especially that of programming languages/, numerical methods, verification of programs, theory of algorithms, and so on. Some years ago these enumerated disciplines either did not yet exist or at most they represented a subsection of mathematics /e.g. theory of algorithms/, or having been of too highly theoretic character /e.g. abstract algebra/ not more than a handful of mathematicians found an interest therein. While about 20 years ago the knowledge of programming languages/or only that of one language/ was the privilege of the few of highly educated mathematicians, engineers, nowadays advanced programming languages are taught and used at secondary schools.

After some opinions the impact of computers on human civilization can be compared with the effect of the introduction of electricity. No doubt, however, the application of computers has enormous benefits in the contemporary societies. I do not intend to treat at length the variety and advantages of the computers' usage here, since there

is quite a number of articles, books, advertises having been published on these subjects day by day. After all, the computers, computing systems working all over the world in a number of some hundred thousands had to be sold somehow, potential users had to be persuaded, and last but not least, since they exist, it seems logical that they are to be applied, anyhow. It is enough to mention e.g. their important role: in weather forecast, or the prediction of elemental disasters, in cosmonautics, prevention of epidemics, public health, criminal investigation as well as in the automatic control of production processes or in traffic control.

There is a number of people who consider computing technique - I think, under the inspiration of rather incompetent publications of some journalists - as a proper tool able to contribute in the solution of distressing troubles of mankind. Others /in Hungary e.g., mainly some poets and writers/ regard computers only good for alienation, mechanization of men.

A technical device is as harmful or beneficial as it is being used. Nonetheless the history of progress of computers and their final triumphal process is a bit thought provoking.

Devices for mechanization of computation work have been used for a long while /the abacus e.g. since antiquity/. The great French mathematician and philosopher, B.Pas-

cal conceived a machine for calculating the four basic arithmetic operations as far back as the 17th century. The British genius, Ch. Babbage built the first difference engine and proposed an "analytical engine", in principle very similar to the contemporary computer, in the earlies of the 19th century. But in those times there was no social demand for them.

The predecessors of present, electronic computers were mainly developed and even built by scientists who desired to carry out the numerical works of their scientific problems /with a large volume of computations involved/ more rapidly and more reliably than they were able to do by manual work /e.g. Stibitz, Aiken, Mauchly/.

Theses initiations, however, did most likely remain isolated, individual experiments. **The decisive impact given by the war.**

In the World War II, in the USA the ENIAC, the first electronic computer was built especially for large scale ballistic computings to be applied for the new projectiles /1 and 2/. The basis for industrial production, of wide and general use was created by semiconductor devices and their progress in technology. The date of the begin of the computer era /the early fifties/, however remind of the fact that those were the years of the Korean War and of the "Cold War" as well.

At present computing technique is as inseparable fr-

om civilization as e.g. autocars; and as the use of cars en mass has its social aspects, contradictions /eg. pollution/ which have to be treated; in the same way it seems indispensable to point out the contradictions and dangers which are involved in the wide spread application of computers. In the following I should like to draw attention to some of these dangers.

1. World Model

Since ancient times there have been many experiments to determine the regularity of the processes in human societies. A quantitative analysis of a model predicting the common future of mankind, however, is not to be conceived by solely mental means and manual computations. Furthermore the creation and evaluation of a global model become more and more pressing since in the second half of the 20th century, modern technique, especially telecommunication, traffic, international cooperations in production and the globally spreading pollution ceased the isolation of the countries and continents. But the countries have approached in the troubles of such grave problems as scarcity and uneven distribution of food, famines, growing and cumulating pollution too.

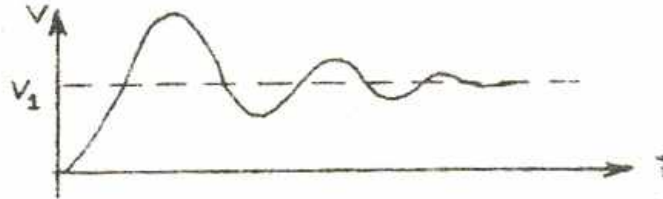
By the means of computer at least a possibility arose to compute and evaluate the relations of an approximate model and the trends of its variables resp. The well-known world model /3/ had been treated and criticized

/e.g.4/, and the authors themselves gave new results since the publication of their first report.

Conclusions deducted on the basis of the world model involve, in my opinion, serious dangers. No doubt that some, more or less quantifiable results and trends of global processes could be obtained by it. Thus, the model and its outputs can make great service pointing out the dangers threatening the whole mankind, focusing attention of decision-makers of the world on the menace of the wastings, the uneven distribution of goods /especially that of food/, of the uncontrollable growth of population. The trouble is that the results have been considered as being of absolute value exactly because of the use of computers which is not regarded by many of the non-specialists simply as a tool for computation but as a non-human, even super-human means able to give exact predictions. Although, in reality, the computer is itself a source of inaccuracies /limited word-length, limited memory e.g./ Decisive are, however, the inadequacies and inaccuracies induced by creating arbitrary models and especially, by such enormous models /omissions, abstractions, such as linearization of fundamental non-linearities, considering constant variables being not-constant in time, and so on/ /5/. Uncritical acceptance of the inductions created on the basis of an inadequate model and evaluated on an incompetent device, might be extraordinary dangerous in connection

with the future of the world /much a conclusion is, e.g., the theory of zero growth/.

There is a well known phenomenon in automatic control: the overshoot. If a quantity in the system varies too dynamically/ that is, with a too high speed/ it will overawing the desired value / v_1 / and reach it possibly only after some swings /see the figure/.



A similar process can be observed with the first world model. An "overshot" arose in acceptance of it. This influence was overcompensated by the hot critics, and nowadays a "negative overshoot" can be observed. How some people are inclined to underestimate all the results obtained by simulation methods, to declare them unusable in general. The danger lies in the fact that just among these people are to be found persons and groups who are holding the power and possibility of decision in their hands.

2. Computer Assisted Instruction /CAI/

I wish to touch this subject only in brief, since my ideas in this field could be regarded rather as a vision than as objectively verifiable statements. The conflict, even the gap between the younger and the older generations in the advanced countries is known. Among other reasons this phenomenon is caused by the inadequacies of educational systems. In general they are not able to fulfil their

dual task: to transfer knowledge and to form the character of the young simultaneously. The main source of these insufficiencies is, in my opinion, the fear of not being able to pass on enough, from the ever growing and widely varying knowledges on one hand, and the effort just to "stuff" as much as possible into the heads of the poor young, on the other hand. Hence, the other and very important task the formation of the childrens' character - falls in the back ground and has only a secondary role /about the consequences see e.g.6//.

The application of computers in education /here I don't mean teaching and training of computing techniques themselves!/, the unjustifiedly wide and frequent use of testmethods result in an attitude which considers only the transmission of facts as a chief aim, possibly without inherent relations. Such methods must enlarge distances between teacher and student, weaken the human connections between the generations at all.

3. Privacy

One of the most important applications of computing technique is the classification, sorting of large data masses and the retrieval of desired data from the such way ordered sets. The economical effectivity of computers can be demonstrated most exactly just in these uses. Such are e.g. systems for optimal distribution and use of tools and raw materials on the basis of the orders in production con-

trols or in other systems for the permanent provision of up-to-date information for management. The benefits of these methods are manifold. First of all they serve as results in savings of material means, in higher reliability, in rapid information and precision in the social services. Medical data-processing systems promote life-saving, prevention of diseases and epidemics. Electronic data-processing is of great importance in criminal investigation e.g., and a lot of other examples could be listed too.

In advanced countries all these beneficial features, however, are associated by the fact according to which the individual can be traced permanently all his life long. Several authorities, organizations, institutions/credit banks, air line companies, medical organizations, various governmental files, records, registers, and so on/ store data on the individual without any controlled or controllable feedback or backsignalling to the concerned without updating or canceling the obsolete data from time to time. Perhaps, in the less advanced countries concerning computerization, people are not fully aware of this coming danger. A warning signal is, however, that in the USA a bill of privacy has been treated just as yet. Obviously, the problem of privacy arises in every country if the computers will be spread widely enough.

In my opinion the defencelessness of the individual by computing technique to impersonal organizations, auth-

orities may be one of the main sources of alienation, and even, that of the misuse with power/with power of information/, and as such, this feature of computing technique can become to one of the greatest dangers in our era.

4. Employment Structure

This is a subject high the Congress of Women Engineers and Scientist can be directly interested in. Employment structure has changed with the progress of technique very intensively. A strong modification of this structure was caused by the first industrial revolution, by mechanization of numerous working processes /followed by strong social changes as well/. In our century electrification and later on automation enabled to carry out a number of strainful and hard physical work easier. In some countries the traditional "peasant" ceased to be, and has rather turned into "agrarian worker" and at the same time, the general level of education and skill of workers is-of increasing tendency.

Computing technique can cause modifications first of all in mental robot works/e.g. data retrieval/ and, furthermore in the fields where computers are integrated with automatic control /leg. Process-Control, NC-technique/.

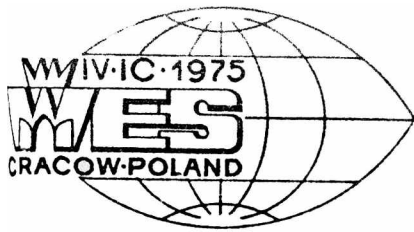
The application of computers created a large number of new and, partly, previously unknown jobs. One part of the new workers is concerned with development and production of the apparatus /of the hardware/. Their work does

not differ essentially from that one of the workers, engineers in other branches of general electronic industry. The most interesting fields of activity from the point of view of our investigation are, however those, which have been created exclusively by computing technique. Of this kind for instance, software engineering /manufacturing of basis software and application software/, systems design, installation of computers, may be mentioned here, computer science may be included as well.

If we examine the hierarchy of employees in the computing technique, practically the same distribution can be observed in function of sexes than in the other, traditional, "white collars" branches of industry. On the summits /systems engineers, chiefs, senior programmers/the ratio of males is determinant. The lower we go in ranks and salaries, the higher the number of females is; and finally, at the lowest levels /card-punchers, junior programmers/ almost women can be found. And what is more, this is an ever worsening process, since in the earlier periods of computer era also boys could be found at the lower places, there was even quite a number of them. The restauration of the "regular" structure of employment in a brand new branch of economy is not "natural" at all. As a proof against this phenomenon I mention here the names of creative women scientists as Grace Hopper, Jane Sammet, or the Hungarian Rózsa /Rose/ Péter who are among the first of the best in the computing field.

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FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

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REMOTE SENSING AND ITS
APPLICATION TO HUMAN
NEEDS

**Section 5: Automation and computer
Science problems**

Printed according
to the author's original

Organizer and Editor:
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REMOTE SENSING AND ITS APPLICATION TO HUMAN NEEDS

Even though remote sensing is a relatively new expression the first aerial photograph was taken by a camera controlled from the ground and placed on a kite (late 1850s in France).

The definitive step forward in transmitting and storing information secured by mechanic sensors was accomplished with NASA' s (National Aeronautics and Space Administration), Mercury and Gemini programs through developments in electronics and computer programs.

REMOTE SENSING INSTRUMENTATION

Remote sensors are agents capable of receiving some form of emitted and/or reflected energy originating from an object under investigation. This energy is received by a registering medium the information secured and transmitted to a receiving and storing facility.

The most commonly known sensor is the camera-film assemblage. There are three general categories of aerial cameras: framing panoramic and cartographic. The films can be panchromatic black-and-white natural color black-and-white infrared (IR) and color infrared (IR).

Another type of sensor is the scanner. Among these, the thermal scanner and the multispectral scanner (MSS) are the most commonly used. The multispectral scanner is an electro-optical instrument providing information in a multiband form of discrete frequency bands. The thermal scanner detects only thermal energy emitted by ground objects.

Microwave sensors, as the name implies receive and transmit microwave signals. Active systems both transmit and receive microwave signals, passive systems only receive incoming radiation

The only commercially available microwave sensor is the side-looking-airborne-radar (SLAR), an active sensing system. It can operate during the day and at night and is capable of "piercing" all cloud cover.

An integral part of this system is its "illumination" source, which transmits a radar beam sideways normal to the flight path. There are single and double systems, depending on whether there

is only one beam directed sideways or two “looking” out of both sides of the aircraft.

The main force-field sensor is the magnetometer. In an aerial magnetic survey, the minute differential magnetic susceptibilities originating from overflown rock types are measured. Flights are arranged into an orthogonal grid pattern covering the area under study and obtaining a complete set of magnetic profiles. These profiles are referred to a magnetic datum; magnetic contour plots are then drawn and anomalous zones found are associated with different geologic structures such as faults, fracture zones, and dikes.

The other two force-field sensors are the airborne gravity meter and aero-radio-activity meter. These two shall not be discussed in this paper but are mentioned for completeness of subject.

From what has been said up to now, it can be concluded that remote sensing is made possible through technologies dealing with the detection, measurement, recording, and utilization of emitted and reflected electromagnetic energy. The range of energy wavelengths and the types of instrumentation suitable for sensing within the various energy bands may be shown on an electromagnetic spectrum. Information obtained by a remote sensing system is a measure of the electromagnetic energy originating from a source whose position can be accurately located. The magnitude of, or energy in a wavelength may be expressed as a tone or color on film emulsions or as voltage outputs from a sensor.

REMOTE SENSING VEHICLES

Vehicles for collecting remotely sensed data can range from small aircraft to large jet airplanes, to manned and unmanned satellites and platforms like Skylab.

The Earth Resources Technology Satellite (ERTS) now renamed Landsat, has by far surpassed all expectations in data it provided and in its life expectancy.

Launched on July 23, 1972 and followed by Landsat II on January 22, 1975, ERTS: (1) has a 103-minute near-polar orbit; (2) revolves 570 statute miles (approximately 917 kilometers) above the earth; (3) covers a field of view 115-status-mile square (or approximately 185-kilometer square) every 25 seconds, with a lateral overlap of about 15 statute miles (approximately 24 kilometers); (4) its position relative to the earth, even though constantly changing, follows the sun and, on the daylight part of its orbit, it is always

about 0942 hours; (5) has the potential of continuous sensing of the globe, with only two small blind spots near the poles; and (6) has the potential to cover the same point every 18 days.

The instrumentation on board ERTS consists of: (1) a multispectral scanner (MSS) system with four bands; (2) a Return Beam Vidicon TV camera assemblage with three bands; and (3) a Data Collection System (DCS) that functions more like a communications unit.

ERTS GROUND DATA HANDLING

The output signals from an airborne sensor are recorded on magnetic tape and later sent to ground stations when line-of-sight is possible. The information collected may also be transmitted "live" if taken within line-of-sight of a ground station.

The DCS aboard ERTS is a relay system which can monitor a given type of information several times a day since it only has to pass close enough to the object for line-of-sight communication. The DCS can, therefore, receive a message sent from any point of the world and transmit it to users less than 12 hours from actual readout time.

There are, at present, five ground stations, all located in the Western Hemisphere. Three of these stations are in the L'SA and the remaining two are in Canada and Brazil. The data received at these stations are sent to a ground processing facility where they are converted to black-and-white photographs or digital tape.

Special centers provide photo reproductions of collected information to interested government agencies and commercial firms at a nominal cost.

Remote sensing information should always be checked against surface data gathered by specialists on location to verify the accuracy of data interpretation. This process is called "ground truthing."

INFORMATION INTERPRETATION AND PROCESSING

Photographs provide the ability to see texture and shape in a spatial domain, whereas electronic sensors give better spectral properties.

The interpretation of imagery is usually accomplished by identifying ground features visually; however, because of the bulk and scale of imagery necessary for sequential coverage and the problem of extracting quantitative spectral data from photographs, a major effort is being made to develop automatic pattern recognition and spectral analysis techniques that utilize digital data.

Spectral data analyses by computer can accommodate many times the amount of information that' can be visually evaluated by a human operator.

A spectral signature, of a feature, a unique combination of reflected and/or emitted energy placed within discrete portions of the electromagnetic spectrum, can be developed. It is possible to identify objects or features from such signatures using a legend applied to spectral data used over large areas.

Demonstrated applications of spectral signature analysis techniques show that in the foreseeable future these techniques will be limited to the gross delineation of features or objects that have distinctly different spectral characteristics such as water, vegetation, bare soil (unsupervised training), and a somewhat more detailed mapping of types of crop and their characteristics such as state of growth, vigor, etc. (supervised training).

Magnetic tape recording and storage of remotely sensed spectral data is potentially the most reliable approach. Images have been produced from electronic scanner and microwave devices because the expertise for such data analyses rested with people used to visual image interpretation rather than computer processing.

As the computer software becomes more available and accepted, the trend will be towards the utilization of automatic data processing of non imaged spectral data.

APPLICATIONS

Remote sensing applications may be subdivided into four categories related to man's most pressing needs for survival: water, food, shelter, and health within and around him.

WATER

Some 97.3 % of the world's water is in the oceans. Of the 2.7 % of the globe's water that is salt-free, 2.2% is at the poles in solid form. The remaining 0.5% is managed and delivered by nature, non-uniformly both in time and space. West of the Mississippi (USA) and in the Brazilian northeast, for example, water is in short supply, whereas the northwest of both countries is abundantly and frequently supplied with rain.

Supplying water to arid land has been man's goal for many a century and remote sensing can be of help.

Groundwater: Satellite imagery can provide information on drainage density and fault and fracture density. This combined information allows groundwater specialists to estimate the water-rearing properties of rock and aquifers may thus be found.

Information about primary and secondary permeability can be secured from drainage density. In addition to permanent natural waterways, channels of temporary streams and gullies can also be detected by remote sensing. In this manner, the sources of groundwater replenishment may be evaluated.

Surface Water: Remote sensing offers a fast and accurate way of

delineating changing land/water interface. The sensors of ERTS are capable of pinpointing lakes as small as 10,000 square meters and river as narrow as 70 meters. This is of invaluable help in little known or explored regions of the globe.

Water availability can also be quantitatively estimated when imagery from ERTS and data from DCS are combined to furnish meteorological information, stream flow rates, water level, etc. Knowledge of these parameters may furnish water depths and consequently water volume

It is also possible to map fresh water and salt water boundaries i estuaries by means of thermal sensors, based solely on temperature differentials. In fact, thermal-IR scanners can detect changes in temperature of water of as little as 0.5⁰C.

FOOD

As important as water, food is a must for man's survival.

Forecasts based on reports of available food sources for the present rate of population growth are either very gloomy or remarkably optimistic depending on whose viewpoint is considered.

However, since at the present time only one-fourth of the world's population is adequately fed, there are some pertinent questions that deserve answers: where can new, unused, tillable land be found? How can it be identified? The answers may be found in soil maps. Securing such maps, however, through conventional methods is not only very costly but time consuming as well.

In developing countries where very little of the land has been mapped conventionally, remote sensors can provide information about topography, depth to bedrock, water availability, drainage, soil characteristics, etc. All this can be obtained through ERTS imagery in conjunction with "ground truthing. In addition, remote sensing can help find ways to develop land: feasible access roads may turn up where none were believed to exist, hidden water such as underground temporary springs and waterways, may be found, etc.

In order to determine farm product outlook for a given year, in certain countries agricultural agencies conduct painstaking surveys of farmers' projected plans, determine the type of crops, and predict expected yields of these crops. However, the purpose of these surveys is often defeated because farmers quite often change their minds as to what and how much they will plant, after they have responded to the survey. Thus, an overview by means of remote sensing of what grows where, may help these agricultural agencies determine what foodstuffs will be available.

Monitoring of crop diseases can warn farmers of potentially critical situations by evaluating the spread of the disease and warning the farmers on where to destroy potential carriers of diseases, thus preventing further spread of the condition. Such an approach was used to

fight the Southern corn leaf blight in the American midwest in 1970 and helped secure an extremely plentiful crop the following year.

Cotton is very vulnerable to the boll worm. To prevent the condition from spreading from year to year, cotton stalks must be plowed into the ground after the harvest. In a global effort of this nature, every farmer must comply. Checking individual cases of non-compliance on the ground would be impossible, but an overview of hundreds of acres can be carried out by ERTS quickly and inexpensively by using near-IR imagery which is especially suited to "see" the difference between fields of dry stalks and bare land.

Location of available grassland to insure adequate feeding of cattle is also extremely easy with the assistance of ERTS. The cattle can then be shipped to areas of available pasture.

In addition to securing information on crop growth, protection of the plants, rangeland location, etc., ERTS imagery lends itself directly to soil mapping on a regional basis. To this end, the criteria employed are: parent material identification, land form, drainage pattern and density, vegetation, slope; in short, detection of elements directly or indirectly responsible for promoting the formation of a given soil type.

SHELTER

Remote sensing is also of inestimable value when dealing with man's shelter. It is especially useful in underdeveloped regions where conventional maps are either too out-of-date or altogether non-existent. Even in areas which are well developed, satellite imagery is useful in inventorying land used for different purposes, changes in land use patterns, etc.

The value of remote sensing can be further appreciated when large urban areas are being investigated for monitoring land use and urban planning.

As an example, one can mention the almost daily decisions that have to be made with respect to site selection for housing developments, factories, power plants, rapid transit systems, shopping centers, recreational areas, etc.

A very striking example of the use of remote sensing in land development is the possible almost overnight planning of an entire city. This has been accomplished with Sun City, outside of Phoenix, in the State of Arizona. Planning was based on an Apollo 9 photograph which covered an area 110 miles by 69 miles, the "Phoenix quadrangle. What had not been anticipated, however, was that 10,000 acres of prime cropland was used up in the process. Obviously, this was not the soundest approach to city location in a world where fertile land of easy access is at a premium.

Had the thinking of the 1960s been more like the thinking of the 1970s, Sun City might have been located elsewhere and the immense cotton fields that were eliminated would have gone on producing crops year after year.

An even more striking example of remote sensing application is the forecast of future urban growth. Should the forecast be pointing to undesirable trends, city planners could take steps to remedy potential inadequacies and possible pitfalls. How much food would the urban center need in the near future? would food be available at reasonable prices resulting from reasonably accessible sources and short transportation distances? How heavy would the transportation load become? How much population could be safely supported in such an urban area? Depending upon the answers, a possible housing explosion could be curtailed to prevent too large a population which might overtax transportation systems, water supply, recreation facilities, etc.

An even more striking example of usefulness of remote sensing techniques as applied to man's shelter is shown in an investigation urban blight. A neighborhood that is decaying sociologically will, of necessity, also decay physically and here a good interpretation of imagery may warn of the danger ahead, before the social researcher who probes the police file becomes aware to it. Undue crowding and litter accumulation, which cause high alkalinity in soil and iron oxide in city dumps can be detected by remote sensing. The absence of vegetation is another sign of neighborhood decay.

These examples illustrate quite adequately how remote sensing contributes to the building, maintenance, and preservation of man's shelter not only from the physical standpoint but also from the point of view of socio-economic integrity.

MAN'S HEALTH

Surrounding man are many modes of pollution which endanger the salubrity around and within himself.

Pollution of the environment can be physical, thermal, chemical, etc., and can be monitored by remote sensing techniques.

Chemical discharge from various types of industry can be detected and monitored by remote sensors. Color patterns on ERTS imagery can determine the areal extent of polluted lakes, rivers, estuaries, etc. Water sampling and chemical analyses will confirm the findings of remote sensors.

Not only can pollution itself be verified, but the pattern and size of pollution plumes can indicate the amount of chemicals discharged into bodies of water. Thermal-IR scanners can detect and map seepage emissions from power plants, for example, based on the tone variations resulting from differences in temperature. Also, as long as detectable thermal contrast exists, subsurface seepage can be detected by thermal scanners. The seepage material may be either warmer or cooler than the host body of water. This has been successfully applied to locating cold spring emissions, geothermal sources, and even leaking underwater pipes.

A third form of pollution is in the form of sediment, either organic or inorganic. Inorganic sediment may result from runoff from construction sites; it can be the result of heavy rainfall carrying topsoil into bodies of water, etc. Organic sediment can emanate from sewage outfalls entering rivers, lakes, or the ocean.

Naturally, sewage outfalls must be monitored very carefully to determine whether sewage discharged in prescribed areas selected to avoid contamination of shorelines remains in those areas.

Suspended fauna and flora need not, of necessity, be condemned; in the ocean, suspended live organisms may indicate the presence of food on which higher fish feed.

Once these areas are detected, the information may be furnished to fishermen who then seek high sediment areas and return home with a better catch of fish.

CONCLUSIONS

To sum it all up, the full potential of remote sensing is only becoming apparent. Its possibilities are limitless and can help man protect himself and his environment, as well as manage and monitor food availability, water presence, plan communities, forecast weather, etc.

As is commonly said in the United States, the sky is the limit!

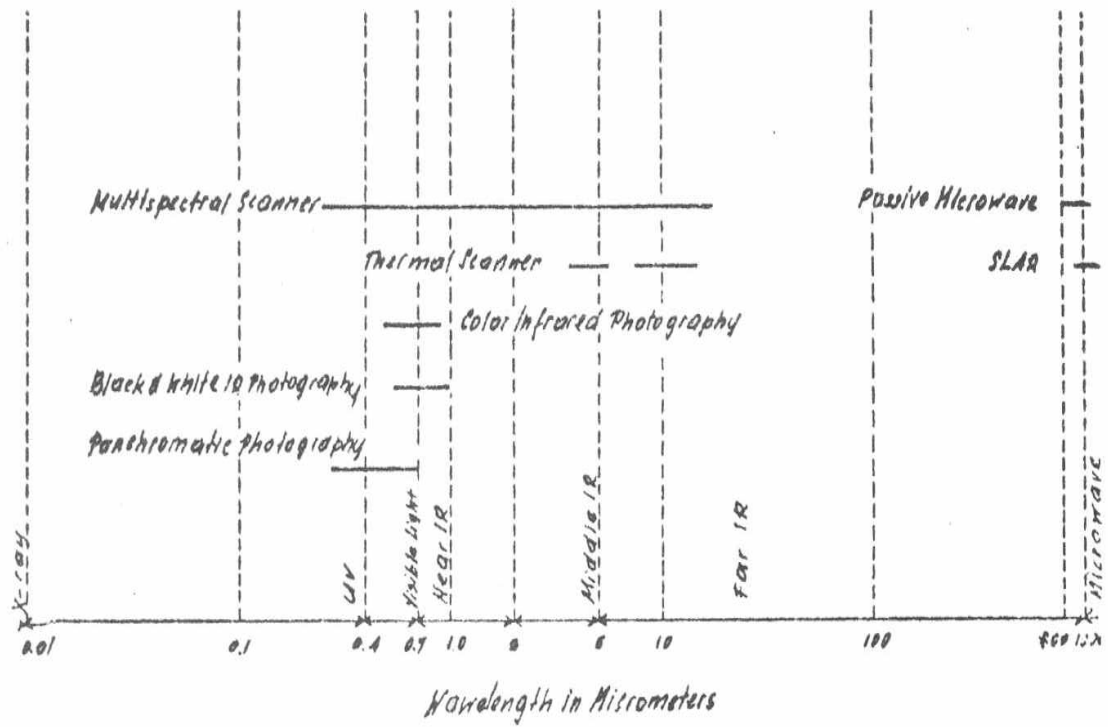
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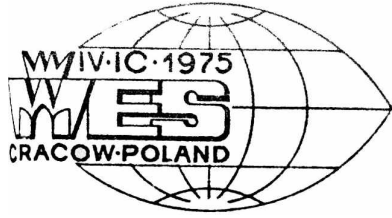
Thanks are extended to Dames & Moore, Consultants in the Environmental, and Applied Earth Sciences and to Mr. Larry Alexander, remote-sensing specialist and image-processing engineer with Dames & Moore.

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Electromagnetic Spectrum





FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

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INFORMATION RETRIEVAL
SYSTEMS FOR SCIENCE
AND TECHNOLOGY IN INDIA

**Section 5: Automation and computer
Science problems**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
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INFORMATION RETRIEVAL SYSTEMS FOR SCIENCE AND TECHNOLOGY IN INDIA

1. TWENTIETH CENTURY - THE CENTURY OF INFORMATION EXPLOSION

If in the 19th century, science and technology have emerged as the most important disciplines, basic and essential for the material progress of mankind.; in the 20th century, they have also become an indispensable part and parcel of modern civilization, the very existence of which, now, wholly depends on the research and development work in science and technology; this is so, because they offer solutions to various problems which the mankind is "facing today - population explosion, consequent depletion of natural resources, urgent need to increase productivity in the sectors of agriculture and industry, that too, very fast. It. is no wonder; therefore, that not only developing but developed countries also are sinking tremendous efforts in terms of money, men and material for R & D work.

This 'research explosion' has given rise to 'information explosion'. As the research grows quantitatively, so also does the literature - in the form of journal articles, conference papers and technical reports -embodying the results of research. In the field of chemistry, it is estimated that the rate of growth of chemical literature doubles every seven years; so far as scientific journals are concerned their number currently published is put at 100,000. On a conservative estimate nearly 2,000,000 scientific articles are published every year.

2. PROBLEMS POSED BY INFORMATION EXPLOSION

The very vastness of information has created problems in 'locating' the right piece of information expeditiously and in its 'dissemination' to its right recipients. It is aptly compared to the problem of finding a needle lost in a haystack. This has often resulted in an unintended duplication of research with consequent wastage in terms of skilled man hours, material and money. It has made cumbersome the work of retrospective search for literature which is necessary to know to what extent research has progressed in a particular field.

3. SOLUTION TO THE PROBLEM OF INFORMATION EXPLOSION COMPUTER-BASED INFORMATION SYSTEMS.

The first step in the direction of a solution to this problem was taken when a new type of periodical ie. abstracting or indexing periodicals came into existence with the starting of "Chemishes Zentralblatt" in 1856, Now nearly 1800 abstracting/indexing periodicals are published. The major abstracting services are:

- 1) Chemical Abstracts, Columbus, Ohio, U. S.
- 2) Physics Abstracts, London, U. K.

- 3) Nuclear Science Abstracts, Oak Ridge, U. S.A.
- 4) Bulletin Signaletique, Paris, France
- 5) Referativny Zhurnal, Moscow, Russia
- 6) Biological Abstracts, Philadelphia, U. S.A.

Though these services have made the work of retrospective search, easier, still, due to increasing bulk (eg. Chemical Abstracts alone gave 333624 abstracts in 1974) a considerable time has to be spent. Even then, one is not absolutely sure that one has not missed the relevant piece of literature, as abstracts are grouped under broad subject headings and alphabetical indexes also use detailed subject headings/concepts.

It is exactly here that the computer has come into the picture. Just as in many other fields wherever repeated jobs are involved, computer also can do the job of literature search quickly, however large the store of information may be, provided the information is properly processed and stored. Hence the birth of computer based information systems.

It may be mentioned here that all the major abstracting services mentioned above have now become wholly or partly computerbased. However, the first major information system which is wholly computer-based since its inception and is of international scope is the International Nuclear Information System (INIS), which is described below.

4. INIS (International Nuclear Information System)

The International Atomic Energy Agency (IAEA) established a computer-based information processing system known as International Nuclear Information System (INIS) at Vienna, which started functioning since April 1970. The System places strong emphasis on the maximum possible computerisation of its services. This is in line with the present trend of introducing automation in science and industry. It is a feature which has to be built into the System to prevent it from becoming obsolescent from the start and which renders the System particularly attractive and useful to the developing countries as it provides a higher take-off even at the initial stages of development and promises international standardization in the field of information science terminology and the methods of information processing.

The participating countries and organisations are responsible for scanning all the literature they produce in the field of nuclear science and technology and selecting that which falls within the agreed subject-scope of the System and supply the bibliographic details in the prescribed format to the INIS. In addition, they have to submit informative abstracts of all the items thus selected as input material and

submit a copy each of the document which is of non-conventional type such as technical reports.

The data received from various countries is processed at Vienna. The entire information is converted to machine readable form on a magnetic tape after the various checks for errors. After the data is processed in the computer, the various outputs are

- 1) Abstracts on microfiche
- 2) Non-conventional literature on microfiche
- 3) INIS Atomindex
- and 4) INIS cumulative index

The items (3) and (4) are available both as hard copies and on magnetic tapes.

5. AGRIS, DEVSIS, UNISIST, etc.

Agricultural Information System (AGRIS) adopting the model of INIS went into operation in January 1975. Development Science Information System (DEVSI) is in the formative stage. It is very likely, depending upon the need, more such computer information systems may be designed and made operational, and this may well lead to unnecessary duplication. Recognising this, World Information System for Science and Technology (UNISIST) is being planned under the auspices of UNESCO and ICSU which will bring co-ordination among existing information systems and form a network of all these.

6. INFORMATION GENERATION IN SCIENCE AND TECHNOLOGY IN INDIA

India has achieved impressive scientific and technological progress since attaining independence in 1947. Presently, there are over 1,500 scientific and technical institutions, national laboratories and universities actively engaged in research and development work. The scientific and technical personnel in India number about 1.5 million of which some 90,000 are in R & D establishments. A significant development in the field of scientific research and development was the creation of a new Department of Science and Technology in May 1971. The various universities, and national laboratories and institutions under (i) Council of Scientific and Industrial research (CSIR)(ii) Department of Atomic Energy (DAE) (iii) Defence Research and Development Organisation (DRDO) (iv) Indian Council of Agricultural Research (ICAR) (v) Indian Council of Medical Research (ICMR) and (vi) Department of Space Science have fairly comprehensive libraries in their scientific missions and disciplines. There are about 800 scientific and technical libraries in the country with collections ranging from 10,000 to 50,000. A number of these libraries offer information and documentation services to their clientele in their fields of interest.

The output of Indian scientific literature has been steadily increasing with the rise in the number of R& D institutions and personnel. It is estimated that currently there are some 1,500 scientific periodicals in the country in English and Indian languages. Besides over 1,600 scientific books are produced and 300 to 400 doctoral dissertation in various scientific disciplines submitted every year. Scientific information and documentation services to meet the requirements of the steadily growing number of scientists and technologists have also increased considerably. Some of the important ones are mentioned here-under.

7. MAJOR INFORMATION SERVICES EXISTING AT PRESENT IN INDIA

Indian National Scientific Documentation Centre (INSDOC), Delhi.

INSDOC provides a full range of documentation services on a national level including translation and reprographic services. It publishes a monthly periodical entitled 'Indian Science Abstracts' which covers scientific literature produced in India and by Indian Scientists abroad. It has brought out 13 volumes in its Union Catalogue series for periodical holdings in various science libraries in country.

A Russian Science Information Centre has been set up in INSDOC as a part of an agreement between the Government of India and the U.S.S.R: Academy of Sciences. It publishes 'Contents List of Soviet Scientific Periodicals' and 'Russian Scientific and Technical Publications - An Accession List'. .

Defence Science Information and Documentation Centre (DESIDOC). Delhi.

The Defence Research and Development Organisation has set up DESIDOC in Delhi to meet the information requirements of the R & D Headquarters and all its R &D establishments in the country. In addition to various documentation services, the centre also has an information bank which provides SDI and other personalised services to those engaged in management of Defence R & D establishments.

National Medical Library. (NML), Delhi

The NML, located in Delhi, is responsible for building up a comprehensive collection of medical literature in all important languages of the world and for offering bibliographical services to medical scientists. Among its publications is 'Index to Indian Medical Periodicals'.

Indian Agricultural Research. Institute (IARI) Library. Delhi.

The IARI Library, located in Delhi compiles 'Indian Bibliography of Agriculture' which has some 40,000 entries in the file. .

Small Enterprises National Documentation Centre (SENDOC), Hyderabad.

SENDOC was set up in 1971 at SIET Institute, Hyderabad. Among the Centre's publications is a bi-monthly 'SENDOC Bulletin' giving information on new products and processes, industrial profiles and prospects etc. The Centre also provides a technical enquiry service.

Patent Library and Information Centre

A detailed plan has been prepared for the establishment of a Patents Library and Information Centre which will not only serve as a depository for Indian and foreign patents but also undertake patent literature search and information service.

Indian Standards Institution (ISI), Delhi.

The ISI, located in Delhi, has an excellent collection of national standards of many countries and is in a position to offer standards information service. It maintains a classified file of world standards literature and has published a number of subject bibliographies.

Social Science Documentation Centre- (SSDC)

The SSDC, established in Delhi by the Indian Council for Social Science Research, is engaged in several projects such as the compilation of the Union Catalogue of Social Science Serials available in important libraries in India, bringing out a directory of social science periodicals published in India, etc.

Department of Atomic Energy: (DAE)

The DAE is one of the largest scientific organizations in the country comprising research units in various fields of science and technology. Hence, the Library and Information Services (L& IS) of the Bhabha Atomic Research Centre (BARC), which is the principal organisation of the DAE devoted entirely to research in and development of atomic energy for peaceful purposes, has been conceived, developed and organised as a mission-oriented information centre for various projects.

The BARC Library has a comprehensive collection of nuclear literature. The scientists working in BARC and other nuclear establishments in the country are kept abreast of the new developments in the nuclear field through a number of current awareness bulletins, some of them computer-produced. Recently, a computer-based SDI service was started as an experimental measure restricted to report literature which will be later on extended to journal articles and other kinds of documents. As the national inputting centre for INIS, L & IS is respon-

sible for all INIS operations in India.

For preparing Indian input to INIS and processing the output product received from INIS, an INIS cell was created in the Library and Information Services of BARC. The INIS cell, to begin with comprised six technically qualified and experienced staff members. It grew to include 9 members of which 4 are women - 2 subject specialists in physics and 2 documentalists. It is noteworthy that the major contribution to our input to INIS at Vienna is from the women, because a major portion of the literature published is processed by the physicists. The obligations on India as a participating nation area: scanning, abstracting, indexing and preparing paper tapes. Copies of the INIS Output, 'Atomindex' are circulated in BARC and other constituent units of the DAE. Frequently requests are received for procurement of the items cited in the Atomindex. The abstracts are often referred to by BARC scientists. As such, it can be seen that the utilization of the INIS output at present is mainly limited to scientists of organisations and industries under the DAE. Attempts are now being made to enlarge the circulation of Atomindex.

However, presently, SDI services on a very small scale are being rendered to the scientists of BARC through ENDS (Luxembourg). User's profiles are prepared queries are formulated and submitted to ENDS. The answers received from ENDS are evaluated for pertinence and a feed-back is maintained with ENDS.

8. WOMEN IN THE INFORMATION SYSTEMS IN INDIA

After the attainment of independence in 1947, education of women received a tremendous boost and like in every other profession, the number of women being trained and employed in information work is growing every year. Qualitatively speaking, the Indian woman can be said to have reached the top in this profession when (Miss) Vidyut Khandwala became the University Librarian in 1955 and Dr. (Miss) Chitale, now retired became the Librarian of the National Medical Library of India. However, quantitatively, the Indian woman has to go a long way which is evident from the sample survey carried out during the last six months, to find out the current pattern of employment of women in this profession.

It has been decided to carry out an exhaustive survey in this connection to get a more detailed picture and the results will be published in due course.

9. PEEP INTO THE FUTURE

Looking at the present trend of growth of women employment

in this profession as compared to the situation obtained in 1947 and taking into consideration the fact that in the most out of the thirty four postgraduate library schools, women trainees form 50% and in some cases 75% of the total enrollment, it can be confidently stated that the Indian woman will take her rightful place in this profession in terms of number and quality in not too distant a future.

It is a heartening factor to know the all-women S. N. D. T. University has a school of Library Science as one of its five colleges and about 50 girls take this course every year.

The number of women who undergo training in documentation at the two institutes, ie. the INSDOC at Delhi and the DRTC at Bangalore, is also on the increase. A sample survey shows that many women librarians and information scientists are being employed by Industries and public sector undertakings.

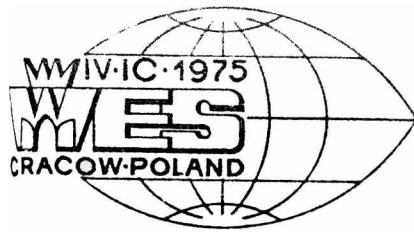
10. PROPOSALS FOR ENCOURAGEMENT OF WOMEN TO ENTER THIS PROFESSION IN INDIA

(1) At present there is only one post-graduate library school/ institution meant exclusively for women. It is the SHPT School of Library Science in Bombay. At least three more such institutions should be established preferably. One each at Delhi, Calcutta and Madras.

(2) Women are most suited for the job of librarians and information scientists than men due to their well known patience and ability to cope with incessant queries. These Jobs are also more or less 24 hour-jobs and so, people have to work in 3 shifts of 8 hours each. Thus, ladies (particularly in India), who prefer part-time jobs, to suit the demands of house-hold chores could be offered these jobs in day-time shifts so that it would be convenient for them. It would also help them economically as well as employ them efficiently.

ACKNOWLEDGEMENTS

The authors wish to thank Dr. V. A. Kamath and Mr. M. G. Bhide of the Bhabha Atomic Research Centre, for their valuable suggestions and Miss Jayashree Dighe for having typed the paper.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Ofelia Vito Bulaong
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RATIONALIZATION OF
THE PHILIPPINE
APPAREL TEXTILE
INDUSTRY

**Section 4: Material supply and
 equipment problems**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

Świętojerska 5/7
00-236 Warszawa

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Ofelia Vito BULAONG and Asuncion B. KALALO the co-authors are active participants in the rationalization efforts being undertaken by the Philippine Board of Investments /BOI/ for the textile industry. Mrs. Bulaong, a chemical engineer and Chief Analyst at the BOI in-charge of the textile and garment industries, started the preparation of the sector program for textiles and contributed a lot in the preparation of the guidelines for the development of the industry. Atty, Kalalo, as Director of the Exports Department and Institute of Export Development at the BOI, was largely responsible for the assistance extended to the industry in terms of product adaptation and export market development. The co-authors in the course of their work at BOI also coordinate with the Philippine Human Settlement Commission regarding the regional dispersal of manufacturing industries and the development of resettlement areas.

**Ofelia Vito BULAONG
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Board of Investments
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RATIONALIZATION OF THE PHILIPPINE APPAREL TEXTILE INDUSTRY

I. Introduction

The textile industry covers a broad spectrum of manufacturing of products ranging from yarn, thread, woven and knitted fabrics for wearing apparel to ribbons, braids, industrial and coated fabrics, bonded fabrics, cordage, carpets, ropes, twines and nets. Due to its essential to the Filipino worker in terms of clothing and industrial uses, the sector has been the object of continuing studies by both the government and private sectors in the Philippines. For purposes of this paper, the ensuing discussions are limited to the manufacture of yarn, woven fabrics and knitted fabrics, or in short, apparel textiles.

II. Industry Profile

The industry is at present composed of about a hundred and thirty-two /132/ mills, most of which are located in the Metropolitan Manila area and nearby provinces. There are fifteen /15/ integrated spinning and weaving

mills now in operation with a total of six hundred thirty eight thousand nine hundred eighty-eight /658,988/ spindles and fourteen thousand eight hundred forty-five /14,845/ looms with a finishing capacity of five hundred eighty -eight /588/ million square yards. Three /3/ of these mills are also engaged in knitting.

There are nine /9/ spinning and weaving mills and a host of other independent weaving mills with as aggregate of eighty three thousand nine hundred forty' /83,940/ spindles, three thousand three hundred ninety-six/3,396/ looms and twenty-two point nine /22.9/ million square yards or knitting capacity. Independent spinning mills totaling eight /8/ have a spindlage capacity of one hundred thirty-seven thousand three hundred sixteen /137,316/.

The industry's total capacity of eight hundred sixty thousand two hundred forty-four/860,244/ spindles and eighteen thousand two hundred forty one/18,24 /looms are capable of producing one hundred seventy five point five /175.5/ million pounds of yarn, four hundred sixty-five point fifteen /465.15/ million square yards of greige goods. Proposed expansion capacities for 1975-1977 will increase spindlage capacity by one hundred seventy-three thousand three hundred twenty four/173,324/ and loom capacity by two thousand four hundred two/ 2.402/ and finishing capacity by seventy four point seven hundred sixty eight/74.768/ million square yards.

In terms of knitting capacities, the industry is capable of producing approximately twenty seven point five /27.5/ million kilos of knitted fabrics from some one hundred /100/ knitting mills throughout the country. The industry employs at least forty thousand /40.000/ people with an annual payroll of more than one hundred /100/million peos.

The industry at the moment is import-oriented since cotton is not grown locally and only polyester and nylon fibers are produced, locally in minimal amounts. Textile machinery equipment and spare parts are mostly imported. The same is true for the chemicals and dyestuffs needed by the industry.

III. Industry Rationalization

The problems of the industry in the past decade included

- /1/ competition from imported fabrics and
- /2/ underutilization and low productivity due mainly to the
 - /a/ the inadequate supply of raw materials
 - /b/ lack of technical know-how and
 - /c/ financing

The industry associations have attributed the competition from imported goods to the goods coming from supposedly embroidery materials and direct smuggling from the Southern Islands. With the imposition of Martial law in

September, 1972, this first problem has been minimized if not totally eliminated.

With regard to the second problem, the mills have been operating intermittently resulting in underutilization and low productivity. The government saw the need for the preparation of a set of policies and guidelines to assure the proper growth and development of the industry through consultations with the private sector and appropriate government agencies. This, rationalization of the industry was started in late 1971 through the Board of Investments /BOI/. The rationalization program centered on coordination efforts between the government and private sectors to solve the immediate problems and to accelerate development of capacity and technical know-how in the industry.

IV. The Textile Sector Program

The guidelines for the program were based on the national objectives of attaining:

/1/ self-reliance in the essentials of life, one of which is clothing

/2/ employment generation

/3/ regional dispersal of industries throughout the archipelago

/4/ enhancement of the environment, habitat and well-being of Philippine laborers, as embodied in the objectives and guidelines of the Philippine Woman Settlements Commission.

/5/ development of the export market and

/6/ development of small and medium-scale industries.

The textile industry sector program sought to accomplish for immediate implementation the :

/1/ Maximum utilization of existing plant machinery and equipment by making available a continuous supply of raw materials and spare parts; increasing working /hours; and restructuring of financing requirements and management of corporations with idle capacity

/2/ Increase of exports to compensate for the dollar outflow and

/3/ Expansion of the industry through regional dispersal; to assure the local market of adequate supply of clothing.

For its medium term objectives, the program seeks:

/1/ to increase labor productivity through higher wages and appropriate labor training programs; and

/2/ to improve the quality of textiles through the proper training of production and management personnel, and modernization of existing plant machinery and equipment.

For its long range objectives, the program seeks to:

/1/ assure the adequacy of supply of fabrics for the domestic market through guided expansion,

/2/ self-sufficiency in repair and maintenance

technical know-how,

/3/ self-sufficiency in the vital spare parts for the industry through an adequate progressive manufacturing program and

/4/ self-sufficiency in the supply of raw materials and some supplies for the industry.

V. Implementation of the Program

In order to facilitate the implementation of certain parts of program, the Board of Investments sought the assistance of experts in the field of apparel textiles in the preparation of the industry sector program. The study has been completed and has been distributed to the private sector through the Department of Industry for comments on the data and statistics gathered and policies to be implemented. Comments from the private sector on the study are expected to be submitted by the end of May, 1975,

Further, as part of the rationalization program for the industry, the government has implemented many policies to achieve the program objectives. The major policies being implemented are:

/1/ In the procurement of its imported raw materials through commercial sources.

The Philippine Central Bank /CB/ in coordination with the Textile Mills Association of the Philippines /TMAP/ and the Development Bank of the Philippines /DBP/ has allocated sufficient fore-

ign exchange for the industry's needs for the purchase of cotton. The government, through the BOI and Tariff Commission, has also created a committee to oversee the importation of other imported staple fibers and filament yarns used by the industry in order to assure continued supply at reasonable prices.

/2/ In the promotion of the establishment of plants for the manufacture of textile raw materials and supplies.

The BOI is encouraging investments in the manufacture of cotton and the synthetic fibers, such as polyester and acrylic and nylon fibers. It also considers as preferred areas of investment the manufacture of hydrogen peroxide for domestic and export sales. The BOI is currently undertaking studies on textile dyestuffs and auxiliaries for possible inclusion of the area in its annual investment priorities plan.

/3/ In the availment of tax incentives for existing expanding and new textile projects.

The BOI gives tax incentives to the industry both for domestic and export market sales.

/4/ In the supervision of the entry of imported fabrics.

The BOI coordinates with the Bureau of Customs

its supervising the fabric importations to be used in bonded manufacturing warehouses.

/5/ In the importation of machinery and equipment

The government through the BOI and CB has promulgated policies wherein the entry of machinery and equipment are carefully screened in order to avoid excess capacities in any particular segment of the industry. The policies are dynamic and are suited to the changing local and international situations.

/6/ In export Promotions and information.

Through the BOI Institute of Export Development, the textile millers get regular information on possible export markets, developments with respect to the General Agreement on Tariff and Trade /GATT/ and the General Scheme of Preference /GSP/ and assistance regarding export problems.

/7/ In the solution of short-term problems

The Department of Industry has created an industry desk to service the industry's short-term problems.

/8/ In the training of local personnel.

The government, through Philippine Textile Research Institute /PTRI/ and BOI and in coordination with the private sector has initiated

manpower training programs for skilled labor in the industry. Further, fellowships abroad for local personnel are offered annually for both the private and government sectors in specific fields of the industry.

/9/ In negotiations for export market quotas.

The government has taken the lead in the Multifiber Trade Negotiations. The Philippine textile industry has a representative in the Textile Surveillance Body /TSB/ in Geneva.

VI. Outlook

The assistance given to the industry is timely considering the current situation. The industry is experiencing a slump in the local and export markets due to the worldwide recession taking place brought about initially by the oil crisis. It is the hope of the industry that the prospects for a brighter market will improve by the end of the year.

The rationalization of the industry has proved to be a good example for other industries and now, the same movement is being undertaken for other Philippine manufacturing industries. Ultimately, such movements will benefit the Filipino worker.

**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Elena Baj Angnoletto

**MEDICAL APPLISATIONS
OF X-RAY
PHOTOGRAMMETRY**

**Section 4: Material supply and
equipment problems**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

Świętojerska 5/7
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Elena Baj AGNOLETTO was born in Milano. She studied at the Politecnico of Milano where she graduated in 1952. She is now in the staff/of the Politecnico as assistant in the Institute Of Topography. Photogrammetry and Geophysics and collaborates with the Institute of Sanitary Physics of the Istituto Nazionale dei Tumori. For some time she has been concerned with the problems of reconstruction of stereoradiography with particular reference to its medical applications.

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I t a l y

MEDICAL APPLICATIONS OF X-RAY PHOTOGRAMMETRY

Introduction

Photogrammetry is a technique which allows the determination of the geometry of a photographed object starting from measurements carried out on photographs: its aim is usually the representation of the ground; in a similar way. X-ray photogrammetry, in medical field, aims to represent the interior of the human body for diagnostic, surgical and therapeutical purposes.

In the same way as the photogrammetric techniques provide the engineer with the maps necessary for an economic and rational planning of the structure, X-ray Photogrammetry should provide the physician with the elements necessary for a better Planning of his intervention in the largest sense.

As the photogrammetric techniques make use of two stereoscopic photographs of the same object, X-ray photogrammetry makes use of two stereoscopic radiograms of

the same anatomic part; photogram and radiogram can be both considered as central projections; this means that the image points are obtained through projection of the corresponding object points from a centre O on the X-photograph plane / in the X-ray photographs the X-focus, assumed to be a mathematical point, is the perspective centre O /.

However, there are some differences both in the relative position object-projection centre-projection plane and in the image formation. In the radiograph, in fact, the object is between the centre and the projection plane; moreover; while in the photographs the film is impressed by rays reflected by the external surface of the object, in the radiograph it is impressed by X-rays penetrating and passing through the object itself that is opaque to the ordinary light.

The transparence to the X-rays is progressively lower for objects containing elements of higher atomic number as phosphorus, sulphur, calcium, iron and so on.

The difference of transparence creates contrasts of shades: the radiographic image is based on these contrasts and may have such a remarkable evidence that the observation of two stereoscopic radiograms makes possible a tridimensional view of the radiographed anatomic part: the observer has the feeling of a more or less transparent vitreous material, except some particularly opaque elements.

The basic equipment, for taking the stereographic pair, can be the one available in any radiodiagnostic; the only qualification is that the source can move, with respect to the bed, in a plane parallel to the bed itself.

On the contrary, for the plotting of the stereoradiograms, the apparatus is more particular and we shall say about it afterwards. In the following paragraphs we refer to the experiences carries out.

Taking radiograms

For taking radiograms a radiological apparatus with a horizontal fixed table and a moving X-ray source is generally used /fig 1/. In particular, the radiological equipment can move horizontally with respect to the bed, in longitudinal direction, while the X-ray tube can be positioned transversally by means of a telescopic movement of a horizontal bar carrying a ruled scale and likewise, vertically, through another telescopic movement.

The bed, as we said, is in a firm position; under the bed is the container for the film holder; the container is independent with regard to the X-ray source and, while it holds the film in a fixed position transversal to the bed, it can be manually set along the axis of the bed itself.

A grid, used for absorbing the scattered radiations, is attached to the container. The grid is held in a fix-

ed position transversally to the bed and is centred with respect to the film.

We used double emulsion films, with salted reinforced screen of fluorescent material /of the type used in the common radiological medical technique/. The pairs of stereoradiograms have been taken with the object kept still, with the plate horizontal and always in the same position, and displacing the source S, between first second exposure, of a quantity "b", that we shall name base, parallelly to the film plane and transversally to the bed.

Fig. 2 shows the scheme of the taking

Positions S_1 and S_2 of the source are symmetric with respect to the optimal position of proper focalization of the grid.

In order to plot a radiogram with the apparatus we used, it is necessary to know some elements of the taking, that is, the elements allowing to go back to the relative position place-source.

These elements are out of the radiogram:

1/ the H distance source-plate that is termed principal distance

2/ the length of the .base b on each radiogram:

3/ the foot of the perpendicular from the perspective centre to the image plane, that is termed principal point.

have to point out that, together another part it is advisable to take a geometrically known elements, in order to control the reliability of the obtained results; this element shall not disturb the stereoscopic observation.

Plotting

The principle which allows the reconstruction of an object in the space, given two stereoscopic radiograms, is very example and is illustrated in fig.4 for a segment AB parallel to the plate plane. We have indicated by 1 and 2 the images obtained by projection respectively from S_1 and S_2 on two different plates/of course, $A_1B_1 = A_2B_2 > AB$, whence we derive that the spatial image of AB, obtained from the contemporary observation of the two radiograms through p stereoscope with no amplification, results smaller than the radiographic image; this fact may perplex the less prepared observer/.

In order to plot the stereoradiograms, we used to the plotter Zeiss St R3, built for medical purposes. It is a Stereoscopic comparator suitable for the observation of radiograms, provided with a digital analogic converter which allows the reading, on a Nixie display, of the plate coordinates of the collimated points. Moreover, this converts contains an interface connecting it to a numeric minicomputer of the III generator performing automatically the computations necessary to pass from plateccor-

ordinates x , y , p_x , that we shall always indicate by small letters, to the model coordinates X , Y , Z , that we shall always indicate by capital letters.

Coordinates X , Y , Z , are produced contemporarily on band printing and on cathodal display.

The plotter consists essentially of a desk on which two plate holders /40 x 40/ can slide in two directions x and y ; on the two plate holders are engraved two axes, x and y ; the lines engraved form a system parallel to the reference system of the plotter. The optics for the observation and collimation of the points is firmly connected to the desk.

The radiograms are set in such a way that the direction of the base may coincide with the x axis and point P be at a distance of $b/2$ from the intersection of the axes, in the sense of the negative x for left radiogram and of the positive x for right radiogram: this corresponds to make the axes intersection coincide with the foot of the normal from the point in the middle of segment S_1 - S_2 .

It is therefore clear the reason why it is necessary to have the point P and the base direction for plotting.

Besides, the plate-holders can be moved, the one relatively to the other, in the x direction by acting on a knob: so we obtain that the references are respectively on the two homologous, points in the two radiograms, that is to say, the point is stereoscopically collimated.

In the equation for the passage from plate to model coordinates, there appear elements H and b, which, as we said above, must be known / in the researches carried out the values H and b vary respectively from 1000 to 1500mm and from 100 to 200mm.

Esperimental application

X-ray photogrammetry, as we said, can be applied in the most different medical fields both surgical and the rapeutical.

Therefore, the “Istituto Nazionale per lo studio e la cura dei tumori” took great interest in this technique and presently a collaboration is born between the above mentioned Institut and the Author, with the aim to study its applications in the radiotherapeutical field.

The cases studied up to now are those relative to the treatment of the uterine cancer through Curie-therapy and to the localization of the lymphatic chains for a better treatment planning.

Another research has been carried out in collaboration with the “II Clinica Odontoiatrica dell ‘Università di Milano” in view to control the meaning and the validity of the cephalometric system, used in the common orthodontic routine, in order to formulate the diagnosis, to forecast the growth and to control the therapeutic treatment.

We refer about these experiments here below:

The uterine cancers are treated in Curie-therapy with Cesium 137 sources contained in suitable applicators placed in uterus and in vagina. The treatment consists of two phases: in the first one the applicator is placed “in situ” and some inactive sources are introduced into it/ simulators, opaque to the X-rays, having the same geometrical structure of the Cesium sources/.

Afterwards, in order to localize the sources, the patient is radio graphed and, if necessary, some corrections are brought to the geometry of the system. Then, when the system corresponds to the application required by the physician, the sources consisting of small cylinders, section $\varnothing$ 1,5 mm and length 3,5 mm, are charged with a system of telemanipulation that avoids the danger of the direct exposition of the persons.

For this therapy a varying number of sources in different applicators is used.

Fig.5 shows the distribution of the dose absorbed by the patient in a case of Curie-therapy in which the central applicators contained 7 sources of 12,5 mcl. The traced lines represent the points of equal dose. It is important to note that the lines of equal dose /isodoses/ are characterized by a high gradient, which is typical of all the internal applications with sealed sources.

The photogrammetric technique intervenes in the first phase to determine the geometry of the system; inde-

ed it is possible to obtain the spatial coordinates X,Y,Z of the sources with respect to a system of axes and this allows a more real computation of the lines of isodoses; besides it is no longer necessary to consider equal-dose lines, but surfaces.

In addition to the source, we have to plot all the elements which allow us to judge, once the isodoses have been traced, if the effect is concentrated on the cancer and saves the sound parts, especially the most delicate ones.

The second experiment deals with the localization of the lymphatic chains of the pelvis. In different neoplasms, especially in the cancers of the uro-genital apparatus, the implication of such chains is frequent. Therefore, the determination of their position in each individual, not only with respect to the frontal plane, but also to the sagittal one, is very useful in the radiotherapy field for a correct elaboration of the treatment plans.

But the localization of the lymphatic chains is not so easily attainable with the common radiographic methods, while through the plotting of a stereopair of lymphograms, it can be attained with a precision that, according to the radiologist is satisfactory.

Fig.6 shows the two stereo programs: the lymphatic nodes have been numbered for an easy identification.

Then we plotted a series of points along the contours of some nodes: precisely 2 and 7 on right side and 5 on the left one; for the remaining nodes we plotted only a central point. Moreover some points along the “unnamed” line have been also plotted.

Fig. 7 shows the plotted points marked with a number followed by a S or a D /respectively left and right of the patient / and the height expressed in mm in parentheses. The point with a dot represent the nodes, the ones with dot and cross the “unnamed line”.

The third research aimed, first of all, to control the validity of a method. The cephalometric measurements, in fact, which consist in the measure of angles between directions determined by anatomic points, and of distances, are usually carried out on a radiography of the cranium: generally, the latero-lateral and the antero-posterior.

In order to evaluate the meaning of those measurements, to give further contribution to the formulation of the orthodontic diagnosis, X-ray photogrammetry has been used. The tests carried out, still confirming the validity of the normal radiographic methods, have shown the advantages of the plotting, that allows to obtain true distances and angles relativity to clinically signifying anatomic points and, consequently, their variations in time.

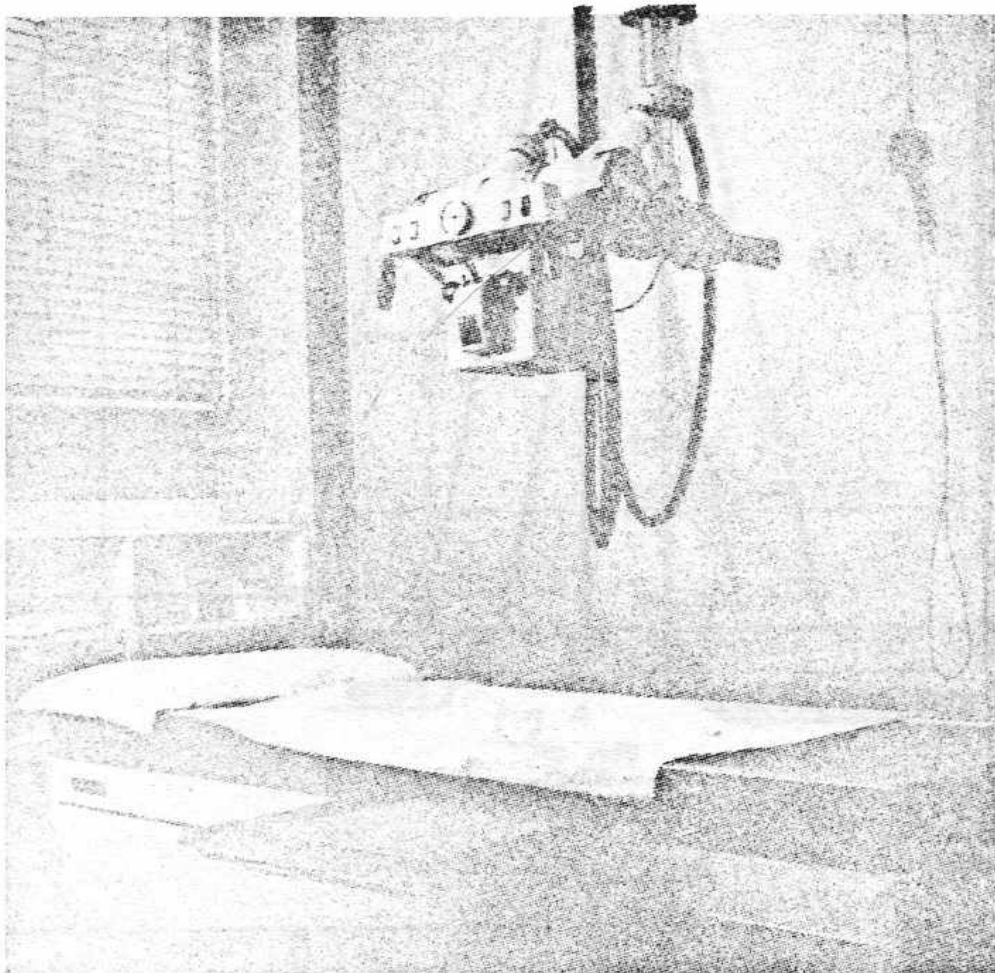


Fig.1

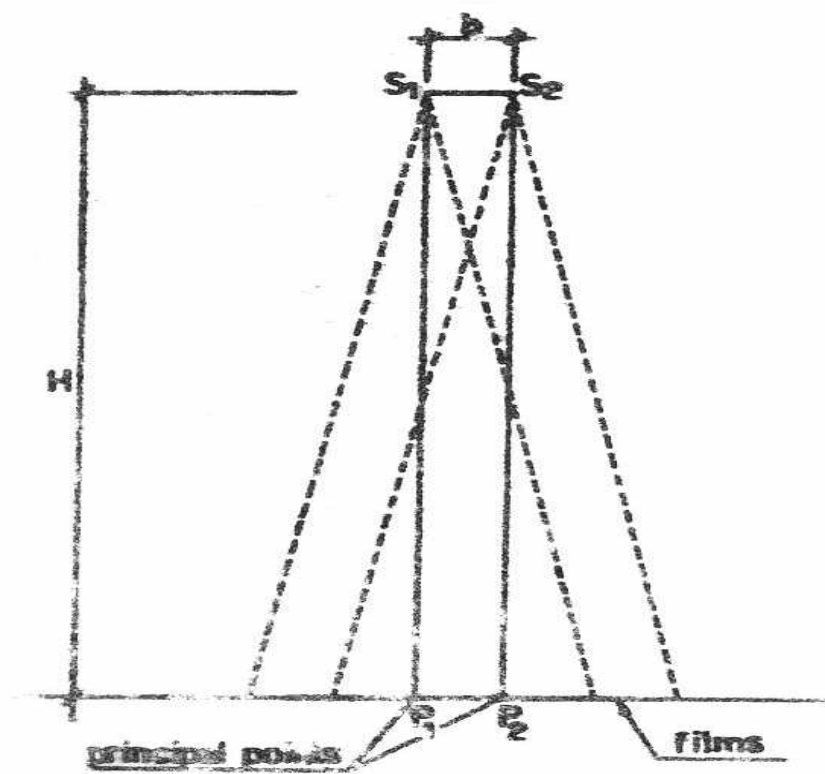


Fig. 2

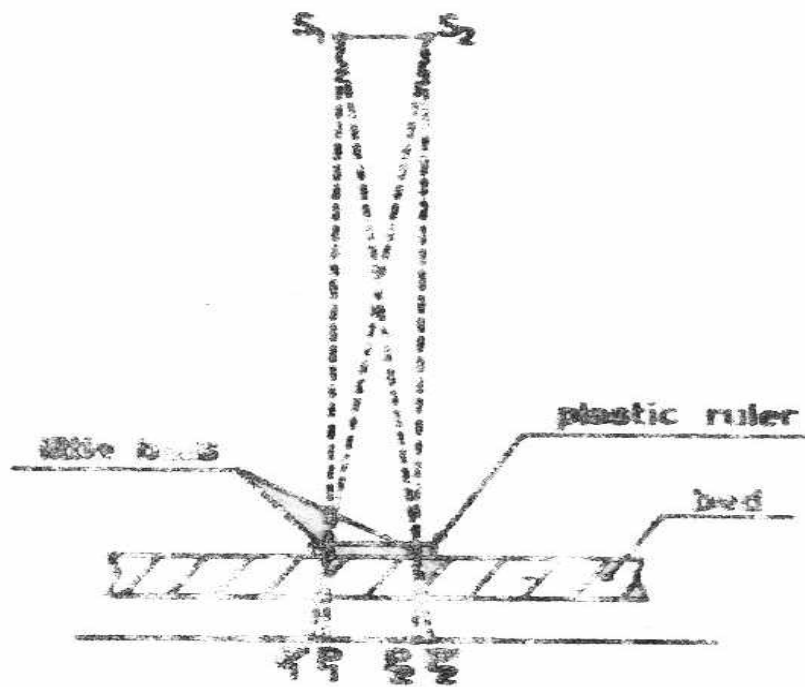


Fig. 3

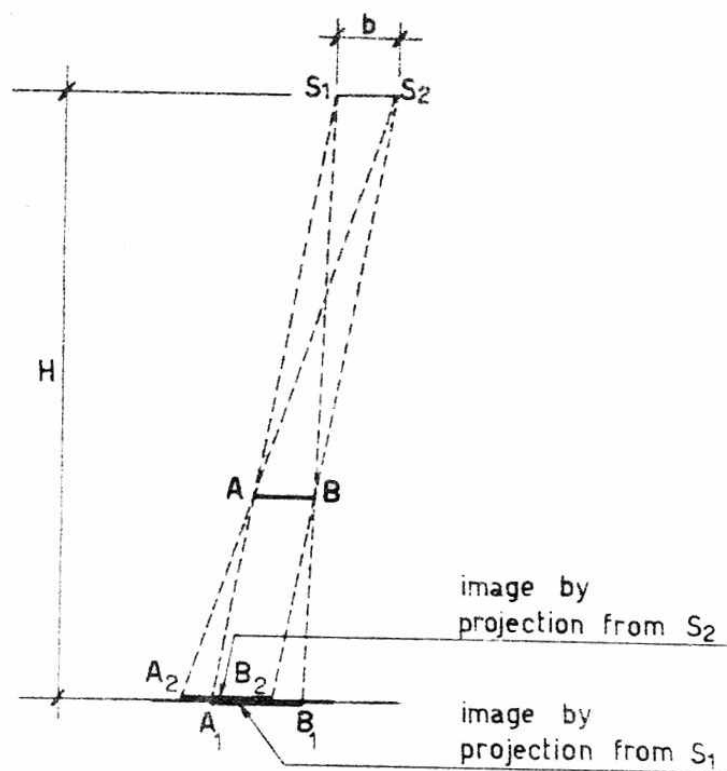
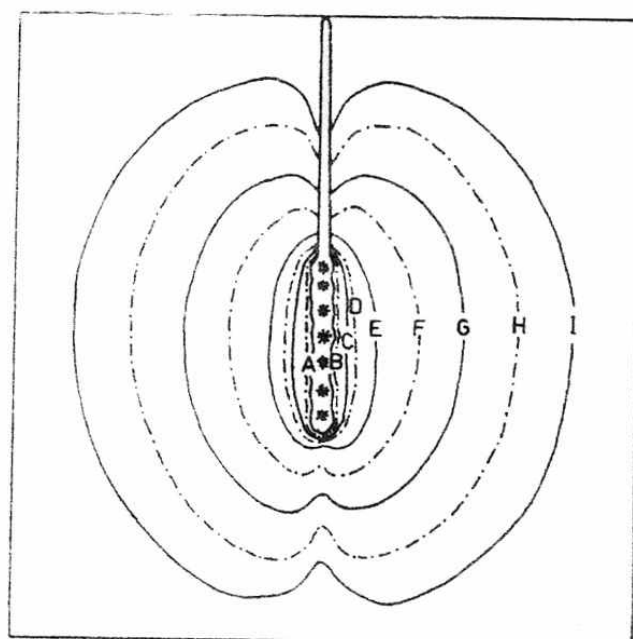


fig. 4



PROBE AGS CURIETRON

TYPE: G56 GRAINS: 7x12.5 mCi

BALLS: ϕ 1.5 mm

ISODOSES - rads/day

— A7500 - C4500 - E1500 - G300 - I90

- - - B6000 - D3000 - F600 - H150

MAXIMUM DOSE 7500

0 2 4
cm

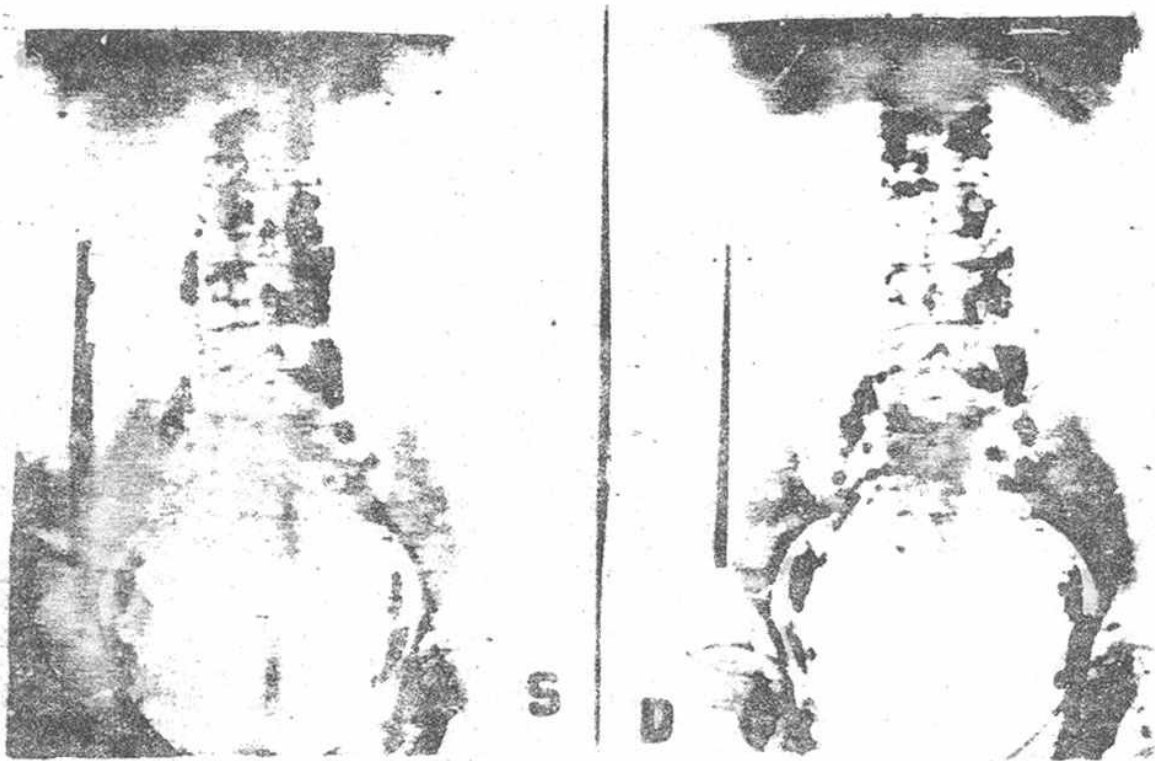
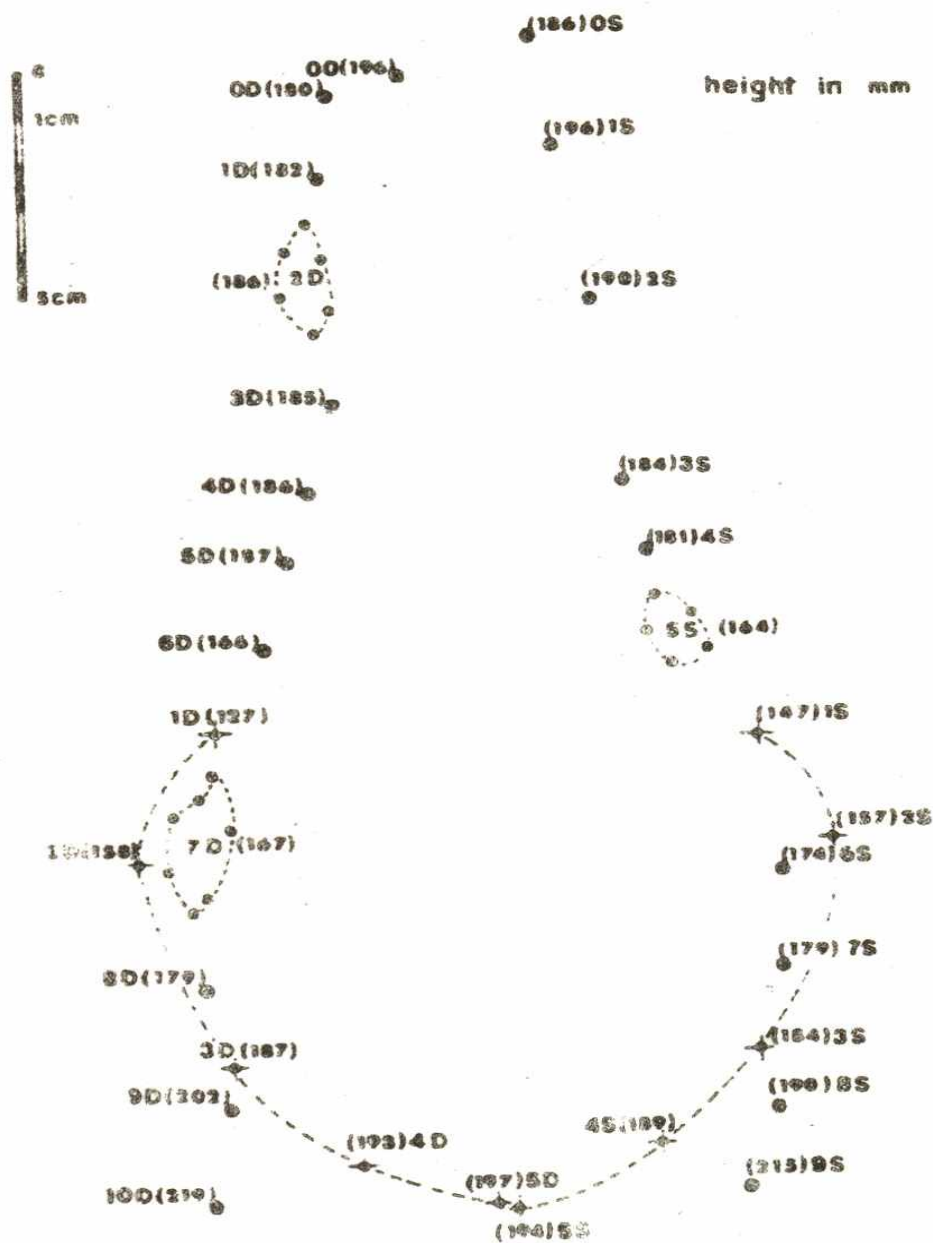


fig. 6



**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Wanda Wiśniewska

**APPLICATION OF ULTRASONIC
ENERGY TO THE TEXTILE
PROCESSES**

**Section 4: Material supply and equipment
problems.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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Author

Wanda WIŚNIEWSKA-Dr.Dipl.Eng., it was in 1954, that Dr.W. Wiśniewska started to work at the Łódź Higher Polytechnical School, on the Chair of Textile Raw Materials and Metrology in the Textile Division. Since the reorganisation of the structure of the above-mentioned Polytechnical School, she has been working at the Institute of Fibre Physics and Chemical Fibre Treatment. In 1957, she graduate as the Dipl. Eng. /II-nd degree of studies/ in Textiles, being given, in 1971, doctor's degree in technical science. In her professional work the authoress delt with problems of raw materials, resistance and behaviour of fibres and products in both sonic and ultrasonic field.

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P o l a n d

APPLICATION OF ULTRASONIC ENERGY TO THE TEXTILE PROCESSES

The impact of ultrasounds on the environment they are introduced in can be of various character. It depends on such factors as the type of environment, frequency of oscillations and aptitude value. It is on these factors that depends whether an ultrasonic wave will pas through a given object without provoking any changes or resulting in the lasting consequences. Application of small-amplitude oscillations practically provokes no changes in the environment, and it is just the this basis of the field pf ultrasonic metrology. This aspect has been excluded from this report.

In the case of big-amplitude oscillations it is possible to obtain various effects of their impact, as it has been said above. This fact gives a chance for their broad application in practice in various fields, including the textile industry, as well. The results of certain published papers give raise to the assumption that application of ultrasonic energy gives a possibility of shortening and improving a number of finishing processes. It is generally known how onerous and expensive

are the finishing processes in the textile industry. Thus their eventual shortening is of a non-negligible double importance if we take into consideration the aspect of man's working conditions and economic side as well.

In recent years in connection with the progress that has been made as concerns constructional solutions for ultrasonic apparatuses the problem of practical use of ultrasounds has, once more, become up-to-date. Insofar as Poland is concerned owing to the singling out of the centres that coordinate work on this so far new field of technics the bases have been created for its successful development. It should be expected that in the nearest future we shall be at the disposal of constructional solutions which will enable it for a wider introduction of ultrasounds to industries as it has been the case, so far.

However, stress should be put upon the fact that, as concerns the textile industry, we are still faced with a number of difficulties as concerns any attempt of formulating the guidelines for practical application of ultrasounds in industry. These difficulties result, first of all, from lack of knowledge concerning the general character of the phenomena that accompany the impact of an ultrasonic wave on the fibre material and a given environment. Information available in publications concerns the separate and concrete conditions of a given experiment. They comprise of all-sided analysis of the occurring process, which is particularly true as concerns information on the behaviour of fibre material

under a given treatment,. Such an information is, thus, an agglomeration of loose data, on the basis of which no generalization could be made and which often make a confusion concerns the real scope of the expected effect.

It is for this reason that, taking into consideration the development of constructional basis as well as a low rate of knowledge on the possibilities of practical use of ultrasounds, it seems necessary to carry out the research work which could give a precise answer for the question what are the textile industrial processes in which application of this new technical means would give positive effects.

This report is a review of the set of preliminary investigations which have been undertaken by the author on the subject in question. The investigations have been classified into three groups:

- 1/ Impact of ultrasonic oscillations on the fibre micro construction
 - 2/ Impact of ultrasonic oscillations on the colouring process of textile products
 - 3/ Impact of ultrasonic oscillations on the purifying process of textile products.
1. The investigations into the micro-structure of synthetic fibres /PA and PET/ subject to an action of ultrasonic field revealed the occurrence of number of changes. There have been observed the changes in the crystalline structure as well as in the crystalline rate and orientation rate

and also, resulting from them, the changes in the fibre properties such as, for instance, the rate of rupture force, elongation in rupturing, elasticity and the like. Drawing Nos 1 and 2 are a general illustration of these changes. They represent the crystalline rate x_d and orientation angle H , both occurring after a sonorization of fibres.

Because of the above-given constataions, knowledge of impact of the ultrasonic field on fibre material is becoming of particular importance, being indispensable for proper designing of eventual technological processes including the ultrasoni technique. First of all, however, it gives the the possibility of understanding tile mechanism of a given treatment under the conditions of an ultrsonic field.

The results obtained as concerns the impact of ultrasonic oscillations on the micro-structure of tested fibres have authorized to give the rough lines of the hypothesis of the mechanism of this phenomenon. It substantiates the following conclusion: the intensity of the impact of ultrasonic enery on the fibre material depends on its orientation. This impact consists in the changes within the framework of both crystalline and amorphous phases. We have to do here with increase and improvement in the construction of the existing cristallites, formation of new, small cristalline areas as well as worsening of the orientation of crystallites and macro-particles.

2. Research concerning the colouring process in an ultrasonic field undertaken in co-operation with Doc.A. Wawrzyniak from

the Łódź Polytechnical School/ has revealed that improvement of sorbtion is not always taking place. The impact of ultrasonic oscillations on the colouring process depends on the mutual relation between a number of factors such as type of dye, colouring temperature, colouring time and influence exerced by the wave, under such conditions, upon the dyebath and the fibre material.

A characteristic picture of this impact is given by the change in the sorbtion increase during colouring in an ultrasonic field and without the latter S=S ultrasounds. S standard, noted on the basis of sorption isotherms obtained for various dyes. An interesting example give the changes observed in synthan Yellow P-2R and in pholan Yellow G /Dr. No 3/ as well as the changes S Ultrasounds / S standard 100 for both dispersed and polan dyes with bigger particle /Draw. No 4/. These examples confirm the presence of a fairy differentiated impact of ultrasonic field on the sorption of dyes.

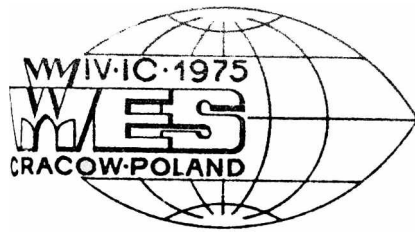
The research of a wider scope has permitted it to formulated the probable mechanism of the ultrasonic field on the colouring process. On the basis of the obtained material one can expect that application of ultrasonic energy in the process of colouring can be analysed from the point of view of changes, multi-sided and advantageus, in this technology. They would consist, for instance, on shortenning the colouring time /by approx. 1/4/, or in decrease of the colouring temperature which is of particular importance in the case of certain synthetic fibres.

3. The preliminary analyses concerning the elimination of oleous-pigment impurities from cotton, polyacrilonitrylic, polyester and polyamide fabrics confirm that insofar as fibre are concerned, there occurs a considerable increase in the efficiency of the cleaning process if an ultrasonic field is applied /table no 1/. The further investigations in this respect have been undertaken in co-operation with Doc.Kalinowski and Dr. Rybicki from the cleaning Institute at the Łódź Higher Polytechnical School. No summing up of the above-mentioned investigations could be made, so far.

On the basis of compiled observations we can, however, expect that application of ultrasound could facilitate the solutions of some problems, connected with cleaning of textile products, which occur in the phasis of their industrial process. The usefulness of ultra sounds for clothing is, however more difficult to be foreseen.

Table No 1.

	Cleaning rate of samples cleaned in a conventional way /%/				Cleaning rate of samples washed in an ultrasonic field /%/			
Washing time /in minutes/	5	20	5	20	5	20	5	20
Concentration of washing agent/ g/	1	1	5	5	1	1	5	5
Sort of fibre:								
Cotton	1,2	1,5	3,2	5,8	45,8	67,1	57,8	72,8
Anilane /PAN/	93,4	94,9	92,9	99,4	95,5	98,7	97,6	98,8
Torlen /FET/	93,4	93,9	91,0	93,1	98,0	99,0	98,9	99,5
Polyamide /PA/	67,2	67,2	-	-	96,7	97,0	-	-



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Kamalaveni Chandrasekhar

**A NEW, EFFECTIVE AND
SIMPLE TECHNIQUE FOR
ENHANCING PRODUCTION
OF CALORIE-RICH.
PROTEIN FOOD FISH**

Section 3: Problems of nutrition

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

Świętojerska 5/7
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A u t h o r

Dr Mrs. Kamalaveni CHANDRASEKHAR had her early education in Bangalore and the B.Sc./Hons/; M.A. and M.Sc. degrees from the Madras University as a University fellowship holder. She joined the staff of the Banaras Hindu University in 1948 and got her Ph.D. degree alongside of her teaching assignment. She was appointed Reader in 1961 in the same University.

Dr Chandrasekhar visited USA twice as Post Doctoral Research Associate and was a member of the Faculty of the University of Washington. She was awarded the American Association of University of Women and Fulbright Fellowships. She attended the Second International Conference of WES as a delegate *of* the Ministry *of* Education, Government of India in 1967.

Dr Chandrasekhar has built up a Neuroendocrinological Research Unit in the Institute of Medical Sciences in the Banaras Hindu University and has a number of research scholars working under her guidance for the Ph.D. degree. Many have got their degrees under her guidance.

Her husband, Dr V.Chandrasekhar is a Diplomat in the Indian Embassy at Moscow. The Chandrasekhars have a son who is doing medicine in the Armed Forces Medical College.

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**A NEW, EFFECTIVE AND SIMPLE TECHNIQUE
FOR ENHANCING PRODUCTION OF CALORIE
RICH PROTEIN FOOD-FISH**

INTRODUCTION:

Father of the Green Revolution and Nobel Laureate Norman Borlaug said in December 1974 that hunger faces India and Bangla Desh and millions will die from hunger during the next 8 to 9 months and called it the worst food crisis since World War II. This is contained in the old proverb which says “When hunger turns into fire, the whole nation shall burn. “It may be pointed out here that 2 centuries ago Malthus predicted that population was increasing in geometric progression while food supplies were increasing in arithmetic progression, and that unless something positive and definite is done, the world population is bound to face annihilation due to natural causes. As per the anticipated fears, heartrending reports are pouring in from many parts of the world. Mr. Manouchehr Ganji, who made a through survey of the social and economic eco-

conomic aspects of the under developed countries under the U.N. Commission on Human Rights, stated, "One third to one half of over 2 billion human beings living in Asia, Africa and Latin America suffer from hunger and malnutrition. From 20 to 25 percent of their children die before the age of five". It is reported that in Thailand 50,000 children died of hunger during the recent past. The numbers are not only alarming but are appalling. It is a matter to be ashamed of, because this is claimed to be the Scientific and technological age, an era in which men are flown to the moon, artificial satellites are hovering round the earth, we are able to get information regarding other planets like Mercury and Saturn. These are, no doubt, spectacular achievements about which man can be proud of, yet on this planet, the scourge of hunger is allowed to spread and millions are allowed to die of the curable malady. As one contemplates, one begins to wonder, as to what is the use of all these breathtaking technological creation, if with such sophisticated implements, the basic human need FOOD, is not taken care of. It is this pathetic situation that made me to undertake this particular piece of investigation. Further, it is an established fact that fish forms nutritious as well as protective food. Nutrition experts in the Koonoor Laboratories /INDIA/ have declared that fish flesh contain 5 of the most essential amino-acids required for body building and protecting the body against

disease. In addition, it contains minerals such as Sulphur, Phosphorus, Calcium and Iodine. It also contains Riboflavin which is essential for sight. This particular fish Clarias batrachus was selected because, a pound of the edible portion of this fish gives 10.000 calories. In parenthesis it may be stated that ordinarily a hard working /manual labourer/ requires about 3150 calories per day. If quarter pound of this fish flesh is eaten with a small quantity of rice or potatoes and leafy vegetables, it will form a balanced diet and will be ideal for the poorer section of the population. It has also been recommended as an ideal 'balanced diet' for expectant and nursing mothers as well as for growing children. Yet it is easy to rear and the cost of rearing is very economical. Hitherto, fishes have never been made to spawn in captivity using a chemical ovulation inductor. Most of the edible fishes breed only once a year. This has resulted in the unequal distribution of the fishes. During a short period a large supply is available while during the rest of the year there is scarcity. Moreover, the human body, especially during the growing age, needs a regular and continuous supply of proteins.

It may be argued that the extra crop available at one season may be preserved. This poses many practical difficulties in the under developed countries because, canning as well as refrigeration are sophisticated processes. Un-

lees it is done under perfect hygienic conditions the flesh becomes useless. It involves capital which is a genuine difficulty in the under developed countries. Further, canned or refrigerated flesh is bound to be costlier than fresh-fish and thus become unapproachable to the poorer section of the people and it is this section of the population that is starving, malnourished and ill-fed. Further, it is this section /at least in India, Bangla Desh and other neighbouring countries/ that does all the heavy labour and therefore requires high calorie food. Therefore, the very purpose gets defeated, if food is made unapproachable to this section of the people. Further, majority of the population prefer fresh-fish to canned and preserved ones. Scientifically also, fresh-fish is better for health than canned fish. In under developed countries, transport is not efficient, so that distribution *of* fish becomes limited. It is estimated that more than 35% *of* the population in India, and the neighbouring countries depend on inland fisheries and in many places on local fisheries. This is because of 2 factors, one is local taste and second is lack of facilities for easy, quick and economical way of transport.

Development of fisheries has certain advantages over agriculture. In agriculture the land has to be prepared, it needs to be manured, which is proving very costly, particularly under the current circumstances of fuel and

power shortage. The process of manufacturing artificial manure is proving difficult because of high price of fuel and power shortage. In addition to all these, for the proper growth of the crops, a lot of attention is needed. I do not mean that cereals should not be eaten. All that needs to be done is to reduce the consumption of cereals to the minimum and consume more of fish. For those who cannot obtain cereals easily; fish alone will provide the necessary proteins, vitamins, minerals and, above all calories, needed for work. It may not be out of place here to mention that it has been found that the imported and hybrid varieties of cereals, especially rice do not get easily acclimatised to the indigenous soil. The special quality of manure that they need is difficult to procure under the present stringent economic circumstances. Moreover, the yield per acre of cereals is much less when compared to the yield of fish under identical environmental conditions.

All these facts were borne in mind while taking up this experimentation.

Materials and Methods:

Materials:

/1/ To begin with 5 or 10 pairs of adult and healthy Cat-fishes, preferably *Clarias batrachus*, /because the experimentation has been done on them/ are to be selected.

/2/ Either procure 2 or 3 aquaria – 3' x2' x2' or dig out mud-ponds of the same dimensions in the Kitchen garden.

/3/ Procure from the market 'Clomid' tablets /Clomiphene citrate/ according to your need. This depends on the number of fishes you want to inject.

/4/ Injection syringes - 10 ml. or 5ml. One or two.

/5/ Mortar and pestle.

/6/ 5 ml. stoppered glass tubes or empty injection bottles or vials - 5 or 10

Methods:

1. Grind each tablet separately to very fine powder.

2. Divide the powder into 5 equal parts - Note: As each tablet is of 500mg., each part will weigh 100mg.

3. Dissolve 100 mg. of powder in 100ml. of distilled water, If distilled water is not easily available, then, boil tap water well, cool, filter through a clean, disinfected cloth or if a water filter is easily available, that can be used, and store in well stoppered bottles. The stoppers can be reinforced by sealing them with molten, paraffin wax. This water can be used whenever necessary. Note:-The powder must be dissolved well by vigorous shaking so that it forms a uniform emulsion.

4. Give Intramuscular injections of 1ml. of the emulsion, thrice a week on alternate days for 2 months.
5. The fishes begin to spawn.
6. Treat the males similarly. When the milt flows out, collect it and collect the eggs and put them together in a third pond for fertilization or allow the females to spawn and the males to shed their milt in the same aquaria. When the act of spawning ceases, remove the fishes and leave the eggs and the milt for fertilization and subsequent development.
7. Allow the fertilised eggs to develop.
8. When they hatch out allow them to grow to 'fingerlings', then they may be transferred to bigger tanks and fed well to grow up and become adults.
9. If the artificial spawning has been effected 2 or 3 months prior to the normal breeding season, allow the spawned fishes to recoup and then spawn again.
10. The best food for these fishes is goat's liver. Some green weeds should be grown in the tanks or aquaria and if they are in aquaria, water should be renewed once a fortnight.
11. For about 20 fishes, 100 gms of goat's liver will be sufficient for a week.

Thus 2 or even 3 crops of fishes can be had in a year, if the fishes are handled carefully.

The procedure is so simple that every household can have a mini-fish farm. The aquaria can be placed even inside a room. This is because the modern apartment /multistoryed buildings/ houses do not have space for a kitchen garden. If that is not possible governments concerned or municipalities can arrange to set up small fish farms, at least 2 or 3 in each village so that every household gets a cheap and continuous supply of this calorie-rich protein food

Discussion:

Arceivala, the Director of The Central. Research Laboratory Nagpur /India/ said that business men and contractors prefer 'turn-key' jobs and do not relish simple methods *for* very obvious reasons. Although Arceivala made this observation under entirely different context still it applies equally well in this case also. Therefore, it should be the earnest endeavour *of* each one of us gathered here to see to it that this simple method is driven home at the highest levels possible so that it becomes imperative to be implemented at the lower levels.

Statistical data regarding the rate of food production and population growth does not show a happy trend. According to the figures given, for India, in the year 2000, at the present rate only 10 person in one will ha

ve food to satisfy his hunger. Further as pointed out by Sinha, U. and B.M. Johri /1974/ with the present trend of urbanisation, industrialisation and rate of population explosion, the areas under cultivation is bound to decrease and so to feed the increasing population, the only way is to resort to increasing food production by unconventional and novel methods and also to find out substitutes or alternate substances as food. Therefore, this unconventional and alternate source of food production, I hope will help to provide food to the billions of hungry and half nourished people and especially to growing children who are the future hope of the world. If my findings can help to solve this malady that is engulfing the developing countries of the world, it shall give me the greatest satisfaction. I feel happy that the long years of devoted work has enabled me to develop this NEW TECHNIQUES which will help to increase the production of the BASIC NECESSITY of life - namely FOOD. I would with your permission, like to end talk with a Samskrit quotation /Samskrit as many of you know is one of the ancient languages of the world like Greek and Latin and it is known for its brevity of expression and word is pregnant with meaning/.

“Anna Data Sukhi Bhava”

“Let the giver of Food be Blessed”



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Jadwiga Grqbczewska

**POLISH FRUIT ROSES WITH
HIGH CONCENTRATION OF
NATURAL VITAMIN C**

Section 3: Problems of nutrition.

Printed according
to the author's original

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The Center for Progress
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**POLISH FRUIT ROSES WITH HIGH CONCENTRATION OF
NATURAL VITAMIN C.**

Introduction

I. Utilisation of fruit roses for pharamaceutical and comestible purposes.

a) For many years the extracts of fruits and petals of roses have been regarded as marvelous substances. Bulgarian popular medicine uses rose assence as a medicine for asthma, alergic cathar, head ache and tooth ache for eyes diseases, liver stone, etc.

1. Doctors now very often use medical herbs because their curing effect is complex and not singular as that of medicines obtaine synthetically.

2. Present-day medicine confirms that the rose extract is a perfect medicine very helpful in internal diseases.

b/ Not many people realize that the rose fruits /hips or heps in Great Britain/ are the richest and cheapest source of vitamin C in the world./

Vitamin C was discovered in 1928 by a Hungarian, SzentGeörgyi, and found in rose fruits by Tillmans in 1932. Besides vitamin C/ascorbic acid/ rose hips/heps/contain small quantities of vitamin A,B,K and P.Numerous experiments have shown that the natural vitamin C is more active and is more easily assimilated by the human organism than the

synthetic are. We must also remember that overdosing of synthetic vitamin C which often occurs in children, who easily and readily "eat" the yellow sour tablets, is not unharmed to their health. It is not so simple as sometimes doctors inform the patients that the surplus of the synthetic vitamin C will be excreted from the organism with urine. I have recently talked to some pharmacists and other specialists, who inform me that the surplus of the synthetic vitamin C binds calcium and other different salts necessary for the organism thus disturbs the basal metabolic rate. Natural vitamin C cannot be overdosed and has no unfavourable effects. But the quantity of natural vitamin C diminishes very easily when hips are gathered in an improper state of ripeness, during transport, storing and extraction. The fermentation process in order to obtain rose wine /causes vitamin C to disappear nearly completely.

The confectionery industry uses rose hips to prepare concentrates of natural vitamin C in production of juices, compots, jams and marmalades and to enrich vegetable products with natural vitamin C. Bulgarian peasants are fond of aromatizing sauces, cakes, juices and other confectionery products with the extract of "their" roses. How much the natural vitamin C and its richest source the rose hips are evaluated in the world can be seen from the fact that in Great Britain there exists the National Society of Production of British Rose Hips and Rose Syrups, whose activity leads to curbing the import of citrus

fruits from abroad.

II. The average content of Vitamin C in some fruits and rose hips, expressed as the ratio of 1mg of ascorbic acid to 100 gm of flesh /mg%/ is given below:

grapes	3mg%
apples	12 mg%
cranberries	24 mg%
lemons	30 mg%
red currants	37 mg%
strawberries	60 mg%
black currants	160 mg%
Rosa canina	470 mg%
Rosa cinnamomea	800 mg%
Rosa rugosa	818 mg%
Rosa beggeriana	5020 mg%

The last species in the list originated from central Asia and has an outstanding vitamin C yield, but is not very vigorous and winterhardy, with hips small in size and quantity. It is planted in our country only in botanical gardens /1 bush in Kraków and 1 bush in Warsaw. Mr. Milewski used it in his hybridization test.

III The possibility of obtaining rose hips as the source of Vitamin C.

At the beginning I want to stress the fact that none of 20/twenty/ rose species growing wild in Poland contains 2000 mg% of vitamin C in dry flesh of hips, which is

demanding by Polish Pharmacopeia norms, when they are used as medicines. The hips gathered by accidental workers from wild growing rose bushes often not at the proper time for picking and not properly dried - have minimal quantity of ascorbic acid. They can be used only to add flavour to pharmaceuticals and comestible products but not as the source of vitamin C. As I said before the hips picked from different wild growing rose species are characterized by a great variation in the size of the flesh and in the content of vitamin C.

These variations make it difficult to process wild growing rose hips for vitamin C into half-products, especially to keep to the norms and technical standard. One also has to bear in mind that the uniform production of rose hips on plantations taking into account the cost of planting and cultivating rose bushes and organization of cropping is not more expensive than difficult and tiresome cropping of rose hips from wild growing different rose bushes, dispersed throughout the country.

IV. The directions of investigations of rose shrubs of native growth.

- a/ The above described situation called for research in order to take an inventory of all rose species growing wild in Poland and to select those which produce hips of equalized and highest features.
- b/ Then it was necessary to select or to obtain by hybridization the cultivars for wide plantations with better features of hips than those in the natural state.

c/ The last problem is the use of hips with high content of vitamin C for the production of concentrates and the enrichment of comestible products with vitamin C. The first investigations of rose shrubs of home growth and their evaluation as a Vitamin source were carried out by women at the Institute of Nutrition under the direction of dr Maria Szczygłowa. Then all the staff including two women /Maria Kaczorowska and Helena Podsekowska/ made investigations on a wide scale, embracing wild growing roses throughout the whole country.

In 1957 prof. Stefan Mrożewski determined the content of Vitamin C in the most popular home grown fruits and in wild rose hips. He also worked out a new continuous thermal anaerobic method of processing fruits into half-products /must and pulp/ with the smallest losses of vitamin C and designed an apparatus for this purpose. /Polish patent Nr 38813, at present non-valid/.

We must remember that the highest loss of Vitamin C takes place during the extraction of the juice in the press and it greatly increases when the fruit has less than 1% of the malic acid or its PH is over 3,4. The most destructive agents for vitamin C are 1/oxygen in the air, 2/catalyzers that accelerate the oxygenation, for example heavy metals, and

3/ enzymes contained in the flesh of hips.

The new method of prof. Mrożewski eliminated all the destructive conditions causing the highest loss of vitamin C

1. The air /oxygen/ is driven out from apparatus by steam
2. Destructive metals are eliminated by the use of acid-resisting steel and
3. Enzymes /contained in the flesh of hips/-the catalyzers of the process of oxygenation of ascorbic acid were destroyed by quickly raising temperature of the fruit to 80°C.

Half-products from wild roses/must and pulp/ obtained to this method contain 100mg% of vitamin C.

V. The Polish contribution

Mr. Jan Milewski who has been working at the Forest Research Institute for many years, is studying wild rose shrubs and the content of vitamin C in their hips. The aim of his investigations is to obtain- the cultivars with a high content of vitamin C. He has spent nearly 50 year working on selection and gybridization of species and varieties which grow in the natural conditions. As a result of his work he has obtained so far 8 /eight/ cultivars which I will try to describe shortly below describing their value for the production of vitamin C.

a/ The first substantial result of his investigations with the view to isolate economic form of *Rosa cinnamomea* L/which among many rose species occuring in Poland shows one of the highest vitamin C contentent /800 mg% as compered with 800 mg%

b/ In 1968 Mr.Milewski after 16 years selection obtained from *Rosa canina* two cultivars.-

c v."Sylvia" /2/ with white flowers, reproduced by seed and cv."Sylvata"/3/ with red flowers, reproduced vegetatively with root-suckers. From one 4-year-old bush we can get 50 root-suckers for replanting. Old bushes must be planted with the spacing of 2 x 3 m. Root suckers can be taken in October and November from big, well grow specimen.

They must be kept in the earth during the winter and planted in the nursery at spring as early as possible. In autumn we replant one-year-old rooted young roses in order to obtain two-year-old strong bushes for plantations for the next year. Two selected cultivars mentioned above are equalized in growth, features of fruits and content of vitamin C which is 3 times higher than that in the hips of Rosa canina growing wild. Thanks to that quality the hips of cv."Sylvia" and "Sylwana" make a specially good raw material for vitamin C concentrates. c/.

In 1973 after 19 years work to improve cultivated species and varieties of fruit roses by hybridization Mr. Milewski obtained 3 /three/ valuable cultivars. –

Rosa hybrida /R.rugosa x: R.Beggeriana/ cv. "Skolimów"/4/ which contains 3053 mg% vitamin C, while R.Rugosa in natural state has as we know 818 mg% i.e. over 3, 5 times as much, Rosa hybrida /R.rugosa x.R.Beggeriana/ cv. "Chylice"/5/ which contains 3154 mg% vitamin C i.e. nearly 4 times more than R.rugosa and Rosa hybrida /R.rugosa x.R.Beggeriana/ x R. rugosa / cv. "Konstancin "/6/ which has 2918 mg% vitamin C.

again 3,5 times more than *R. rugosa*.

d/

In 1974 on the basis of 16 years' selection of *R. canina* Mr. Mileski obtained cv. "Jubileuszowa" /7/. I had the honour and pleasure to be its Christian mother. This species has 1700 mg% of vitamin C against 474 mg% in *R. canina* hips in wild state, nearly 4 times as much. In the same year through hybridization of *R. rugosa* x *R. damascena* Mr. Milewski obtained cv. "Wspomnienie Władysława Milewskiego" /8/ named so for the memory of his son, who worked with him and was murdered by the Nazis during the Second World War.

This rose is a curiosity because although it has 23 petals it has hips. These have shape, weight and the content of vitamin C similar to *R. rugosa*. The hips and petals can be used for comestible industry as aromatic compounds. This cultivar gives 3 times more petals than *R. rugosa* growing in plantations. Besides, it inherited after *R. damascena* very strong scent, so it can be used for the production of rose essence. It blooms from the end of May till the end of September, so it has a great advantage over the roses in the Bulgarian /Kazanlyk/ and French /Grasse/ rose basin which yield flowers only once in a short period of time. Together with all these technical features cv. "Wspomnienia Władysława Milewskiego" has a great decorative value/shape, foliage, double rose flowers, big red hips, etc.

Finally, I wish to say that the content of Vitamin C in rose hips may be given, as in this paper in milligrams of vitamin C

in 100 g of fruit flesh. It can also be expressed in kilograms of vitamin C from 1 hectare of plantation particularly when we use fixed spacing of fruit bushes. Unfortunately I have not the data for all 8 /eight/ cultivars therefore to facilitate the comparison of their values I use mg%. The usefulness of the mentioned fruit roses is very great. The bushes are very good for plantations and tree planting, as border lines of forests, under of high-rottag lines, near forest roads as well as snow-screens. We can use them for the recultivation of military firing-grounds and of the devastated ground left over by old brown coal mines.

While on plantations, when we use two-year-old plants the best spacing is 2,5 x 1,5m. For tree plantations and borders we use spacing 80 x 100 cm.

These rose bushes can of course be planted in parks, gardens, on small lots of ground, where they provide us with fine decorations and the precious vitamin C which can be obtained at home according to the recipe given by Mr. Milewski /enclosed/. I must also emphasise that fruit roses play an important part in saving the biocoenosis, because birds can make their nests in big, well branched bushes, and rose hips consist of very good food for birds, including very useful partridges and pheasants.

CONCLUSION

1. Considering the superiority of natural vitamin C over the synthetic one easier to assimilate, it acts as a composite unity, containing also vitamin C, B2, K and P/we ought to-

- a. preserve the natural vitamin C in comestible products and
 - b/ use natural vitamin C for enriching raw fruit and vegetable materials scanty of this element, because the addition of synthetic ascorbic acid does not solve the problem.
2. In order to obtain the greatest number of Polish fruit roses with a high content of vitamin C we ought to persuade the Ministry of Forestry to start a large scale production of maternal material in its nurseries.

In addition to this the Ministry of Municipal Economy and Environment at Protection, the Union of Horticultural Nurseries and Seed Production, the Union of National Farms as well as private nurseries should make the production of those rose bushes for State and Town mass plantations, for pares, gardens and private lots.

We ought to inform and to get the Army Administration interested in the possibility of recultivation of firing grounds and the Mining Ministry in experiments made in DDR with plantations of rose shrubs of high vitamin C content on waste dumps of lignite mines.

According to our knowledge the best understock for budding the rose cultivars with a high content of vitamin C are *Rosa canina inermis* and *Rosa canina pollmeriana*.

In small quantities /single bushes/ the cultivars selected by Mr.Milewski from *Rosa canina*, cv."Sylvia" and cv. "Sylvana" as well as cv."Selecta" from *R.Cinnamonea*, can be bought at the nursery of People's Town Council in Lusowo, Tarnowo

Podgórze, district Poznań.

- 3/ While making a price list for rose bushes we ought include Polish rose cultivars with a high content of vitamin C. These cultivars should be placed in the price list to the same level as other budded, roses at least in the first /lowest/ price group with shrub and climbing roses.
- 4/ It is necessary that Ministry of Forestry in view of the future exports should make some efforts to obtain the patent for the above mentioned 8 cultivars of Polish fruit roses with a high content of vitamin C.
- 5/ After obtaining large quantities of rose fruits we ought to influence the State Enterprise "Las" and the Union of Comestible Concentrated to enlarge the production of concentrates and comestible products enriched with natural vitamin general for use. At the same time we ought to take care that the key and local industry of fruits and vegetables begin to produce products containing the natural vitamin.
- C. So far fruit juices enriched with natural vitamin C have been exclusively produced for export and at home they are only available for some extremely hard working professions, like pilots, miners and steel "Hutnik" juice.
6. We want to ask the industry to have amount of vitamin C in milligrams indicated on the labels of comestible products for the knowledge of the consumers, together with the information if this vitamin is natural or synthetic mixed.

Jan MILEWSKI
Ing.
P O L A N D

Enrichment vitaminization of home made
fruit and vegetable products with natural
vitamin C from rose fruits.

The enrichment with fresh rose fruits.

The rose fruits whole or excavated it means with eliminated seeds and hairs we put together with basic raw material /fruits or vegetables/ to weeks and make pasteurization in accordance with minutes recipes fixed for each product. The process of vitaminization rely upon diffusion of vitamin C from rose fruits to pickle or syrup and to fruits or vegetables in week.

Now of course you wish to know how many rose fruits we must put to one litre week.

In order to obtain the product which contains about 20 mg% of vitamin C we must introduce to week ca 60 gr fruits of *Rosa rugosa*, that means ca 12 pieces. When we use *Rosa canina* with lower content of vitamin C we must respectively increase the number of fruits. On contrary, when we use the rose fruits from polish cultivars with high content of vitamin C, we can diminish their number to 6 and even 4 pieces.

This mood of vitaminization we can use for all pasteurized products and specially for compots, vegetables and cucumber pickled and soured in weeks. In the last case we must put 50% more rose fruits, because during milk fermentation vitamin C partly oxygenated.

If we use the excavated fruits we can of course eat them with product. But if we use whole fruits /with seeds and hairs/ we must before using the product throw them out.

The second mood of vitaminization with extract from rose fruits.

This method consist on preparing earlier the extract and on adding it as a component during the home production of fruit and vegetable products.

In order to obtain the extract /essence/ of rose fruits we must crush them /whole or excavated/, submerge them in boiling water /2 litres of water on 1 kg fruits/ end cook them on “small fire” ca 30-45 minutes. After cooling we filter that extract through the loose texture, pressing lightly the pulp. When we use the rose fruits with high content of vitamin C we repeat the extraction of the flesh, diminishing by half the quantity of water and time of extraction. We join both these extracts, fill with them the bottles and pasteurize in temperature 85-90⁰C. Next we close those bottles aith corks. We can avoid the process of pasteurization filling the hot bottles with boiling extract and immediately closing them.

What content of vitamin C we can obtain in extracts? During double extraction for example of whole fruits *R. cinnamomea* cv *Selecta* which contains ca 2.000 mg% of vitamin C, we receive during first extraction 2 litres of extract containing 500-600 mg% and during second extraction 1 litre of extract containing 200-300 mg%. When we join those extracts together the average content of vitamin C wil1 be 400-500 mg% and its utilization in relation to raw material amounts 65%. The remaining 35% of vitamin C contained in the fruits of roses partly dissapears during the process of extraction /oxygenates/ and partly remain in wastes.

What content of vitamin C we can obtain in extracts of different fruit roses? From *Rosa canina* during single extraction 100 mg%, from *Rosa cinnamomea* 450mg% and from mentioned formerly selected cultivars during double extractions nearly 600mg%. During the extraction of vitamin C.

from rose fruits we must remember, that vitamin C is undurable compound it very easy oxygenate on the air and. through the contact with metals, especially with copper. For this reason we must use during whole action stainless aluminium or enamel ware /with unspoiled enamel of course/. The bottles with extract should be stored in cold room and used during the same season for vitaminization of products. The vitaminization of fruit and vegetable products with rose extracts consists in adding during processing the necessary quantity of extract, which depends on its activity /that means the amount of vitamin C/ and of our conception what contain of vitamin C we wish to obtain in our product. If for example we have in our disposition extract from *Rosa rugosa*, which contains 200 mg% vitamin C and we wish obtain the compote with 30 mg% of vitamin C we should introduce to week /with some surplus for losses/ - 200 gr. of extract, using it to dissolve the sugar.

We can add also extract of roses to domestic products of quick consumption for example to jellies and to different sorts of fruit and fruit-milk cocktails. These vitamin drinks can be treated as dietetic, healthier of course, especially for children, than coca-cola-xanthina drink with stimulant action.

The rose fruits are not comestible in raw state and for this reason we cannot buy them in fruit shops. We can buy them sometimes on bazaar or pick them from wild growing rose bushes during our weekend excursions or what is the best way, we can plant few fruit roses bushes in our garden or allotment.

But if we decided to plant the fruit roses we cannot plant these with unknown origin, contain of vitamin C. We must buy in state or private nurseries one of 8-polish cultivars, obtained by ing. Milewski with well known resistance to frost and diseases, with good vigour, fruit abundance and high content of vitamin C.

**IV^{ème} CONFERENCE INTERNATIONALE DES
FEMMES INGENIEURS ET SCIENTIFIQUES**

Aurelia Woźnicka

**LES DIRECTIONS
D'ELARGISSEMENTS
DE LA BASE NATURELLE
DES ALBUMINES DU
FOURAGE**

Section 3: Problèmes d'alimentation.

Imprimè d' après l' original
de l' auteur

Organisateur de la Conférence
et éditeur:

Ośrodek Postępu Technicznego NOT
ul. Świętojerska 5/7
00-236 Warszawa

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dr Aurelia WOŹNICKA - En 1948 elle a terminé l'Université de Poznań en recevant le titre de licenciée; ensuite elle a recommencé son travail dans l'industrie. Elle a travaillé entre autres dans l'Etablissement de l'Industrie Organique "Rokita" et dans l'Etablissement Chimique "Rudniki". A "Rudniki" elle a été le chef du laboratoire des recherches où elle a obtenu la nomination du doctorat des sciences techniques, en faisant les études hors du travail dans l'Ecole Polytechnique de Częstochowa.

Elle a élaboré ou a coopéré à l'élaboration de nouvelles descriptions technologiques. Elle a obtenu six diplômes d'auteur pour les modifications et aussi 11 brevets. Elle a participé à des Réunions et des Conférences / 3 internationales / où elle a prononcé 16 exposés.

Le moment le plus important de sa carrière c'était la coopération dans l'élaboration technologique des bacs de remplissage clairs en silicate, métasilicate de sodium, inhibiteurs de corrosion en silicate.

Aurelia WOŹNICKA
Dr
Pologne

LES DIRECTIONS D'ELARGISSEMENTS
DE LA BASE NATURELLE
DES ALBUMINES DU FOURRAGE

La nature vivante se caractérise de l'indivisibilité, la possibilité de l'autorégulation, c'est pourquoi il est important pour de futures générations de laisser de vastes étendues dans les conditions virginales. Les provisions de la nature ne sont pas suffisamment reconnues et elles constituent une richesse inépuisable des matières premières qui puissent nourrir toute l'humanité au cours de son développement et son accroissement naturel.

L'homme étant l'un des facteurs biotiques exerce la plus grande influence sur le changement du milieu naturel; il choisit certaines espèces d'animaux et de plantes et il crée le milieu artificiel de la culture. Cet état est dû à un degré insuffisant de la connaissance de toute la phyto et zoocénose et leur utilité pour homme. La puissance insuffisante de la surface productive de la terre est le résultat de cette situation, ce qui provoque une

restriction du développement de l'humanité et est la cause de beaucoup de malheurs.

L'utilisation de la surface de la terre c'est l'utilisation de l'énergie solaire qui tombe sur trois zones liées entre elles: litho, hydro et atmosphère.

L'utilisation de l'énergie solaire dépend entre autre de la couverture des plantes qui assimilent cette énergie dans les réactions de photosynthèse et la transmettent ensuite sous la forme de la nourriture pour le monde animal.

La couverture des plantes entre dans la composition des substances organiques du sol par l'intermédiaire de l'activité du monde animal et d'autres facteurs mécaniques.

La partie organique du sol est une composition complexe de différentes substances qui restent dans le sol sont les restes des plantes et des animaux qui subissent à une transformation sous l'influence de la microflore et de la microfaune ainsi que les transformations physicochimiques comme oxydation, hydrolise, émiettement mécanique directement après les précipitations atmosphériques, réaction du sol, vent et changements de la température.

Ces différentes substances on peut les classer en albumines, aminoacides, corps gras, acides

organiques, cires, goudrons etc.

De nombreux savants illustres comme S. Wingrodzki, G. Nadson, W. Omielański, A. Winogradow ont donné leur opinion sur le rôle et la signification de ces substances dans le procédé de la création du sol fertile donc nous n'en parlerons pas.

Dans mon rapport je voudrais parler de l'obtention de nouveaux engrais organiques enrichis avec les substances inorganiques qui sont nécessaires pour les procédés de la création du sol fertile - surtout pour les sols sablonneux et légers. C'est l'obtention des engrais organiques grâce aux procédés bien connus mais qui ne sont pas encore suffisamment utilisés dans la culture des plantes engraisées.

**La culture des bryophytes et d'autres
plantes du sol tourbeux pour obtenir l'engrais
organique**

On connaît bien les serres du type "Hydroculture" dans lesquelles on cultive des monocultures des légumes sur le gros sable au-dessus des rubans polyvinyl; ces monocultures sont ensuite alimentées en solution des sels minéraux.

Je m'intéresse surtout à la culture des plantes qui peuvent végéter sous la lumière dispersée, réfléctée et aussi avec de petites quantités de lumière directe ce qui

résulte de la possibilité de les cultiver sur de minces couches artificielles du sol, rangées en palette / l'une sur l'autre/, sur les rubans portants de polyvinyl ou d'une autre matière.

Les plantes cultivées dans le milieu humide, où l'eau qui les entoure approvisionne ces plantes d'éléments de nourriture; ce sont des plantes comme p.ex. bryophytes, hépatiques, mousses etc.

Sur le fond des rubans de polyvinyl dont les bords sont courbés verticalement en haut, on apporte une couche de sable de 1 à 6 cm, des silicates, des silex, des cailloux; ensuite on arrose ces couches avec de la solution des sels minéraux et on y sème les plantes citées ci-dessus.

Les plantes végètent sans être rechauffées artificiellement. Dans ce système on aperçoit le développement de la microflore et de la microfaune.

La cultivation de ces plantes créera un ensemble d'engrais organiques, riches en sels minéraux; cette culture donnera la microflore et microfaune propres pour engraisser les sols sablonneux. Ces ensembles d'engrais amélioreront *les* traits caractéristiques du sol, n'entraînant pas d'effets indésirables qui ont lieu dans l'utilisation des engrais minéraux par ex.: manque de balance entre macro- et microéléments s'il y a les doses excessives de potassium, d'azote et de phosphate.

Les ensembles complexes d'engrais organiques diminuent la pollution des eaux de surface et des eaux foncières avec des sels minéraux. Ce type d'engrais enrichira le sol avec les substances organiques - les déchets des plantes qui ne se développent pas dans les conditions de la culture champêtre et de plus il enrichira le sol en microflore et microfaune.

La culture des bryophytes
/hépatiques et mousses/ liée avec la culture
des invertébrés

enrichira le sol en albumines qui ne sont pas encore suffisamment étudiées du point des sortes d'acides aminés. Les albumines provenant des invertébrés augmenteront les provisions du fourrage pour la volaille domestique ou sauvage. La culture des espèces du type d'invertébrés qui vivent sous la surface du sol par. ex. oligochaeta, lumbricus terrestris, lumbricus variegatus, etc.

Le lumbricus, comme nous le savons déjà, se nourrit des parties mortes des plantes ainsi que des composants du sol. Ce mélange de la nourriture dans leur conduit alimentaire forme le humus qui possède une grande valeur comme engrais. En cultivant une telle culture des bryophytes, des invertébrés qui vivent dans le sol, on obtient l'engrais pour les sols sablonneux.

Sur le ruban de polyvinyl où on cultive les plantes des sols humides, on peut faire la culture des invertébrés qui vivent sur la couverture verte p. ex. de différents limaçons / limax agrestis, arion, helix nemoralis, helix pomatis /.

Les invertébrés reçus constitueront le fourrage pour la volaille

Ces systèmes de la culture n' exigent pas de grandes manipulations agrotechniques sauf l' arrosage avec des solutions minérales; les albumines sont liées avec les organismes vivants – ils n' exigent ni récolte ni conservation dans les magasins en hiver.

Je n' ai mentionné qu' un petit extrait des préparations de la culture que l' on peut suggérer après une année d' études de laboratoire sur la culture des plantes comme bryophytes et d' autres comme invertébrés qui vivent dans le sol et la couverture verte.

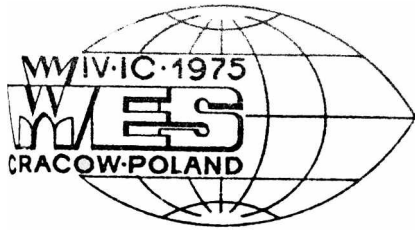
Les cultures mentionnées ci-dessus n' exigent point le chauffage direct du soleil ou du chauffage additionnel sauf obtenu de l' atmosphère; elles peuvent être étagées sur n' importe quel nombre de rayons

-d' après la construction.

En conclusion on peut dire que:

-il est nécessaire de faire participer des savants des autres domaines biologiques à ceux travaux, à la coopération sur l' analyse complexe des phénomènes et aussi pour

relever et établir les dépendances entre ces phénomènes pour mieux connaître la nature sous tous ses aspects.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Lillian G. Murad - Bablanian

HUNGER AND MALNUTRITION: A PSYCHOLOGICAL, PHYSIOLOGICAL AND SOCIOLOGICAL SURVEY

Section 3: Problems of nutrition.

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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HUNGER AND MALNUTRITION: A PSYCHOLOGICAL, PHYSIOLOGICAL, AND SOCIOLOGICAL SURVEY

Nutrition is one of the most pervasive factors influencing growth, mental and physical development, health, and social stability and progress. It is, in fact, central not only to child development but the development of a people and an entire nation. To go one step further, it is the welfare of all humans in the entire world.

The symposium which marked the birth of Albert Schweitzer, in Atlanta, underlined the fact that hunger, malnutrition, and infection work synergistically and leave in their wake permanent growth retardation, mental retardation, and susceptibility to disease (1). With the world population expected to surpass four billion this year, 500 million are infected with malaria, hookworm affects an estimated 400 million; schistosomiasis is endemic in Asia, Africa, South America, and the Carribean. An estimate of 200 million people, which includes half of the population of Egypt and Yemen, is infected. In Africa, at least 50 million carry the parasite known as trypanosomes that cause sleeping sickness. A related disease in South America produces Chaga's disease which affect another 50 million inhabitants. Roundworm is found in one in every four inhabitants of the earth - an estimated billion people. Filaria - roundworms that invade the bloodstream and internal organs affect a total of 250 million persons. The worms that cause river blindness in Africa is carried by at least 20 million. All these diseases including 35 others are termed as "diseases of the poor". All are debilitating and infect only those living in primitive conditions that hamper efforts to improve their lot (2).

To most Americans, hunger and famine have been strangers. The rich farmlands and the prairie states had been going through what was termed as the "Green Revolution". (3) The grain elevators were filled to capacity and the government paid agriculturists to let their lands idle and fall fallow suddenly, mass starvation on a scale never before witnessed had become an unbelievable possibility, and the shock of recognition had jolted the land of "supermarket culture". The earth may be running out of food...

Was it possible that the predictions made by Thomas Robert Malthus in 1798 were coming true? In the first of six editions of his "Essay on tile principle of Population", 'he had written:

necessary to the existence of man. Second, that the passion between the sexes is necessary, and will remain nearly in its present state ...

Assuming then, my postulata as granted, I say, that the power of population is indefinitely greater than the power in the earth to produce subsistence for man.

Population, when unchecked, increases in a geometric ratio. Subsistence increases only in an arithmetic ratio. A slight acquaintance with numbers will show the immensity of the first power as compared with the second.

By that law of our nature which makes food necessary to the life of man, the effects of these unequal powers must be kept equal. This implies a strong and constantly operating check on population from the difficulty of subsistence...The race of plants, and the race of animals shrink under this great restrictive law. And the race of man cannot, by any efforts of reason, escape from it. Among plants and animals its effects are waste of seed, sickness, and premature death...I see no way by which man can escape from the weight of this law which prevades all animated nature... (4)

Is it possible that the geometrically increasing population would, indeed, eventually outstrip the planet's finite food supply? Who would eat? How much and what? Who would go hungry and die of starvation?

The statistics are staggering: at least 460 million people are threatened with starvation. Ten million will probably die - most of them children under 5 years of age. Malnutrition and undernutrition has become rampant in Asia, Africa, some European countries, South America, Central America, and has even hit residents of many states of the U.S.

What accounts for the sharp deterioration in the balance of supply and demand? The causes are not hard to find: in the past two years everything that could possibly go wrong in the production and distribution of food did go wrong (5, 6). Floods, droughts, and storms ravages crops in the United States, parts of China, the Soviet Union, Africa, and India. And the shortage of fertilizer and the cost of transportation was aggravated by the extant oil politics.

Presently we are concerned with the relationship between malnutrition, undernutrition, and hunger and retarded behavioral development which affects not only the child to develop according to normal standards, but to grow into a healthy, well-functioning and productive adult. Although this relationship appears clear-cut in some areas, information is considerably less direct and more complex in others.

First let us define the terms we specify as causes of disease, susceptibility to disease, and inability to be productive in adult age. Malnutrition is the state of impaired functional ability or development caused by an inadequate intake of essential nutrients or calories to, provide for long-term needs (7). Malnutrition results in specific symptoms or conditions, such as anemia, goiter, vitamin deficiencies, or growth retardation, and may include such attitudes as passiveness, inability to learn, and inability to respond to responsibilities of every-day living. Malnutrition may be either "severe" or "moderate".

Severe malnutrition refers to marasmus or kwashiorkor, a gradual wastings of the tissues of the body from insufficient food supply. Both lead to severe growth retardation. In addition, kwashiorkor produces water retention (edema), skin ulcers, and changes in the color of the hair to red or blond. If unchecked, both lead to early death.

The largest number of the world's children and adults, however, suffer from moderate or chronic undernutrition, which occurs when both quantity and quality of food intake are restricted. Although not death-threatening, as is severe malnutrition, the morbidity rate is high: the child grows at a much slower rate, is more susceptible to such childhood diseases as measles, diarrhea, or pneumonia, is mentally less alert, lethargic, unresponsive, all minor sickness-prone, and grows into an adult who has little resistance to disease. The specific clinical disorders include anemia, rickets, goiter, and susceptibility to other diseases (8).

The relationship between early malnutrition and the structure and function of the central nervous system and the influence of superadded environmental factors on intelligence and behavior are actively under study in many countries. A variety of scientific disciplines and an array of new techniques are being applied to unravel the complex nature of these relationships.

The biochemical, metabolic, and cellular changes in experimental malnutrition both in maternal tissues and in the growing fetus in utero have been seriously studied. These changes were observed in nutrition stress induced by different methods, severity, and duration. Maternal malnutrition during pregnancy decreases the number of brain cells in the infant rat. Of course, the rat is not an ideal model for studying prenatal problems of humans, but what is significant is that it now has been observed in early marasmus or in infants who "fail-to thrive". The head circumference and brain size of the failure-to thrive child are reduced, particularly in populations where women are chronically undernourished. Significantly, fewer brain cells have been found in children who have died of marasmus during the first year of life, as compared to normal children (9).

The nutritionally induced dwarfism or neurological consequences of gross growth retardation which appear to be permanent in experimental animals, is now supported as applicable to humans through studies of children hospitalized for marasmus, kwashiorkor, and failure-to-thrive children (10). Maternal malnutrition during pregnancy apparently increases the deleterious effects of malnutrition on growth, neurologic development, and behavior.

What is curious is that some research challenges the widely held, widely observed and widely publicized opinion that malnutrition in early life jeopardizes mental development. Children of women who were pregnant during the Dutch famine of World War II had little or no effects of this relatively brief period of severe restriction. Maternal reserves may have protected the fetus (11).

Since the end product of malnutrition is death, the mortality in those age groups that are specially vulnerable has been used commonly as an indicator of the severity of malnutrition in the community. All mortality rates are subject to major limitations in that they indicate the end event of the process of malnutrition culminating in death but may not reflect the health status of the survivors. Mortality rates reflect but do not measure the prevalence and severity of malnutrition (12).

It is generally accepted that the consequences of malnutrition include a high mortality rate, retarded physical growth, impaired learning and behavior, physical deformities, high inclination of illness, lower productivity of adults, a greater incidence of absenteeism from jobs, the inability to hold jobs, increased load of health services (if any), less effective use of educational services, possibly less acceptance to family planning, increased acceptance on dole given out by government agencies, and thus, less self-esteem (13).

The direct and indirect cost of malnutrition and its repercussions on society and on the economy can be roughly evaluated. Such estimates have revealed to governmental planners the gravity of the problem and that it is a priority area requiring immediate solution. More recently, the results of food consumption studies based on weight of foods have become valuable in gauging food consumption patterns of poorer groups in the population. In all these studies, the food requirements are approximated by using the age and sex-specific energy needs and safe levels of protein intake per kilogram of body weight per day (14).

But the term "requirements" should be treated with caution. Low body weights are themselves in part the outcome of poor diets, and it can be argued that diets must be adequate to allow full genetic potential to be researched. Furthermore, productivity and mental development might be improved by better than minimal diets. The estimates given by the surveys should be regarded as minimal rather than the desirable standard (2).

Hunger is the psychological and physiological state resulting when there is insufficient food to meet the immediate energy needs. Famine results from prolonged and total lack of food. This results in starvation.

The first and obvious effect of hunger is the wasting of fat deposits; both the subcutaneous adipose tissue and the deeper fat pads are affected. Abdominal and thoracic viscera are affected next. The liver size is diminished, the intestinal mucosa becomes thin and smooth and loses some of its absorptive ability; diarrhea results. Gastric achlorhydria, absence of free hydrochloric acid from gastric juice, is generally noted. During starvation, the heart begins to show "brown atrophy", an atrophy of tissue associated with a deposit therein of brown pigment; blood pressure falls, and the systolic pressure may be as low as 75mm Hg; the pulse rate may fall below 40 per minute; edema generally occurs, a swelling of the body as the

weight decreases (the causes of famine edemas are still not clearly understood); renal disturbances are frequent effects endocrine disturbances - failure of reproduction of male hormones and in women, ammenorrhea. In men, impotence and loss of libido are early effects of starvation. Gynecomastia, the excessive development of the breast of the man, is seen in young males. Hair is dull and staring, and in children, abnormal hair grows on the forearms and the back. There is a fall in tissue and intestinal tension due to lack of elasticity of skin. The skin acquires the consistency of paper: it is dull, gray, and inelastic and frequently shows the irreversible brown splotches that are one of the permanent stigmata of starvation. Cancrum oris, a disease characterized by the formation of the buccal surfaces of the cheeks or lips, destroying lips and part of the cheek, appears in extreme cases.

The psychological state deteriorates rapidly and the individual becomes obsessed with food, mentally restless, physically apathetic, and self-centered. In extreme cases, starvation leads to suicide, murder, and cannibalism.

A true famine is unlike anything else: humans automatically obliterate it from memory as soon as it is over. In statistical terms this shortage of food is accompanied by a significant increase in the local or regional death rate. In chronic starvation, people may suffer or be crippled mentally and physically. The number of deaths may be a good index of the severity of the famine. Old persons and young children die first, and women and adolescents tend to survive better than men.

A dangerous consequence is the state of social disruption, including; large-scale panic: generally, people under these circumstances tend to leave their homes if they can walk toward a destination where food is rumored to be available. During this migration, families are separated and children are lost. The small child often reaches a suicidal state of mind from self-starvation, refusing to eat because of its grief over the absence of the parents. Adolescents, finding themselves on their own, band together in foraging bands. This kind of banditry makes it difficult to rehabilitate the youngsters when the famine is over (15). The greatest tragedy is "the breakdown of the social order which makes all relief measures so much more difficult to put into effect.

Epidemics also take over. The physiologically weakened human organism and the disruption of social organization lends itself to the spread of diseases: typhus, born of lice, cholera and smallpox, tuberculosis, relapsing fever, and many other infectious diseases follow famine. In drought areas, malaria is rampant and deadly, particularly when the rains come.

It is estimated that "over 400 million" people are suffering from the food shortage. As regards to cereals, which provide the bulk of man's food, the demand is projected to rise from about 1,200 million

tons in 1970 to about 1,700 tons in 1985. Thus, the world's food situation has suddenly become exposed to an uncertainty of unacceptable proportion (2).

Food prices have gone up sharply all over the world and have hit particularly hard the poorer sections in the developing countries. The major factors in the price increase have been the demand for grains and other sources of concentrated livestock feed and was exacerbated in 1973 by serious fertilizer and energy problems. In addition to the accumulating problems of food production, there is the equally vital issue of the nutritional adequacy of available supplies within countries and the extent of under- or malnutrition (16).

Scientists differ on how to define malnutrition, but taking a conservative view of the definition currently in use, it would appear that out of 97 developing countries, 61 had a deficit in food supplies in 1970. In the Far East, Near East and Africa, 20 to 25 percent of the population suffer from significant under nutrition. Altogether in the developing world, excluding China for which insufficient information is available, malnutrition affects some 400 million people, a less conservative definition might double the figure (17).

This is not a cold statistic: it describes the daily physical privation of fellow human beings, adversely affecting health and physical growth and seriously reducing the capacity of children to learn and adults to work. This is a conservative statistic, as such it brooks no complacency. Under - or malnutrition is strongly correlated with poverty: in such widely dispersed countries as Brazil, India, and Tunisia, the 20 percent of the population with lowest income has half the percent "caput" energy intake of the top 10 percent.

Malnutrition and infections combine to pose an enormous hazard to the health of the majority of the world's population who live in poverty. The threat is particular to children under 5 years of age. Many children under that age succumb to infection and die. The children who do survive, are not those who have escaped malnutrition or infectious diseases, but those who have survived. They are seldom left without permanent scars of their early health experiences. Retarded in their physical, psychological, or behavioral development, they may have other abnormalities that may contribute to a reduced ability to function optimally as adults, and possibly have a shorter life expectation. The lack of environmental stimulation and a host of deprivations related to poverty are other factors influencing the normal development of these children.

The governments in both developed and developing countries must decide what "development" may really mean. Too often in the past development has been viewed mainly in terms of industrialization, and measured in terms of productive capacity and material output of the country, and this may sometimes aggregate the problem of the poor.

We need, therefore, to ask, "what is the purpose of the economic development? who is it for?- If improved health and better nutrition for people are not considered in development plans, then one might seriously question whether this is really a development.

Birth, death, and reproduction are common to all life, but humans, because they are capable of reflection and of planning their own actions, do not blindly respond to nature like other organisms; they assimilate and transform nature and invest it with a meaning of intelligible moral value (17).

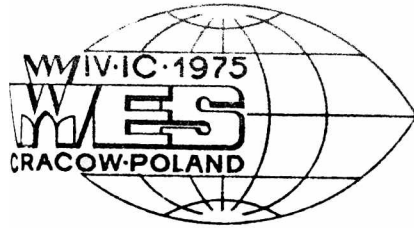
We must strive for an ever fuller understanding of our relationship to greater wholes - society, nature, and ultimately to the primary source of order and value in the world. If humans with their extraordinary power to multiply and consume seek only to maximize short-term gain, global disaster will result in the very near future. The only solution according to Heilbroner, "lies in our capacity to form a collective bond of identify with future generations" (18).

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FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

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THE PRODUCTION OF QUICK-FROZEN FOODS IN THE SERVICE OF HOUSEHOLDS AND PUBLIC SUPPLY

Section 3: Problems of nutrition

Printed according
to the author's original

Organizer and Editor:
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János ASBÓT - I was born in Budapest, on April 29th 1930. My mother was an office worker, my father a telephone mechanic. After my father's death in 1936 my mother had to bring me up alone.

I graduated from elementary and secondary school with excellent marks. I passed my maturity exam in 1948 in the "Kanizsay Dorottya" girls secondary school. I immatriculated at the University of Law but left after the first year and went to work to the United Incandescent Lamp and Electricity Corporation; there I began to get interested in the technical problems of industry. This was a turning point in my studies. In 1950 I was admitted to the mechanical engineering faculty of the Budapest Technical University; I obtained my diploma there.

I started to work as engineer at the Enterprise for the Production of Research Instruments of the Hungarian Academy of Sciences. I had to design instruments for laboratory research.

In 1968 I was transferred to the food industry as technological development engineer; there, among other things, I designed the experimental tobacco factory of the Hungarian Tobacco Industry's Research Institute. For this

work I was decorated with a government order in 1971. Since the same year I have been special engineer for package development in the Hungarian Cold-Storage Industry: my special field is the technological development of modern packages for quick-frozen fruit, vegetables and ready-cooked food.

I have continued my extension training and in 1973 I graduated at the General Department of the Marxist-Leninist Evening University.

I have been doing community work since 1957. My first charge was women's representation in the trade union of the enterprise. At the same time I started to work for women in the residential area: I have been leader of the women's committee in the 14th district of Budapest for the last ten years, and through this activity I have become also a member of the Budapest Women's Committee of the Patriotic People's Front. In 1972 I was elected member of the Presidium of the Patriotic people's Front National Council. I am doing voluntary work in the National Council of Hungarian Women.

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THE PRODUCTION OF QUICK-FROZEN FOODS IN THE SERVICE OF HOUSEHOLDS AND PUBLIC SUPPLY

Contemporary man witnesses colossal technical transformations, he is an active partner in technological revolution. This speedy change is perceptible and visible in all branches of technology and in almost all walks of life. It is very old that man's eating habits which have a direct impact on his life, health and well-being still bear the traces of past centuries. Although people would like to reduce worries connected with eating they have difficulties in finding a method for solving this problem certainly because they cannot get rid easily of rigid old habits.

Objective reasons prevented the solution of the problem as long as the technical conditions for quick- and deep- freezing did not exist.

With the evolution of social relations the conditions in which people eat their meals changed both in the family and in the constantly increasing larger communities in the big enterprises cheap warm meals had to be cooked

quickly for feeding many people at the same time

- in hospitals, schools and other children s facilities the possibilities for the necessary variety are limited, the requirements of hygiene cannot be fully satisfied, etc.
- in the family the changed conditions result from the women going out to work outside their homes availing themselves of the chances offered by their equal rights.

They need the help of society and new methods for supplying their family with warm meals.

Modern quick-freezing industry offers the possibility for solving all these problems. Linde's invention of the ammonia compressor in 1874 created the conditions for the large-scale production of quick-frozen foods but big industry has developed only since 1930 when C.Birdseye obtained a patent for his, contact-plated freezing equipment and this and its improved versions have spread throughout the world. This technology has been improved and it has been applied every-where in the last four decades.

Today's food industry produces an abundant variety of preserved foods but only quick-freezing ensures

- that the product preserves its vitamins contents almost completely,
- that the original flavour, colour, aroma and substance remain intact because of instantaneous processing without additional material,
- ready made dishes and food components keep their fully

biological value,

- that large numbers of people can be fed with meals which contain the appropriate calories and fulfil the requirements of variety of different populations.

As I mentioned in the introduction the social changes after the large-scale technological development directed women and girls until then occupied in the household towards industrial production. Their active participation in production reduced the time to be spent on household chores respectively took up their leisure time. This put women at a disadvantage: it prevents their distraction, improvement and individual leisure activities. The problem affects directly or indirectly every member of society, hence the quest for an adequate and economic solution is one of our main tasks today.

Sample surveys enabled us to work out a chart about the daily time spent on household chores by working women and working men. The data refer to Hungarian families but they more or less characterize the trends everywhere. /Slide no I./

It is visible that working women spend a considerable part of their time on household chores: the time spent by men on this type of work is insignificant even in the best - organized households.

The data also show that women who do not work in production spend almost the same amount of time on household

chores because they spend more time on performing the same work and do not concern themselves with organizing their tasks.

Let us establish now an order in women's household chores on the basis of the amount of time they require. /Slide no.2/

For the sake of effective help we should appreciate the findings on this chart:

- washing and ironing require the least time:
in most households this operation is performed once a week because the washing of synthetic underwear requires only a few minutes every day.
- dusting every day is not too time-consuming:
once a week more thorough cleaning-up lasts for a longer time.
- no amount of careful organization and work distribution could so far change substantially the time required for providing daily warm meals for the family. Larger quantities of foodstuffs cannot be stored at home because of lack of space and so shopping is an every-day chore with the preparation, cooking and dishing-up of meals followed by the most unpleasant chore washing up.

Let us see now how industrial methods and up- to date technology can contribute to solving this major and time consuming problem. If we consider that in Hungary woman spend 500 million workdays per year on providing

meals for 3.3 million families it is clear that the question can be solved only with the methods of large-scale industry.

The productivity of meals prepared at home is 1.4 complete meal per hour. This rather low rate of productivity is not high enough in the catering industry so that we cannot build our future plans on it: a kitchen in a catering establishment working with an experienced staff but with the traditional equipment has an output of 3.55 meals per hour. Besides, there is a shortage of staff already now and in the future the situation will be worse. The mass production of quick-frozen foods, however, can reach an output of 100 meals per hour.

How can we satisfy the requirements of quantity and quality in the different spheres of mass consumption?

1. We must work out a catering method where meals are produced with the highly productive methods of large-scale industry capable of surpassing traditions.
2. Economic conditions must be created which make these meals accessible to large sectors.
3. The technical conditions of the storage, distribution, sale and utilization of meals and of the components of meals must be made available.

The intensive development of the production of quick-frozen goods will provide the solution.

Quick-frozen fruits, vegetables and meals have the

above-mentioned advantages over other preserved foods so the industrial method of providing food with full value should be found in this field. Meals produced with large scale industrial methods should be conceived as constructions which can be put together from food components made of different raw materials. In this way it will be possible to compare them to any other mass-produced industrial article put together from different parts. In mass food production we should use those types of food which can be put together from the combination of their components to complete meals. These prefabricated components can be typified to a certain extent and so they can be manufactured on a production line with a high output anywhere and at any time separately from each other in different forms of cooperation. Such products are quick-frozen flavoured heat-treated steaks or meat cut into square pieces, or quick-frozen heat-treated chopped vegetables, etc.

The recipes of the meals which can be made of these components can be worked out scientifically, also by means of a computer. With the help of a gastronome we can select from among the combinations worked out by the computer the meals of identical type in consideration of the population's general taste. Those components which are tasty foods in themselves - garnish, sauces, vegetable dishes, soups - can be assorted as full meals toget-

her with the meat considered a basic food, thus satisfying the needs of consumers. /Slide no. 3/the components separately/

The meal components produced for storage according to a well-thought-out plan and stored in frozen state until utilization. If they are packed in one- portion packs so that after selection of the individual components the full menu is packed in several boxes; it is possible to work out a menu according to the taste or biological requirements of the consumer. The packing material should not change its shape when heated and its presentation should be inviting because like this no separate dishes must be used, the meal can be eaten directly from the package. After eating there is no washing-up, the boxes are thrown away. Here is one example of dishing up a packed meal: /Slide no. 4/

The further development of the method depends on the production lines. After slight adjustment of the line many diverse types of foods can be produced by changing only the recipes of the raw material fed into the machine. With the production of these meal components it is easy to produce 200 meals per hour.

The price plays a considerable part in the popularity of this type of feeding. Big industry is capable of using steady-quality raw material processing it always when it is cheapest. Computer-directed production can alw-

ays obtain the most advantageous price.

This catering system based on quick-frozen meal components requires a cold-storage chain. High-capacity deep-freeze storers with mechanized material transport and service network supply all consumers, big and small, on the basis of a determined program by means of refrigerated vehicles without almost any human agency. For this it is supposed that department stores, retail stores and households have a high capacity -200°C refrigerator. Household refrigerators must have an adequate deep-freeze space accommodating one week's family ration. The foodstuffs being processed before storage, no skin, stem or stone will occupy space and the food will be dished up to the family easily without time-consuming work, and with its full value preserved.

If this form of catering will become popular with families, and their eating habits and economic conditions will make its introduction possible women will spend much less time with household chores. Let us take a look at the chart showing the leisure time of men and women. With our method the time needed for providing the family with warm meals will be reduced with 55 per cent, i.e. one and a half hours. The free utilization of this time is of extraordinary importance both for the individual and for society. And with this method, women's leisure time will be doubled and be only one hour less than the free time

of men: this difference can be arranged within the family with the better distribution of other chores.

Up- to- data technology in catering for family needs is of tremendous significance: this method does not reduce the free time of other family members. Large-scale induction takes over the tasks performed individually and uneconomically in every household with outdated equipment and obsolete technology producing meals of doubtful biological and nutritional value.

As I said before these concerns are not limited to individual households, the same requirements apply to many fields of public supply.

- increasing numbers of people avail themselves of some for of public supply /factory canteens, hospitals, schools, children's institutions, tourism, etc/
- in these fields there exist only the traditional outdated kitchens with low productivity,
- the number of staff gets lesser and lesser,
- hygienic requirements are higher,
- many more people wish varied meals of a steady quality,
- consumers can see the calory content of foods on the package.

Feeding requirements change. The adequate amount of calories and nutritive matter for different populations are determined scientifically. In the case of catering for large crowds of people these are the bases for large-scale

meal production in working out meals put together from components.

Mass catering with the large-scale production of quick-frozen food components can be solved in three ways:

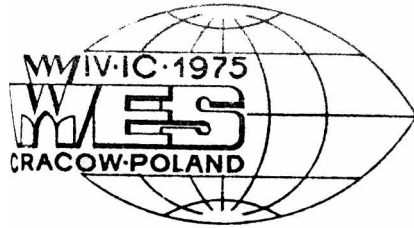
1. The restaurants, canteens, etc. heat and dish up mainly quick-frozen foods. They make simple meals which require only the addition of water from components on the spot. For this purpose they keep some of their traditional kitchen equipment.
2. The eating-places utilize only quick-frozen ready-made food which they buy and store in catering packages /10 portions/. After heating the meals they are dished out in the kitchen which has no traditional equipment.
3. There is no kitchen at the eating place. The one- portion ready meals and components are stored in deep-freeze refrigerators; their package is heatable. They are heated in a special apparatus /micro-wave, infra-red oven, etc/ and dished up on a plate with plastic cutlery and glass. This method eliminates preparation, dishing up and washing up, and a few persons can serve large crowds smoothly within a short time. This method is especially suitable for hospitals, schools, seasonal rest houses and transport.

The above-mentioned forms allow for the large-scale production of articles, for the computerization of recipes and price calculations and for the most advantageo-

us from of catering. With the assembled menus from almost identical components the differentiated requirements of different populations can easily be satisfied.

The production of quick-frozen meals has many possibilities of development and therefore it seems suitable for a long-term program of public supply: as far as we know today, this is the only possible way for future catering.

I believe that this technology should be conceived as a basis for the future production of food because it guarantees full value with large-scale industrial methods.



FOURHT INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Antonina Rumińska

PLANT CONDIMENT S IN NUTRITION

Section 3: Problems of nutrition

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
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PLANT CONDIMENTS-IN NUTRITION.

The problem of condiments is of such a broad scope that I will limit myself, in this report, to some of its aspects, namely:

1. Historical sketch of application and production of condiments,
2. Analyses of major components which occur actively in the condiment raw materials and of their physiological role,
3. A short analyses of condiments characteristic for the Polish cuisine as well as of the organisation of production and scientific research on medicinal and condiment plants in this country.

1.

The archaeological investigations have revealed that condiments were used as early as in the Stone Age, i.e. some 50 thousand years ago. The primitive man instinctively searched for plants with a definite taste, and arome and he used them with aim of assuring variety to the taste of the food which was generally queasy at that time. At the beginning man was completely condemned to plants from his direct environment, however, with the passage of time, when contacts between countries and peoples were established, condiments began to penetrate. The history of the popularisation of the so called spicy condiments such as pepper, cinnamon, ginger, cloves and the others, is particularly colourful. Their home are the tropical regions

of Asia. Already in the early ancient times the above-mentioned spices, used to be transported on chamel back from the Far Asia, to the Arabian peninsula where they were transloaded aboard ships and, in turn, taken by sea route to the mediterranean countries. After such a long and dangerous, route they became highly appreciated articles equal in price to gold and precious stones being, moreover, quite often considered as a currency. It is for this reason that when the Turks closed, in the 15th cent the land route towards the East, the feverish search for a sea route towards “the country of spices” began. It resulted in the discovery of America by the Europeans, sailing around Africa, and clearing the sea routes for India, Indonesia and the Far East. As we know, the consequences of those expeditions were farfetching both in the economic and socio-cultural fields. And it all began because of spices.

Tillage palyed a great role in addition to trade. As early as several thousand years before our Era a number of condiment plants used to be cultivated in Middle East, Egypt and in Crete. Not only local plants, used to be cultivated but those of foreign origin, as well. For instance, onion and garlic were cultivated in the Mediterranean region, deriving from Asia. The second example of a successful acclimatisation is the case of paprika, which was brought to Europe from Central America in the 16th century. The Mediterranean countries have revealed the greatest amount of invention as concerns the acclimatisation of plants, the local plants of those regions being, in turn, adopted in both North and Central Europe. This is how marjoram, sage, thyme, savory and the others have come to us.

However, the more man's role as concerned managing of agricultural production was growing the greater was the number of plants that adapted themselves to life outside their respective

Umbeliferae, Rosaceae and the like. They are composed of several or several scores of terpen compounds and their mutual relation and character decide on the scent. The phenol cils are similar to them. They are located in the plant in special reservoirs and it is for this reason that they began to emanate the scent not earlier than after grinding and that the scent disappears quickly. These raw materials are preserved best without being crushed, which should be made immediately before use.

The glycoside oils are the compounds in which the saccharic part, being the bearer of the scent, is connected with one or several sugar particles. They are: almond oils, present in the aglucons of hydrogen cyanides, mustard oils-characteristical for cross-breed families such as, for instance horse radish, mustard, radish and the like. It is allyl isothiocyanate that occurs in them as aglucone. The so called garlic oils are similar to them and they occur in garlic and onion. The identification of the above-mentioned compounds was carried out not earlier than in 1950, by Stoll, who isolated from garlic sulphuric amino-acid, which under the influence of allinase emits disulphide/allicine/ the latter one being just the bearer of characteristic odour.

The glycoside oils emit the scent not earlier than after the destruction of cells which liberate the action of enzymes and, in turn, liberation of scent factor. Many condiment plants, containing oils are used in the same time as medicines, because oils exercise a broad action especially as concern alimentary canal and digestion processes. Such oils as, among the others, parsley, celery, cumin oils provoke secretion of gastric juice. Mint, thyme, black-redish oils provoke the secretion of bile and its formation while parsley, juniper and celery oils are diuretic and they are disinfectant for the ureter.

The mustard, marjorie, thyme, onion, garlic, mint and other oils

are bactericidal and bacteriostatic, the rosemary, eucalyptus, mustard oils are irritating the mucous membrane. Though the action of oils can be associated with the feeling of taste however, that are mainly the compounds such as alkaloids or tannins that give Taste to foodstuffs. They are for instance such as: piperine in black pepper, capsaicin - in paprika, absinthine in absinthe. The condiments hot, stinging and contracting in taste are in particular demand. All those compounds belong to substances provoking strong physiological effects.

The compounds of the type of carotenoids and flavonoids are the main factors giving colour to alimentary plants. As it is known, carotenoids, in addition to a beautiful red colour, are the precursors of vitamin A, and flavonoids participate in metabolic processes as one of the oxido-reducing systems. Flavonoids are dettractive diuretics, diminishing blood pressure, facilitating storage of vitamin C by the organism etc.

The condiment plants are in the same time the source of a number of vitamins, mainly C and A as well as of some vitamins from the group B, E, K.

Finally mention should be made of the fact that they are the plants which supply us with a number of mineral compounds under the form of organic compounds which are easily absorbed. A number of microelements are among them / Table No 11. As it can be seen, the condiments comprise not only the compounds attractive from the point of view of palatability and sense of smell but they are, moreover the compounds active physiologically, sometimes fairly strongly, thus, a skilled application of condiments can be fairly advantageous for the organism while an improper one can provoke disturbances and harmful reactions.

Despite the fact that condiments have been applied since

natural zone. It is for this reason that we have today a number of cosmopolitan plants cultivated independently of their origin.

The use of condiments was connected not only with the possibility of their cultivation but, as well, with various opinions as concerned their role and share in nutrition. Primary man searched for and used condiments for a completely spontaneous and intuitive motivation, the news concerned being conveyed owing to tradition. However, with the passage of time, more rational criteria, based on the knowledge of chemical composition and physiological action began to be decisive. It was, as well, an often case that emotional or economic factors were decisive in history. By way of example, in Europe, in the 16th and 17th centuries, when the exotic condiments were fairly expensive their use and, often, over-use resulted from snobism and it was for this reason that they were condemned as the symbols of extravagance and debauchery. At the beginning of our century the problem of nutrition has been brought down to the number of consumed calories, proteins, carbohydrate, the condiments being ill treated. Anti-condiment campaigns even used to be launched in a number of countries as concerned the exotic plants, within the framework of autarchy, imports and on the basis of their harmful effects for health.

We are lucky that in our days the condiments are not branded anymore and that, generally, they are within our reach. On the contrary, we recently observe an intensified interest in condiments which results from several reasons:

- because of an intensified agricultural economy we undoubtedly have to do with a certain standardisation of foodstuffs from the point of view of the amount of consumed sorts as well as from that of their quality. There would be enough to mention that some 100 years ago, 150 species approx of vegetables were grown

in Central Europe, as compared to 50 kinds grown nowadays. Some years ago some 50 species of grain plants were used, while today their number amounts to several, and so on.

- Standardisation of varieties and intensive tillage methods, especially/use of fertilizers for plants and feeding animals result in an often worsening of product taste.
- The technological processes connected with industrial processing have an even more strong impact in this respect. The point often is of giving taste to surrogates, for instance albumin products achieved from plants and imitating meat and other products.
- The ever easier contacts between nations and adopting of foreign dishes in our own cuisine which could not be prepared with no suitable condiments is not without importance.

More over, science began to interest itself in condiments. The research consisted in analyses of chemical composition of condiment plants as well as in investigation into their physiological role, especially because of the fact that many condiments are in the same time cure plants.

2. The Major Active Substances in Condiment Plants.

The most important condiment components, are those which give taste, odour, and colour to dishes.

Odour: Of condiment plants is due to oils which are volatile compounds provoking the reaction of the olfactory receptors placed in the closest vicinity of taste receptors which is the reason of a strong connection between olfactory and smell impressions. The oils are multicomponent compounds having the character of terpenes, phenols and glycosides.

That are the terpen oils which are relatively most popular and they occur in plants belonging to the following families:

hundreds of years we do not know much about the mechanism of their action. The preliminary research carried out at the Max Planck Institute in the Federal Republic of Germany have revealed that a number of condiments such as paprika, ginger or curry provoke an increased secretion of saliva making it, on this occasion, richer in enzymes which is the cause of the fact that food is more quickly decomposed, and absorbed. The further investigation into the subject have revealed that some condiments stimulate the hormonal secretion/ superrenal gland/ and influence the heart action. The recent tests carried out by a British scientist Menon confirm that onion, even boiled or fried, provokes solution of fibrin in blood exercising, in a sense, an anti-collapse action. The Hungarian doctors, on the basis of tests, put the stress upon the advantageous properties of paprika to which they ascribe anti-collapse and antisclerotic action. It is generally known that garlic is a disinfectant and exerts an anti action.

Stress is, moreover, put upon the importance of condiments in, saltless diets, as they improve taste and, in turn, digestion. Let me, moreover, mention the investigations carried out at the Warsaw Academy of Agriculture into the positive influence of some condiments on the quality and durability of bread, and into preserving and taste advantages of some condiments as concerns, preservation of animal deriving products: meat and fats.

Scientific research both in the field of analyses and physiological action of condiments are undoubtedly necessary and even absolutely imperative, however, we should say to ourselves that application of condiments in cuisine is a skill and sometimes even a gift being moreover, a factor of cultural nourishment and, by the same, of material culture, as well.

The so called national cuisine such as French, Italian or Chinese, are based on particular type of food but, as well, on the condiments

typical of them. Personal skill can make out of those components an unrepeatable taste and Frenchmen say that composition of a new dish contributes more in the happiness of humanity than the discovery of a new star.

As concerns the Polish cuisine, it is similar, by its character, to that of our neighbours to the German and Russian ones, being characterized, however, by a rather high consumption of meat, especially pork, flour products, starches and potatoes. The consumption of vegetables and fruits has grown, as well, in recent years. The Polish cuisine is relatively poor in local condiments that are species growing wild and used since a very long time. They are, among the others, as follows:

Cumin - *Carum 1arvi* L. from the Umbeliferae family. Its fruits are characterized by a relatively high content of oil / some 5 per cent/. It is hot in taste and is used, first of all, for "heavy" types of meat, mainly pork, cheeses, especially cottage types and vegetables hard to digest - mainly cabbage. It facilitates digestion, is a disinfectant of alimentary canal and is carminative.

Horseradish - *Cochlearia armoratia* L. a cross fertilize, family. It has a thick, fleshy root of a hot, taste owing to its oil containing sulphur. It has, as well, a considerable content of vitamin C, sugar, enzymes and mineral components. A horseradish root hashed and mixed with vinegar is generally used in this country as a seasoning of fat meat, cured pork and beef products, fish dishes and eggs. Hop - *Humulus lupulus* L. - family of Cannabinaceae - has been known, since a long time, in both Central and East Europe as a plant for beer production. The so called hop cones /inflorescences/ produce a composed substance called lupulin which comprises: oils, resin compounds and the so called bitter hop acids. Owing to the lupulin and tannin presence the hop cones give clarity to beer

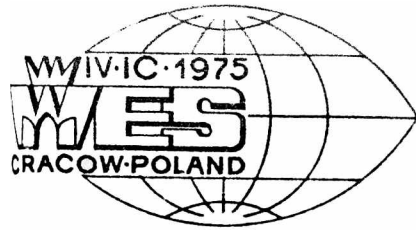
as well as a specific taste and foam creative capacity.

Bison plant - *Hierchloe odorata* – Gramineae family is a condiment typical of our country. It contains the oil having a coumarin scent. It is a basic condiment of Bison vodka.

All the above - mentioned species run wild in our country, however insofar as market demand is concerned the supplies derive exclusively from plantations. We also cultivate and use a number of foering plants that have been adapted to our conditions. They mainly derive from Mediterranean countries. It is marjoram that belongs to the most popular condiment in the Polish cuisine, however savory, basil, tarragon, mustard, coriander, archangel, lovage and the like are used, as well. The Polish cuisine, as well as that of other nations, use, moreover, readily the spicy condiments, especially pepper, cinnamon, vanilla, cloves and nutmeg apple. Poland is a country that raises many condiment and medical plants. These are old traditions in this country, however, both cultivation and processing have developed especially after World War IT. Some 60 species are grown in this country. We are not only selfsufficient in this respect but we are exporting, as well, a numer of such products as cumin, ergot, marjoram and the like.

All the problems of herb cultivation, beginning with growing, contract, through turnover and reprocessing, i.e. herb medicine and condiment production are at the charge of “HERBAPOL” which is subject to the Ministry of Food and Purchase. The scientific bases of HERBAPOL is the Institute of Herb Industry in Poznań, which carries out the complex investigation into biology and ecology of plants, agrotechnics, cultivation of new species and new forms of medicines and their effects.

Scientific research on medical plants is also carried out at the Academics of Agriculture – Horticultural Division – as well as at Medical Academies –Pharmacological Division.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Mahin Rahmani

**THE FUTURE ENVIRONMENTAL
PROBLEMS ASSOCIATED TO
LAND USE AND URBANISM
THROUGH INDUSTRIAL
EXPANSIONS IN DEVELOPING
COUNTRIES**

**Section 2: Spatial arrangement of human
environment.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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THE FUTURE ENVIRONMENTAL PROBLEMS ASSOCIATED TO LAND USE AND URBANISM THROUGH INDUSTRIAL EXPANSIONS IN DEVELOPING COUNTRIES

I – Introduction

Population monster as has been termed by Norman E. Borlaug the 1970 Nobel Prize Winner, should be viewed from all its angles of attack on the environment and on the people, such as food, education clothing, transport, employment, sanitation, population congestion, hygiene and other concomitant economic and social implications duly integrated and scrutinized.

Rapid population growth is usually accompanied by strong tendency in urban development, accelerated industrialization, excess production and consumption and naturally serious environmental complexities as caused by over-utilization of land, depletion of natural resources, increase of waste etc.

II - Urban Problems Versus Population Growths And Industrial Expansions

Urbanology and future population projections having quite a number of common factors and features should be studied simultaneously and owing to their accelerated expansionism and growth rates a coordination of their -relevant implications seems of

utmost importance. The present population densities being on the average of the order of 130 persons per square kilometer will be multiplied by a factor of 2 round the year 2000 and if the trend of events are not disrupted, this will be multiplied by a factor of 20 round the year 2100. Naturally, frightful and grave consequences are to be expected which will ultimately disorganize all the existing relevant social and economic net of regulations and the interconnected and interdependent activities. Since man is dependent on community pattern of life and all such relations being disturbed and endangered through population explosion, therefore the case needs some analytical treatments.

At the moment only some 10 percent of land surface of the globe is under cultivation, on which human life and agricultural production depends. Some countries are better supported by nature as far as the cultivable kind surface is concerned, while others in the semi-mountainous or arid or tropical regions suffer from quite a number of disadvantages and deficiencies.

The use of chemicals, biocides, defoliant, open mining, crop farming etc., if uncontrolled, will all culminate in an ecological imbalance, the results of which, to a certain extent, are evident in certain urban communities. Such unfavourable consequences are particularly more pronounced in highly industrialized and progressive urban sectors of rapid economic growth than others with their development projects at hand and hardly starting to become industrialized.

Urbanists should by all means discourage the development of large cities and concentrate on the planning and the development of cities of the order of 240,000 to 400,000 inhabitants. Such cities would have less complication not only from the point of view of

pollution, but also from the social and administrative implications.

Already the lure and sophistication of the cities are absorbing the rural population and the demographers visualize unhealthy proportions in the decades to come. Such concentrations will naturally increase the slums where sanitation are sadly deficient, particularly in the low income countries.

Urbanism presently is playing an important role not only in the modifications of the environment, but disappointedly also are sources of rather grave and destructive phenomenal alterations. Statistical analysis reveals unhealthy figures as to the superfice of land which is being constantly absorbed each year through housing projects, community construction, community construction requirements and all the relevant interconnected services such as roads, airports, parking and recreational areas etc. Unfortunately, such development projects are all aiming to reduce and drastically decrease or partially eliminate the cultivated land superficies and thus cause a destruction of the nutritive soil layers to be ultimately replaced by elements with quite different physical factors and chemical specifications from the point of view of reflectivity of the incoming radiations and the receptivity of solar energy and ot3er alternations, all culminating to further the cause of environmental deteriorations.

III-The Implications Of Land Use

Contrary to the natural requirements of providing more agricultural and residential¹land superficies for the global population, million of acres of rural¹lands are being converted each year not only to agricultural uses, but land is also absorbed for dwelling, factories and development projects such as airports, highways, transmission lines etc. Such, development projects will upset the run-off balance and the general pattern of the dynamic equilibrium

of the various ecosystems and above all degrading the beauties of the country-side and man's aesthetic needs.

It is clearly evident that such environmental damage and modifications when once started will affect the land depending biotas through the disappearance of agricultural or grazing land facilities. The case will be aggravated by the problems connected to erosion and the consequences of diverting the natural flood courses and furthermore by destroying the public recreational asserts.

The intensive drain on land use is presently imperative through the urgent necessity for expanding the rural and urban growths to meet the demands of accelerated population increase. Likewise soil erosion by wind, water, salinization, leaching of nutrients etc. are equally grave problems that certain regions are naturally forced to face both from the Joint of view of regional or global requirements.

Serious and continued grazing and the application of modern mineral fertilizing agents will seriously damage the soil structure and cause a removal of the valuable vegetational cover of soils.

This is purely a local problem, but when continued also could be developed into a matter of great and serious international concern where large scale nad extensive activities such as deforestation, overgrazing, climatic modifications or over-burdening of the land surface or similar man induced man activities would lead to the loss of organic cover.

The case would be aggravated in regions where plant regeneration is very slow and can be a cause of serious concern. Such alternations could be analytically studied and properly registered through the applications of modern infra-red and bio-sensors and the- satellite technology.

Since our planet possesses quantum possibilities and has a certain limited and finite potential capacity either in land or material resources to accommodate a certain limited population, therefore overdrain in any form whatsoever, land or resources, will be detrimental. If all the people on this planet acquire high standards of living and require modern urban development schemes and amenities of industrialized societies, then the consequences will be a general disrupted global community which seems inevitable as we approach the year 2000.

IV- The Socio-Economic Aspects Of Urban Developments

In the majority of the crowded cities and urban areas, particularly in the developing countries, the basic civil services and facilities are either poorly organized or utterly inadequate to meet the public and community demands.

In developing countries the education and the medical units in such centers are far from being proportional to the community requirements. Recreational parks and playgrounds are practically non-existent. The number of dispensaries and hospital beds are practically a fraction of the equivalent numbers in the developed countries. Similarly are the recreational facilities. The problems connected to traffic and transportation are really acute and more critical than other developmental objectives and problems. In some such centers public libraries or reading rooms are practically non-existent.

Such problems are being aggravated by the fact that the majority of industries are centred round such cities and this has been the main cause of attracting the rural population to new urban settlements at the expense of ruining the economy and absorbing the man power resources of the agricultural centers, so desperately required for the daily life and the existence of such countries. Such are the magnitude of the problems to be encountered in the urban development project of some of the developing countries with new industrialization projects and sophisticated concepts for modernization and industrialization.

It is the ultimate duty of the urbanists and town planners to view the future prevailing conditions when planning new urban centers and take into consideration that new industries should not be developed at the expense of any agriculturally based rural economy which causes the partial collapse of the socio-economic pattern of the developing communities.

To improve urban environments in congested area is not only a socio-economic problem, but requires the utilization of new resources to effect the improvements and provide the basic facilities and the minimal public amenities for the living conditions in an inforeseeable future.

In the developing countries in order to combat against unemployment, the economic growth cannot be retarded nor decelerated and if such provisions are not accounted for, then the existing socioeconomic parameters which constitute a potential threat to the country's economic and political stability will justify their existence. In such communities mental disorders, delinquencies, crimes, immoral traffic and illicit business etc. will prevail and such problems will overshadow the problems arising from the population growth poverty etc.

V-Environmental Impacts of The Forementioned Subjects and Man-Environment Relationship

The influence of modern technology in the developing countries usually is interpreted by the pattern of urban and social developments as is the case in the highly developed and industrialized countries.

In the past the traditional and cultural requirements of such developing countries demanded that all the members of the family be congested under one roof with a distinctly established concept that all the members of the family should be placed under the guidance of a common patriarch.

The modern urban developments in such countries demand a separation of the different generations and the loosening of the collapse of the former family ties and relationships and discard of the traditional solidarity of the family collections. In the new urban developmental plans where complete independency is the objective to be achieved, a marked deviation from the generally and traditionally accepted norms of life are imposed with the consequence of inducing a series of social complexities. Therefore, in future urban developmental problems all the relevant parameters affecting, one way or the other the life pattern of the developing societies should be taken into account.

Rapid urbanization and rapid industrialization always are associated or coupled to a steady deterioration of the environment, the air, the land and the waters. Any urban development and industrialization program should take into account the normal functioning of the ecosystems and their conservation and present possible or probable deteriorations. The extent of the feasibility of the plans depends on how the public, the environmentalists, the

urbanists and the socio-economic experts sense the problems and arrive to common solutions and save the environment and the living species from the possible effects of deterioration.

In rapidly developing cities and urban centers with rich and poor population the problems connected to mass housing under varied living conditions deserve due consideration. The analysis of the housing shortage as felt in some of the developing countries where thousands of the inhabitants are forced to live in a one room dwelling in contrast to communities accommodated in spacious garden villas and offered luxury public amenities should be duly scrutinized.

The appearance of slums with all its ramifications and congestion consequences and the proliferation of environmental issues *is* such densely populated centers where shortages of the prime necessities such as schooling and hospital facilities, recreational centers and other public requirements such as adequate sewage disposal mechanisms etc. are felt, reveal cases for further proliferation of environmental complexities and causes of severe concern.

Naturally the increasing population imposes a certain stress on the land capacity and when studying the overall land capabilities all the problems connected to planning and policy making should be duly analyzed. Therefore, the study of the “Carrying Capacity” which is defined as “the number of acres or hectares required to support a given number of persons or animals or both”, are imperative.

VI- Assistance of Archiecology for Solving Some Environmental Problems

The new concept of the science called “archiecology” recently justifying an existence current literature is really a marriage

between architecture and ecology and has the prime responsibility to coordinate such projects involving the manifold urban requirements when to be considered and treated in terms of finite ecological factors commensurate with the environmental implications.

This new science when properly applied will provide all the possibilities for a well balanced and coordinated scheme of activities in town planning, recreational necessities, airports, large scale development projects, roads, highway and dam constructions etc., all to be harmonized and coordinated with the nature's constraints and ecological ideals, concepts and principles. As the new science develops, it is hoped that by the next decades, particularly prior to the year 2000, provisions could be made for the materialization of better solutions for alleviating the lack of harmony between the man's architectural and urbanic exigencies and his ecological and aesthetic concepts and requirements:

Such a marriage concept between landscape architecture and ecology promises to provide and compensate man's aesthetic and human requirements presently endangered and lost through urbanization settlement programs and expanded industrialization and thus save man's cultural heritage by the imposed aggressions on modern civilized life and its manifold activities.

In the evaluation and assessment of the merits of any large scale developments projects either from the urbanistic, financial, economic, social and engineering angles of approach, recently a new dimension has been added to the formerly existing procedures. This new dimensions is the urban and the ecological repercussions or the impact of the planned project on the environment within the constraints of which it has to be executed. This phase involves a complete assessment of capital investment and the expected benefits and whether the accruing results would be counterbalanced by

an irreparable deterioration of the environment from the point of view of land degradations and urban complexities is open to discussion.

Analytical procedures are necessary to develop scientific basis for the rational use of land and conservation of the resources of the biosphere and the crust and the improvement of the global relationships between man and the environment the plans will ultimately tend to increase man's ability for an efficient land use, allocation of sites and control management of the natural resources and predict the degree of repercussions of man's activities on the future world of tomorrow, considered from the point of view of land and resource deficiencies and the ensuing complications.

Modern engineering activities are destroying some valuable monuments and archaeologists have the ethical, moral and national responsibility to save the cultural heritage of mankind.

Certain areas of natural, historical or architectural significance have unique and outstanding spiritual or rather sacred characteristics that deserve to be considered as not only belonging to one nation, but equally well to all human societies irrespective of political boundaries or cultural discrepancies and they should be considered as a common heritage of all families of mankind.

Efforts already have been made to establish the international organization to be called "The World Heritage Trust". It is really of vital importance that an official recognition be given to the idea of the creation of such an organization which primarily would safeguard the aesthetic needs of mankind and preserve and protect the relics of the past not from the environmental and climatic aggressions, but also to protect them from man's modernized activities.

Since such relics reveal an international ownership, therefore any agreements or conventions for their protection would impose no barrier or limitations on the sovereign rights or territorial ownerships of the nations on whose land the property lies and the apparent constraints could be removed through mutual cooperation and understanding.

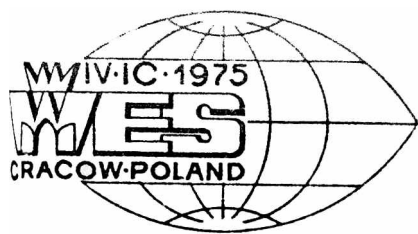
CONCLUSIONS

After reviewing the entire aspect of the problems treated in the above, the following conclusions could be derived:

- 1- Population growth should be decelerated.
- 2- The planet's quantum resources should be used with utmost care, thrift and scrutiny.
- 3- Particular emphasis has to be put on the use and consumption of fossil fuels, particularly coal and petroleum. The development and application of nuclear energy should be given due considerations and the probable hazards associated to its use has to be properly considered.
- 4- The use and application of the biocides, germicides etc. has to be reconsidered.
- 5- Thermal pollution of the planet, whenever possible, has to be prevented.
- 6- Excessive use of communication facilities such as cars, planes etc. has to be discontinued.
- 7- Man's aesthetic and recreational requirements has to be given due weight and consideration. This will imply perfect maintenance and preservation of historic monuments, natural parks, pasture lands, forests etc.
- 8- The preservation of wild-life has to be given due thought and consideration.

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IV^{ème} CONFERENCE INTERNATIONALE DES FEMMES INGENIEURS ET SCIENTIFIQUES

Teresa Colletta

**LES VALEURS HUMAINES,
SOCIALES ET ECONOMIQUES
DANS LA CONSERVATION
INTEGREE DES ENSEMBLE
HISTORIQUES**

Section2: Environnement de l'homme.

Imprimé d' après l' original
de l' auteur

Organisateur de la Conférence
et éditeur:

Ośrodek Postępu Technicznego NOT
ul. Świętojerska 5/7
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men theorique et de la mission de s'exprimer á un nombre toujours croissant d'observateurs. Ces sont justement les "raisons humaines" de la sauvegarde, fondées sur la thèse fondamentale de la continuité du passé au présent de l'histoire architectural et urbanistique. Thèse que Roberto Pane a remarquablement exposée dans plusieurs écrits (1) comme le motif déterminant pour chacun de nous le besoin de "conservation", pour opposer á la ville inhabitable d'aujourd'hui un milieu de vie plus juste et plus humain.

Leg valeurs sociales et économiques des ensembles historiques. Les noyaux urbains ne doivent donc pas être sauvegardés uniquement comme "valeurs antiques", mais pour ces "valeurs-intérêts" qui exercent une utilité sociale fondamentale pour la vie associée urbaine. Il s'ensuit la nécessité de considérer ainsi l'aspect économique de la conservation des e.h., c'est-à-dire en relation avec le patrimoine architectural existant comme habitation, infrastructures et services et particulièrement avec ces "valeurs" dont on peut jouir en quantité limitée qui sont stratifiées dans les e.h. et que doivent donc être considérés des "biens économiques". Nous précisons ainsi car nous ne croyons pas que l'orientation interprétative des e.h. seulement comme "biens économiques" et non plus "biens culturels" soit la solution du problème de la conservation, bien que ça donne une meilleure prise sur l'opinion publique (2). La signification instrumentale donnée aux e.h. pour détecter des appréciables changements de tendance et une alternative globale aux modèles sociaux, économiques et civiles du système capitaliste ne peut pas nous trouver d'accord. La conservation comme "moyen" pour un "acte révolutionnaire" qui défère la solution du problème qui nous intéresse aux hypothèses de changement des "grandes décisions économiques" de réorganisation territoriale et démographique de l'Etat nous semble éluder l'engagement disciplinaire de la conservation par la "restauration urbanistique". Mais nous n'avons pas l'intention d'affirmer avec ce qui précède que l'on puisse détecter une solution du problème des e.h. sans chercher à connaître les aspects et les implications économiques et sociales. Ces derniers doivent être situés dans la réorganisation institutionnelle de l'urbanistique que nous espérons en Italie engagée d'ici le novembre prochain, afin que la restauration soit coordonnée et non pas remplacée par ces aspects.

Dans ce problème est de remarquable importance l'orientation culturelle

et l'action des Etats du Conseil de l'Europe, conduite parallèlement a celles d' autres organismes tels que l'UNESCO, l'ONU, l'ICOMOS, mis en oeuvre de manière systematique, depuis une dizaine d'années pour choisir des directives politiques communes pour la sauvegarde d'un patrimoine (historique-artistique, naturel) qui est richesse collective des hommes du monde entier. (3)

La "conservation intégrée" du patrimoine architectural. L'année Européenne du Patrimoine arch. (1975) et la réalisation du Programme de "Réalisations Exemplaires" (4) a donné un nouvel élan a l'action du Conseil de l'Europe. Dans le cadre de cette Campagne une doctrine s'est dégagée: celle de la conservation intégrée. Cette nouvelle appellation désigne l'ensemble d'une politique active de défense, de mise en valeur et de réanimation économique du patrimoine arch... En outre la volonté d'identifier la connaissance, la préservation, l'entretien, la restauration améliorent leur procédures et leur techniques et en sont développés le champ d'action en même temps qu'en cherche d'assurer un lien étroit avec la conscience des réalités locales, régionales, nationales. C'est à dire que tous les aspects ont été disséqués et réunit tant sur le plan législatif, que économique et social que financier et technique. La Campagne d'information et de persuasion entreprise par la politique entregouvernante, à la quelle nous reconnaissons le plus grand mérite, cherche à faire comprendre au public et aux responsables des gouvernements les conséquences de la dégradation continue d'un patrimoine bâti irremplaçable dans une unique direction culturelle et juridique. On a écrit (5) que la conservation active "...doit être axée non seulement sur la préservation de la valeur esthétique mais aussi de la valeur sociale, essentielle, que représente sa présence dans l'environnement riche et variée dont les hommes ont besoin. La conservation, le assainissement et l'adaptation aux exigences de la vie moderne des bâtiments et des quartiers anciens et leur intégration utile dans le circuit fonctionnel de la cité est un aspect fondamental d'une action complète en faveur de l'habitat et de l'environnement..."

Nous pouvons résumer l'idée de la conservation intégrée en trois points principales. Le premier est l'élargissement des critères de valuation

et de choix de l'objet non plus fondés sur des principes historiques absolus mais qui reflètent le développement de la société. La restauration aura ainsi intérêt non seulement aux quartiers et aux e.arch. mais aussi au tissu social qui en est le contenu et le support. Les principes fondamentaux sanctionnés par la "Charte de Venise" (1964) restent pourtant encore les mêmes, malgré ce qu'on pense. L'équilibre entre les différentes parties qui forment le milieu historique bâtiments et population qui y habite et y travaille est ainsi introduit dans les objectifs de la conservation. ⁽⁶⁾ Le deuxième doit être l'intégration de la substance historique du centre ancien à la ville entière et/ou la réanimation de secteurs sauvegardés au moyen de nouveaux emplois en garantissant ainsi une amélioration de la "qualité de la vie urbaine". La conservation sera donc une partie intégrée de la politique générale la plus vaste. Le troisième point doit être la suppression de l'indifférence de la plupart des habitants des a.h. à l'égard de la conservation. La création d'une responsabilité sociale comme "conscience de la conservation" est le fondement effectif unique afin que se produise la possibilité de la réalisation des décisions et des projets.

L'intégration souhaitée pour garantir l'indispensable fonction de la conservation est jusqu'aujourd'hui plus une demande et un espoir qu'un véritable changement des conditions actuelles. On doit préparer et plus encore vérifier une base opérationnelles pour une évaluation comparative de la conservation. Les lignes directrices et les critères théoriques doivent avoir agilité et flexibilité en un processus continu d'adaptation aux nécessités et aux événements nouveaux.

Les critères méthodologiques d'intervention. Nous avons défini le but qu'il faut atteindre mais les moyens sont encore controversés. Ça est dû à la multiplicité des disciplines qui convergent dans la conservation et aux méthodologies différentes qui doivent être appliquées selon les différentes typologies des e.h. Pour abréger notre discours nous parlerons seulement du problème des noyaux antiques des grandes villes en expansion, parce que du reste nous le croyons le nœud de la question. En ces types d'ensembles on rencontre en effet la plus grande difficulté pour la restauration urbanistique. Ces ensembles occupant une position centrale

dans une agglomération active plus vaste et ils présentent, en Italie, une riche stratification historique et architecturale, qu'il faut soustraire avec le projet de conservation aux interventions de réanimation partielle et de structuration tertiaire non planifié. D'un côté donc le réglage du développement de la banlieue, de l'autre la sauvegarde du noyau historique. Dans ce but, faute d'une théorie d'intervention appropriée, il nous semble d'utilité l'extension à l'urbanistique des critères étudiés pour la restauration architecturale qui ont déjà des principes "scientifiques". On aura recours à la distinction bien connue, proposée et appuyée internationalement, entre la restauration urbanistique d'un côté et la restructuration et la reconstruction de l'autre, qui donnent lieu ensemble à la réanimation urbaine. (7). Pour illustrer les différences substantielles entre les respectives opérations techniques nous croyons utile nous arrêter un instant sur des images de notre expérience personnelle.

La réanimation urbaine. La comparaison de quelques interventions dans le centre de grandes villes américaine et européennes, où l'exigence de modification des vieux quartiers était urgente pour la résolution des problèmes du développement, nous montre la prolifération de reconstructions grandioses, extrêmement lucratives, et le renvoi de la restauration au compte d'une économie fondée exclusivement sur le profit. C'est le cas du LOOP et de la Marina City de Chicago, du Government Center dans la City Hall de Boston, du quartier Wall Street de Manhattan, du centre de Berlin ouest. L'exploitation intensive du terrain public en plein régime de spéculation immobilière donne partout le même résultat: une accentuation de la concentration du bâtiment en nette opposition avec le témoignage historique préexistant. Pareillement dans Berlin est, pays socialiste, on a attribué, par exemple à la Marx Engels Platz centre de l'ancienne ville de Berlin-Cölln, un ~~re~~ ^{renouveau} émergent qui bouleverse les structures architecturales anciennes et quoiqu'il sousentende une "idée de ville" bien différente, nous confirme pourtant une politique de conservation inadéquate.

La restauration urbanistique. Dans le noyau ancien de Spalato en Yougoslavie on a opéré d'une manière clairement différente. On a inséré une respectueuse restauration urbanistique et architecturale de la ville-entre-

les-murs, qui est un exemple extraordinaire de continuité de l'architecture, dans la grande et nouvelle ville près du port et qui acquiert ainsi une fonction précise de milieu culturel, de récréation et de résidence. Les transformations du palais-cité de Dioclétien: le vestibule en place, le nymphée en place couvert nous enseigne à user la ville comme une structure formelle qui peut devenir une vision correcte de conservation.

Nous désirons maintenant parler de l'Italie, pays de densité élevée de noyaux historiques et nous porterons l'exemple de Naples qui est indicatif du débat général d'aujourd'hui et que nous avons fort à cœur. Naples est en effet un cas emblématique de contraste net entre institutions différentes ; universitaires, administratives, techniques. On doit y joindre la confusion de l'enchevêtrement des problèmes pratiques et l'introduction dans la question du capital public et privé et des géants du secteur industriel avec le mot d'ordre: recouvrement des e.h. comme biens économiques. Quelles que soient réellement les raisons de la majorité pour rassembler le problème de l'utilisation du patrimoine urbain avec la conservation des biens culturels, cet aspect nous semble couvrir une partie seulement, une section au problème d'une sauvegarde. Il nous semble qu'il ne soit pas la seule disposition à prendre ni le seul but à atteindre. Nous croyons que l'exigence susdite d'une conservation intégrée d'activités propres à la vie d'aujourd'hui dans la multifonctionnalité des e.h. doit être le but de l'intervention et non pas seulement la solution du problème de l'habitation (qui est grave pourtant).

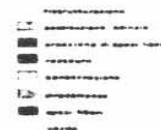
Parlons maintenant de Naples. La structure formelle de l'ensemble historique de Naples a eu un processus de développement accéléré et discontinu dans son aspect morphologique, mais la succession des temps historiques –une stratification plus que millénaire - a été continue. On doit souligner encore le rapport étroit entre la population et son milieu et que les habitants, aujourd'hui comme autrefois, sont un nombre de beaucoup plus grand de la possibilité de contenance de la ville. C'est la "contradiction" qui émerge la première dans la planification de Naples ainsi qu'en plusieurs villes de l'Italie du sud. Bien que nous croyions la ville un "bien collectif" et bien que nous acceptons l'opportunité de ne faire aucune "déportation" des classes moins riches, un éloignement partiel sera inévitable. La conscience que justement les secteurs anciens de la ville révè-

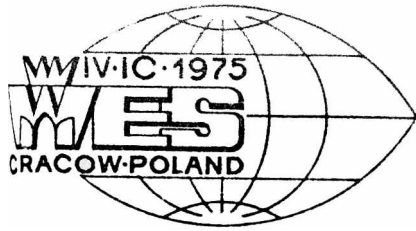
lent les contradictions sociales les plus aigües, nous oblige, pour une intervention réaliste, à l'hypothèse d'une réduction du tissu social dans l'exigence même de la reconstitution des structures arch. ad un niveau minimum d'habitabilité. On sait que la fondation de "Neapolis" est du période grec et donc fidèle à une règle urb. appliquée à un grand nombre de ville-colonies méditerranéennes. La correspondance parfaite du tissu actuel avec l'originale structure à plateaux nous montre l'unicité et la valeur de l'e.h. napolitain. La persistance du tracé ancien sur lequel les additions du tissu successif ont eu lieu, détermine - et c'est son plus grand prix - l'existence aujourd'hui encore d'exemples arch. stratifiés en plusieurs siècles, ce qui rend la ville de Naples unique en Europe. La richesse d'un patrimoine tel a donné plusieurs longues études de l'Institut d'Histoire de l'Arch. de l'Université de Naples et dans les années 1964/70 une équipe de spécialistes, sous la direction de R.Pane, a conclu la recherche méthodologique de restauration de l'e.h. (8). On a en effet distingué pour ses caractères d'omogénéité le noyau originel et ses stratifications successives - centre ancien (c. a.) - du plus vaste e.h. Le développement de la ville bourbonienne jusqu'à la fin du XIX^e siècle, appelé centre historique, présente en effet des considérables discontinuités et disomogénéités des tissus: c'est une distribution urbaine équilibrée même, mais composée de secteurs autonomes et individuels. Sur cette distinction porte aujourd'hui la polémique: d'un côté qui veut sauvegarder le c.a. pour sa valeur commune "unité urb. omogène" avant tout (127 ha) selon la loi de plan d'urbanisme en vigueur. (P.R.G. 1972) De l'autre côté il y a qui veut astreindre à une loi unique sans privilèges ni différences l'entière ville historique (750 ha). En rapport avec ce vif débat nous avons proposé dans les années 1972/74 une recherche et un projet pour vérifier sur un secteur de la ville historique la possibilité de la subdiviser en des sub-zones omogènes et y étendre les P.P.E. qui seront, selon les caractéristiques du tissu, des plans de restructuration ou des plans de restauration. (9) Le choix de la zone n'était pas prédéterminé et retourné sur la zone d'agrandissement à l'ouest du c.a. Nous avons commencé notre recherche en collaboration (10), avec une analyse soignée hist.-urb.-tectonique-géomorphologique d'une vaste zone pour connaître le tissu urbain. Nous avons nécessairement différencié la zone susdite juste-

I) Le centre de Naples, avec la ligne hachée est marqué le centre historique (D.M. du P.R.C.) avec la ligne continue le centre antique. On evidenc aussi la zone de notre intervention.



2) Plan de restauration urbanistique du "secteur sauvegardé" : Tarsia-Pontecorvo.





**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Cecylia Rozkwitalska

**PROGNOSTICATION OF THE
DEVELOPMENT OF MUNICIPAL
TRANSPORT IN POLAND**

**Section 2: Spatial arrangement of human
environment.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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Poland

PROGNOSTICATION OF THE DEVELOPMENT OF MUNICIPAL TRANSPORT IN POLAND

1. Introduction

The quick development of towns, the state and the limited possibilities of the development of street network in conditions of motorization and the general intensification of the traffic cause increasing transport difficulties. In order to rightly assess the requirements of municipal transport it is necessary to predetermine the socially and economically justified directions of its development. It is to be realized that the- development of urban transport in the future will be taking place in conditions of an increased significance of the time factor, people's demand for traveling in improved conditions and the decreasing influence of the difference in the cost of the means of transport chosen in conditions of the increasing welfare.

The present article is aimed at presenting the general outline of the forecast of the development of municipal transport in the Polish towns for the period till 1990. The point of departure has been the needs and the scope of transport in the sphere of mass communication and urban road system.

2. Factors determining the scope of transport requirements

The transfer of people and traffic as well as parking is the determining factor here. Transfers are made between two points, namely between the sources and the targets of the traffic. Those two points are separated by a certain distance the covering of which takes place in specific conditions determined by the speed of transfer and the comfort of the journey.

The most important factors determining the scope of the needs of urban transport include:

- the size of the urbanized area,
- building development,
- the town's spacial arrangement,
- the character of commuter zones,
- the number of people and their social and professional structure,
- mutual arrangement of the places of living, work and rest,
- street network and the quantity of parking lots,
- the arrangement of collective transport routes,
- the state of motorization,
- technical progress in mass communication and the street network.

The influence of the above mentioned factors varies from one urban centre to another. Hence it is so difficult to establish the future needs not only on the national scale but also for the individual urban units.

Apart from that it should be kept in mind that of capital importance for determining the requirements of municipal transport is the degree of the economic development of the country, of the individual towns and the standard of living of their inhabitants. An increase of the general welfare of the society leads to less attention being paid

to the costs of journey, while its duration and comfort as well as security gain additional importance. Besides, the envisaged increase of the out-of-work time, due to the shortening of the working week may produce an increased transfer of people.

The protection-of the natural environment will be of no small significance in the future either. Transport routes, the network of streets and the means of transport employed must be considered from the point of view of the protection of the natural environment against the noxious effects of road traffic which concerns especially the diffusion of noxious fumes and noise into the atmosphere.

Due to the different influence of those factors the method of the extrapolation of the present development of city transport in Polish towns as well as the transposing into the Polish conditions of world tendencies in this respect cannot be applied in order to determine our future requirements in that field. This could lead to an incorrect assessment of the needs. Not only the quantity but, first and foremost, the quality of the transport means applied will change. That is why in order to present the forecast of the development of transport in Poland the present draft projects of transport systems have been used as well as the initial conceptions of solutions to problems in the country's biggest agglomerations contained in the works of the Institute of Environment Shaping such as "The Programme of the Development of City Transport till 1990" and "The state and Development Prospects of Infrastructure in Urban Transport with Regional Specification".

3. General-Directions of the Development of Municipal Transport in Poland

Despite the dynamic development of individual motorization in Poland nowadays it seems that for the Polish conditions the most desira-

ble thing at present is a complex development of both the individual and the collective transport with the latter given priority. Such an approach is justified by a greater social and economic efficiency, much weaker demand for space and less negative influence on the natural environment. It is estimated that collective transport will assume fifty-five to eighty per cent of the general number of journeys during the rush hours.

An efficient municipal transport network and a determined parking policy are the only effective means capable of counteracting in the future an excessive use of cars. Private car owners will use municipal transport only when it will be able to guarantee them a regular, quick- and frequent service. To meet those conditions municipal transport routes must run along the general directions of traveling as well as must take into consideration the hitches occurring in that traffic which are due to an increased motorization. This segregation may be carried out horizontally, through defining specific lanes on the streets reserved for municipal transport means and giving them extended privileges on the crossroads, or, vertically, through putting municipal transport routes on another level. It would be unadvisable to postpone the realization of those solutions for a more distant future because together with the growing motorization car owners drop the custom of using municipal transport and stop seeing advantages offered by a collision-free urban transport. In such a situation, contrary to the logic and independently of the exploitation costs, an improvement of city transport does not cause a decrease of traffic, thus, missing its target to a certain extent.

It could be deduced, therefore, that the modernization of municipal transport systems in Polish towns should preferably occur before the advent of mass motorization as it is the only way of not losing

its present users. Taking this into consideration the following directions of the development of city transport in Poland's towns have been adopted:

1. Any new transport design which has not been in application in the world today is unlikely to be used in Poland by 1990. Unconventional systems in foreign towns are now being tried on the model and prototype scales. A detailed analysis reveals that in view of the present state of technology it is impossible to apply them in practice on a larger scale. Till 1990 the transport in Poland will be based on the existing means.
2. The main system of collective transport in big urban agglomerations will be the underground or regional trains supplied by a network of bus and tramway lines. This concerns Warsaw, Łódź, Wrocław, Cracow, Szczecin, Poznań, Bydgoszcz, The Upper Silesian Industrial Region and the Gdańsk Conurbation.
3. Due to the low technical standard of the equipment of tramway transport and the impossibility of providing special routes for them it is expected that tramway systems in Elbaż, Grudziądz, Gorzów and Toruń will be maintained until a complete wearing off. The possibility of building a tunnel in the city centre of Częstochowa is planned for the more distant future. The introduction of tramway systems to the agglomerations which do not possess it at present is not expected.
4. Busses with combustion or other engines / electric, gas/ will be the main means of transport in the remaining towns. Due to various numbers of passengers in different towns the capacity of busses is also to be differentiated accordingly and special lanes for busses will be reserved in the areas of the heaviest traffic.

5. Bus routes will also in the future extend beyond the boundaries of towns connecting settlements lying within their gravity spheres.
6. Railway transport will be increasingly used in great town agglomerations. Railway lines should be supplemented with urban transport routes as well as by the State Inter-City Bus Service and vice versa.
7. The system of trolleybus service in the towns which had or are having it is not likely to be developed. It will be maintained in the existing form as long as it wears off. In conditions of an increasing significance of environment protection that means of transport may be introduced in rest and recreation areas! spas, health resorts/.
8. An integration of all those systems from the point of view of the passengers is one of the most important aspects of the modernization and the extension of mass communication in great agglomerations. The integration should be understood in terms of its convenience, irrespective of the organizational divisions and technical sub- systems / regional railways, tramways, city busses and the State Inter-City Coach system/. Well selected changing points are of capital importance here including even common platforms for the various sub-systems.

The modernization of the road system and especially the creation of high-speed traffic roads is also important. In view of the protection of the natural environment those roads should by-pass the administrative and service centres as well as housing settlements. Their unfavourable affecting of the natural environment in terms of noise, the contamination of air and destroying of landscape should be reduced to a minimum. Contrary to that, city transport should reach the closest possible proximity of the sources of traffic /workplaces,

living quarters, service centres/.

Spacial planning and the system of transport should ensure getting to the workplace in the average time of not longer than thirty minutes.

4. Requirements of city transport and street network in Polish towns

4.1. Requirements of collective transport

High- speed urban routes

It is planned that a construction of two lines of an underground railway is needed in Warsaw by 1990, one line in Łódź, Cracow, Poznań, Wrocław, and Szczecin and the construction of a tunnel in Bydgoszcz. Systems of regional railway lines should be developed in the Upper- Silesian Industrial Region and in the Gdańsk Conurbation.

The construction of an underground system without the intermediary stage with the simultaneous exploitation of the tramways is advisable in Warsaw, Łódź, Szczecin and Wrocław. This is justified by both the intensity of the envisaged traffic and also by the necessity of shortening the time of travelling in relation to the duration of a tram and bus journey. The solution of the "premetro" type with the intermediary application of tramways to be introduced to the already constructed tunnels has been adopted for Poznań, Cracow and Bydgoszcz.

The overall length of high- speed urban routes should by 1990 reach the distance of 168 kilometres/excluding the routes of regional railway system in the Upper-Silesian Industrial Region and in Gdańsk /.

Means of collective transport

The demand for the rolling stock can differ depending on the length of routes, the intensity of traffic along the route, the capacity of the means employed, the exploitation speed and the index of usage of those means. Examining the results of the projected communication arrangements it turned out that the only comparative index can be the number of places available in the transport means per one thousand inhabitants. Taking into consideration the still insufficient supply of the rolling stock with the capacity standard in the rush hours of 0.15 m² of floor space per one standing passenger /6.6 persons per square metre/, the index of the number of places per one thousand inhabitants should grow by 55 per cent as compared with the state for 1973. A considerable improvement of service standards to counteract the excessive traffic inducing private car owners to take advantage of municipal transport should occur after 1985. This will be possible after increasing the frequency of circulation on individual lines and decreasing the number of passengers in transport vehicles by an average 25 per cent in relation to the present norms. The thus acquired number of places must be referred to the numerical state and the kinds of the rolling stock and its envisaged production. Thus it is estimated that in 1990 Poland will need:

tramways	2775
underground	1330
busses	20585
total	24690

This means that the overall number of the means of transport will, in numerical terms, grow by 69 per cent as compared with

1975. Taking into consideration that those will be mainly vehicles of increased capacity, the growth of them in comparative terms will be very high indeed.

Production and the technological background

Due to the exchange of the old tramway rolling stock for vehicles of a new type which consume more electric energy and the construction of the underground system, the sub-electric power stations capacity must increase greatly. After the adoption of the suggested number of vehicles the installed power should be in the range of 390 MW that is 35 per cent more than in 1970. The prospective growth of the number of vehicles will also require an appropriate technological background in the form of depots and repair shops to be built. By 1990 the number of places in the depots should correspond to the number of vehicles.

4.2 Requirements in the street equipment system

Development needs in this sphere concern streets and squares, car parks, engineering objects traffic light signals and street lighting. The 6.5 million population increase of Poland by 1990 will cause a marked rise of investment areas in the towns. Urban areas must be provided with a network of streets of such a density which would fully facilitate the service of those areas. A ten-fold increase of motorization will cause the necessity for developing qualitatively new road equipment. This concerns primarily the change in the structure of street network depending on the difference in road surface and a change of the structure of that network according to classes.

The forecasts maintain that by 1990 the extension of the street

network in towns should concern the enlargement of the streets of improved road surface by three times a double extension of the length of the streets of such surface as compared to 1970. The average width of the street will thus reach some 12 metres.

The extension of the street network concerns both the high speed urban routes and also streets connected with the building programme. And so:

- about thirty per cent of the streets will be built in the housing areas,
- research on the system of high- speed routes led to the conclusion that by 1990 in connection with the construction of the first highways in Poland some 135 kilometres of highspeed routes should be built in the urban areas of Warsaw, Łódź, Częstochowa, Cracow, the Upper Silesia Industrial Region and other towns. The Torun Thoroughfare” in Warsaw is a grand undertaking in this respect,
- it is expected that all out-of-towns roads will be dual carriage ways.

The increased number of cars in towns will demand more parking space. Taking as a point of departure that 50 per cent of the cars will park on the pavements and in parking bays and only the remaining cars will require the possibility of parking in single-or multi-storey car parks, by 1990 it would be necessary to allot 5000 hectares of space for those car parks and build multi-storey car parks for about 103 thousand vehicles. The need for building multi-storey car parks will be especially acute in the build-up areas and particularly in city centres

In connection with the extension and modernization of the street network there will also be a necessity of building multi- storey cross

roads and intersections with the railway lines, bridges and collision-free passages for pedestrians.

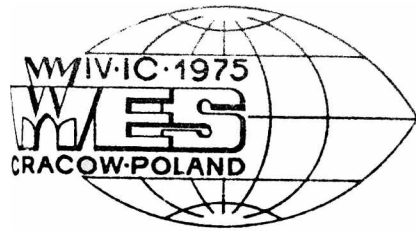
Light signalling is one of the basic factors of the organization of traffic. It enables for gaining considerable effects in increasing road safety and lessening time losses. It is expected that by 1990 some 8000 cross-roads will be equipped with light signals.

Proper lighting also has a big influence on the security on the roads. It is being estimated that some 1.2 million light points will be installed in Poland by 1990.

5. Conclusions

The present state of city transport despite a remarkable improvement is still to be recognized as insufficient. To counteract the negative effects of motorization before its intensive development it is necessary to ensure an efficient collective transport. High efficiency and comfort of travelling may be ensured through the introduction of vertical segregation that is through the construction of systems of high- speed municipal transport and the development of bus services. The prognostication leads, to the following conclusions:

- the scale of prospective needs requires some changes and a preparation to increased tasks,
- to make results more concrete it is necessary to revise them periodically in view of the constant changes in the development of motorization, transport needs and the introduction of new means in this respect.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Gulsun Saglamer

A HEURISTIC METHOD FOR THE SYNTHESIS OF SIGNALE STOREY LAYOUTS

**Section 2: Spatial arrangement of human
environment.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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A HEURISTIC METHOD FOR THE SYNTESIS OF SINGLE STOREY LAYOUTS

INTRODUCTION

The assignment of facilities to locations is a combinatorial problem that has been of interest to many investigators. Some optimal producing procedures have been presented and a number of interesting heuristic procedures have been proposed. No computationally feasible optimal producing procedures exist at present because of the combinatorial difficulty inherent in the problem. It is convenient to classify sub-optimal procedures as either "construction" or "improvement" procedures. Construction procedures build up a solution from the null solution by making a successive assignment of facilities to locations (1), (2), (3), (4), (5), (6). Improvement procedures start with a complete existing layout and modify it so as to improve it (7), (8). No method other than going through all possible layouts, is absolutely guaranteed of finding the optimum solution. All other approaches are heuristic. They employ strategies which will tend to lead towards better solutions, but are not bound to produce the optimum. Clearly the solution generated by sub-optimal procedures depend on the historic adopted and since there is often no way of telling how appropriate the heuristics are, one can not be at all sure how near or far the solution is from the optimum. Some of these methods generate alternative layouts according to the heuristics employed and the sub-optimum solution is defined by the evaluation of alternative layouts according to the decision variable, which is generally the total circulation cost of the layout. Alternatively, some of these techniques generate a single layout which is claimed to be a sub-optimum layout without being based on any criterion. It is the aim of this paper to propose a new constructive technique for the generation of the single storey layouts.

METHOD

The proposed method is a construction procedure which build up the layout from a null solution, by making a successive assignment of

activities to locations. In this section the essential features of the proposed approach will be outlined. The details of the technique which also considers several design parameters, that of compatibility and incompatibility of activities, natural daylighting of activities, allocation of circulation space and the realization of bioclimatic building shape were explained elsewhere by Saglamer (5).

In this technique there are two basic requirements. The first one is the "site matrix". This might be obtained in the simplest way by dividing up the site or the floor plane on which activities are to be arranged with a square grid for example, each cell of which becomes an element of "activity area". The second requirement is the criterion, for the generation of the "synthesis order" by which to decide in what order the activities should be located in the site matrix.

In the proposed technique, the "synthesis order" is determined taking into account the association values and the existency of links between the activities. The association value which is denoted by S_{ij} is the number of standard journeys between the activities. The term link which is denoted by K_{ij} is either zero or one. If the association value is greater than zero or a certain value specified by the program user, then there exists a link between the activity pairs which means that $K_{ij}=1$, if the association value is zero or less than a specified value then $K_{ij}=0$, which means that no link will be assumed between the two activities in question. At the first stage, the computer routine which generates the synthesis order determines the sum of links and the sum of association values of an activity together with the rest of the activities, and this is done for every activity of the problem. Following this, the two sums are multiplied and the activity having the maximum resulting value is chosen as the first element of the synthesis order i.e., the first activity to be positioned on the site matrix. To put this in formal notation if S_{ij} denotes the association value between the i th activity and the j th activity and K_{ij} ($K_{ij}=0$ or $K_{ij}=1$), denotes the existency of the link between the activity pair of i and j , the computer carries the following calculations formulated in equation (1).

$$C_i = \sum_{j=1}^n S_{ij} \cdot \sum_{j=1}^n K_{ij} \quad (1)$$

The activity having the maximum C_i value is selected as the first element of the synthesis order. The S_{ij} value of the each remaining activity with the first activity is multiplied by its corresponding K_{ij} value, and the activity having the maximum result is selected as the second activity to be located. The third and the remaining activities in the synthesis order is determined by:

- § summing the S_{ij} values of the each remaining activity with the activities previously located,
- § summing the K_{ij} values of the each remaining activity with the activities previously located,
- § multiplying the two resulting values for every remaining activity and selecting the activity having the highest number to be the next one in the synthesis order.

As a first approximation an element of the association matrix (S_{ij}), which is greater than zero, is assumed as a link and then the synthesis order and the related plan layout are generated. In the proposed technique, the general procedure devised by Whitehead and Eldars (1) is accepted for producing, with the aid of a computer, a single storey building shape and a layout of activities within that shape, with a minimum circulation cost. At the next stages, certain increasing S_{ij} values of the association matrix are assumed as links and each time an alternative synthesis order and the related layout is generated. The total circulation cost of each layout is then calculated. This assumption means that only the pair of activities having greater association value than the specified value is accepted as linked. Employing such a heuristic for the determination of the synthesis order permits the omission of small relationships, thus gives priority to the high relationships in the design process. If the total circulation costs of alternative layouts, generated by the step increments of the association value compared, a curvilinear relationship which passes through a minimum value is obtained between the total circulation cost and the limiting association value. A decrease in the total circulation cost is achieved to a certain increasing S_{ij} value, which is assumed as a link, by the close location of activities which have high association values. Beyond this point, the omission of high relationships causes the placement of highly related activities far from each other, resulting in an increase in total

number of elements	activity areas
1	1
2	2
2	3
6	4
7	5
3	6
2	7
3	8
1	9
5	10
3	11
4	12
2	13
2	14
1	15
2	16

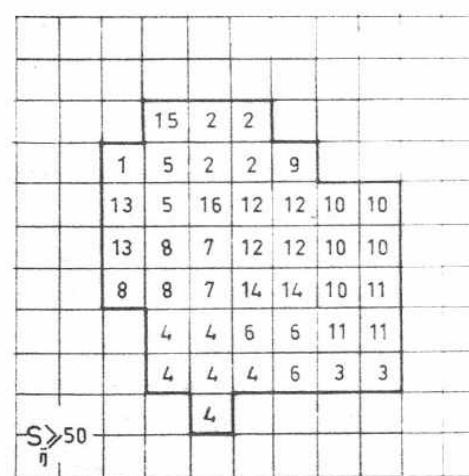
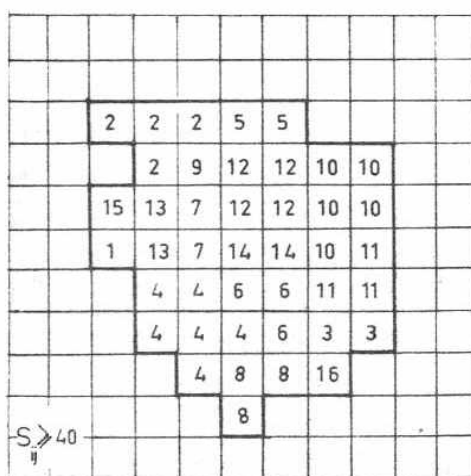
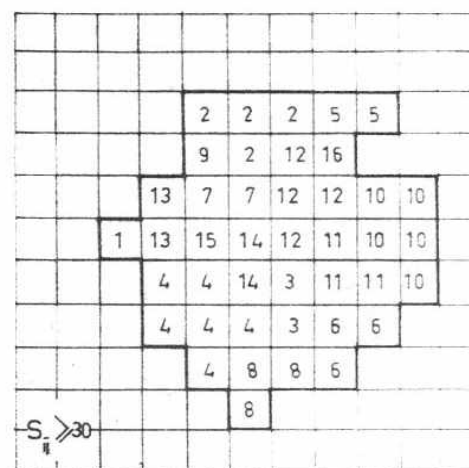
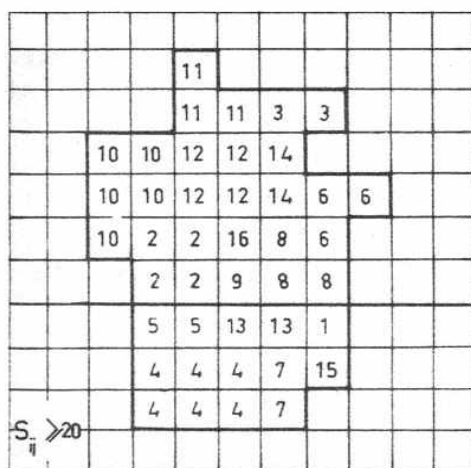
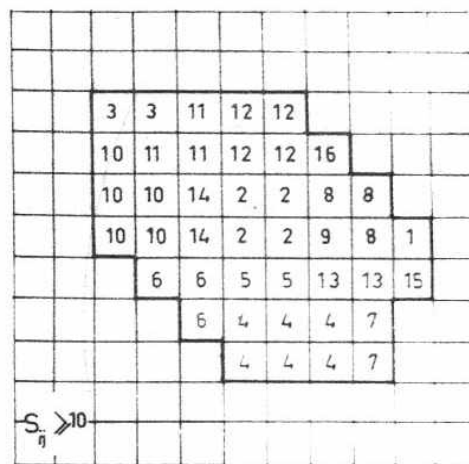
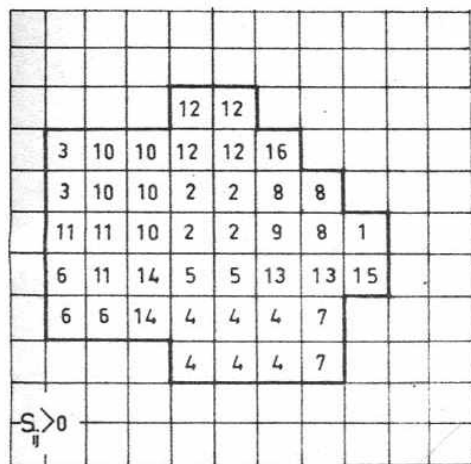


Figure 2 Alternative Layouts Produced by Computer

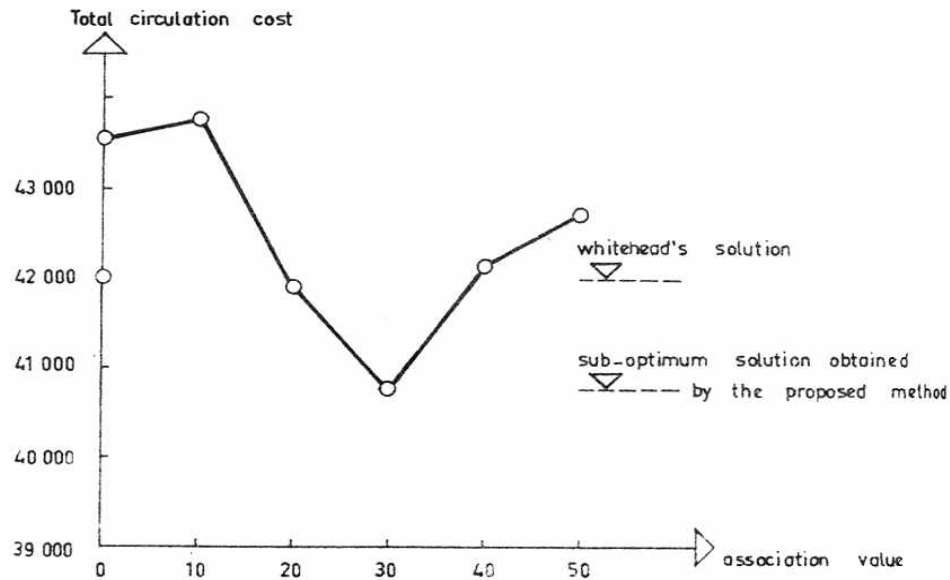


Figure 3 Total Circulation Cost of Alternative Layouts

circulation cost. Therefore, the user may continue to generate alternative layouts until the total circulation cost is minimized and this layout is defined as the sub-optimum solution of the overall problem.

A SAMPLE PROBLEM

If the hypothetical matrix shown in Figure 1, which comprises sixteen, activities is taken as the data input for the SIRO location routine, the computer program calculates the synthesis order by assuming every $S_{ij} > 0$ value as a link, and outputs the synthesis order and the related site matrix showing the layout of activity areas and the total circulation cost of layout. At the next stages, alternative synthesis orders for increasing S_{ij} values, i.e., $S_{ij} > 10$, $S_{ij} > 20 \dots S_{ij} > 50$, predetermined by the program user, are calculated and corresponding layouts of activities and the total circulation costs are received as the computer output (Figure 2). Figure 3 shows the total circulation cost of alternative layouts which

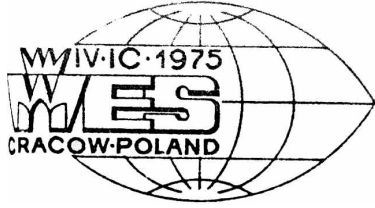
indicate that the minimum total circulation cost is achieved by assuming a certain association value as a link which, in this case is $S_{ij} > 30$. For comparison purposes, the total circulation cost of layout obtained by the application of Whitehead-Eldars technique is also shown in Figure 3. The computer outputs of several experiments prove the validity of the heuristics adopted in the proposed method as the total circulation cost of the sub-optimum layout is found to be less than the total circulation costs of layouts generated by similar techniques.

CONCLUSION

A heuristic method for determining the sub-optimum relative location patterns for the single storey layouts is presented. The algorithm for the preparation of the alternative synthesis orders and the generation of the related layouts is explained in detail. A worked example demonstrating the application of the proposed heuristic approach is illustrated including the data input together with the computer output.

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FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

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SATELLITES AND THE GEODYNAMICS PROJECT IN GLOBAL LAND USE PLANNING

**Section 2: Spatial arrangement of human
environment.**

Printed according
to the author's original

Organizer and Editor:
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SATELLITES AND THE GEODYNAMICS PROJECT IN GLOBAL LAND USE PLANNING

Global land use planning is basic for all nations. Priority should be given to providing suitable living conditions for each individual. The earth's resources are limited. How can we feed, house and clothe the world's present population and yet provide for future generations? Planning is essential. Two developments, Satellite surveillance of the earth and the Geodynamics Project, offer a means for knowledgeable management of the earth and its resources.

More than a quarter of habitable land has not been mapped in detail. Many mineral deposits, geothermal power sources and reserves of water have not been identified. 75% of the earth is water. Exploration of the oceans and their resources is needed. Weather information over the oceans and from inaccessible land areas is not available. Satellite photography and data collection have changed this picture. The Geodynamica Project involving more than fifty countries with active research into the earth's dynamics and its history can compliment satellite information in locating resources and predicting natural disasters.

SATELLITES

Space does not permit a discussion of the different satellites which have and are now providing weather information, knowledge of the changing topography of the oceans and monitoring land based instrumentation for snow pack measurement, volcanic activity, etc. The Earth Resources Technology Satellites /ERTS renamed LANDSAT/, National Aeronautics and Space Administration /NASA/ orbiting observatories, provide data particularly applicable to land use planning. ERTS I /LANDSAT I 1 was launched in polar orbit July 1972 and in 2 years returned to earth 124,000 images covering 5 billion km². LANDSAT II /previously designated ERTS B/ was launched on January 22, 1975. A third LANDSAT is in the planning stages but funding is being questioned.

The mission of ERTS 1 was to show the feasibility of remote sensing from space for use in practical applications of earth resources management. The spacecraft weighed about 950 kg and was aligned 0.7 degrees to the earth's vertical. Solar arrays provided power / approximately 500 watts/ for operation of the spacecraft and its instrumentation. The latter included the Multispectral Scanner /MSS/, the Return Beam Vidicon Camera /RBV/, two Wide Band Video Recorders /WBVTR/ and a Data Collection System /DCS/. When turned on, the MSS and the RBV provide multispectral images of the earth approximately 185 km by 185 km. The orbit is sun synchronous so that shadows cast on the ground are at a maximum for interpreting surface features. ERTS has an inclination of 99. 1 degrees crossing the equator in a N-S direction at about 0942 local time. Successive orbits are separated by about 2870 km at the equator. After 24 hours, the orbit moves about 159 km to the West, giving

a 14 percent overlap of coverage from day to day. Thus ERTS passed over any location on the earth every 18 days at the same time of day and with the same lighting. Orbiting the earth on a new polar orbit 14 times a day, provided 185 km wide photographic strips in North America three times a day and eleven times in the rest of the world. An orbit adjust propulsion system maintained the ground track within ± 18 km.

The Multispectral Scanner /MSS/ images the surface of the earth in four spectral bands simultaneously through the same optical system. For ERTS I, data was gathered from these four spectral bands

Band 4	0.5 to 0.6 micrometers
Band 5	0.6 to 0.7 “
Band 6	0.7 to 0.8 “
Band 7	0.8 to 1.1 “

Bands 4 thru 6 each use six photo multiplier tubec as deteuors, band 7 uses 6 photo diodes. The product is generally a photographic image, though Computer Compatible Tapes /CCT' S/ are also available. Corrections for nonlinearity of mirror velocity, earth rotation, attitude rates, altitude variation and others are made in the NASA Data Processing Facility. After 16 months in orbit world-wide coverage was being obtained at the rate of 135 scenes per day. 206 United States and 106 foreign Nationals work with NASA to assess the value of ERTS imagery for such disciplines as agriculture, geography, hydrology, ecology and oceanography. Data is received by Canada at Prince Albert and Brazil at Cuiaba as well as U. S. receiving stations.

These data are available to any purchaser who may wish to use them for the butter utilization of the earth's resources. A third

foreign station at Fucino, Italy will soon be joined by an Iranian station in the Tehran area. Both will have access to data from ERTS I and the first year of ERTS B. Later NASA will have the option of cost-sharing with the foreign stations.

To illustrate the wide variety of information available to land use planners, a few cases will be discussed. Additional information can be obtained from references in the Bibliography in particular reference 1. The ERTS I role in land management and planning in Minnesota demonstrates its value in a diverse situation; urban areas, iron mining, water resource, wetlands, forest, cultivated and non-cultivated lands. Optimum information extraction varies with the season and the class of terrain. For example, some land cover classes are limited by the unit size required for discrimination and the necessity of an extremely narrow time period to distinguish some features from their surroundings. Seasonal wetland associated with open water may be seen for only a few days and wetlands with vegetation cannot be detected if less than 75 acres in size. More frequent coverage or reductions in cloud cover and thermal infrared band images could improve this situation.

Three demonstration projects were chosen to cover the range of conditions in Minnesota. These included Itasca County with forests and iron ore resources, the Twin Cities Metropolitan area with urban uses, rapid change and user interest and West Central Minnesota with plowing of intense user interest. Studies are continuing in these areas and data have been made available to the appropriate planning agencies. In Itasca County mining areas are delineated with their associated pits, tailings ponds, basins and piles as well as forest cover. Changes in

these are also noted, particularly nonconforming use. Foresters are evaluating the results of forest and wetland surveys where conifers and hardwoods, also mixed forests are distinguished.

Residential, commercial, industrial, and institutional land use was indicated in the Twin Cities land use map prepared for the Metropolitan Council at a 1:125,000 scale. This will be compared with a map prepared in 1966 with aerial photography to note the rate and location of developmental activities as a basis for future planning and controls. In addition seasonal monitoring will identify wetlands and open space in need of protection. Ten sets of maps, monitoring seasonal changes in surface cover in West Central Minnesota are being used in wildlife habitat planning projects. This has proven less costly than the conventional technique of field mapping planning agencies are being trained in the use of ERTS data and the state government has provided money for one agency to develop a broad based remote sensing program. Imagery is beginning to be used by state land use and water resource planning agencies and will be expanded to a coastal zone planning program where adequate coverage exists.

Alaska represents another type of terrain with vast unmapped areas and unexplored resources. ERTS mapping in Alaska is a good example for other undeveloped areas. A facility at the University of Alaska is used, by 12 University ERTS project and public and private agencies to produce environmental surveys in strategic regions of Alaska based on ERTS data. Examples of the results include: 1. vegetation mapping for potential archeological sites, 2. marine and sea-ice surveys on the continental shelf for determination, surface circulation

and sedimentation patterns which affect navigation, 3. location of harbors and construction of off-shore structures. 4. snow surveys for inventories of water resources and flood potential in Alaska watersheds. 153,400 km² of North Central Alaska was studied and a map of surficial geology and vegetation was produced. The result was a first permafrost terrain map of the same area.

After ten years study, earthquake information in Alaska is far from complete. Satellite imagery is a welcome tool. It can be used to pick linears that have the appearance of faults and by comparison with epicenter maps determine which of them may be seismically active. Linear fracture traces, faults and boundaries are readily seen in ERTS images. This is valuable information because major deposits of minerals and fossil fuels are generally found in these regions. Thus areas for further exploration are pinpointed with great savings in time and expense. Fracturing correlated with mineral deposits and a large east-trending lineament in Alaska's Arctic Coastal Plain a potential petroleum source, have been discovered in ERTS maps.

The first detailed tectonic and geomorphological maps of the Republic of South Africa have been developed from ERTS data. The latter map was prepared at a scale of 1:1,500,000 and 1:500,000 was used for maps of urban and regional land use. The scale is too small for significant results in urban land use, but for the region it is fast and adequate. Roads, railways over long distances, water reservoirs, larger ponds and political boundaries are defined. Major vegetation types can be recognized and aid in the identification of soil types. Recognition of burnt areas with an estimation of the age of the vegetation for up to 5 years was an unexpected result. ERTS imagery found many

previously unknown lineaments, and is invaluable for local mining and exploration companies.

These are only a few examples of the results obtained from ERTS I to indicate the value of satellite photography in land use planning. Another facet of satellite operations is remote sensing, which has proven to be a cost effective method for monitoring data collection platforms /DCP'S/ in areas such as Iceland, the Canadian Arctic, Alaska, Hawaii and Central America. Most applications have been in the area of water resources with some reports made in meteorology, oceanography, volcano surveillance and forestry. Nine data gathering platforms were situated over a wide range of areas in Canada including heavily forested and mountainous regions with considerable snowfall and temperatures ranging as low as -40°C . In all cases data was provided in a matter of hours, where previously data gathering visits 5 or 6 times a year had been the norm.

In Maine a data collection platform provided essential information in near real time during a flood on the St. John's river. A prototype volcano system was established in four countries. Test sites included 2 in Alaska, 3 in Washington State, 1 in California, 1 in Hawaii, 1 in Iceland, 1 in El Salvador, 5 in Guatemala and 4 in Nicaragua. Instrumentation included tilt meters, event counters and standard seismic stations, which were specially adapted for ERTS readout. Difficulties arising from damage due to snow pack and vandalism are being overcome. With better instrumentation, worldwide volcanic coverage and readout by satellite sent to small groups for analysis could result in much information of value to land use planners in all countries.

ERTS I DCP'S were located in 22 states in the U.S. and in 5 foreign countries in order to monitor data listed in the following table:

reservoir level	stream flow	ground water
tidal variation	ice condition	salinity
dissolved oxygen	turbidity	acidity- alkalinity
biological content	water temperature	air temperature
wind direction	windspeed	humidity
precipitation	solar radiation	snow depth
snow water content	evaporation	soil moisture
earth tilt	tremor events	earth temperature

Table 1. Parameters Monitored by ERTS I DCS

By May 1973 it was found that the Data Collection System was adequate for operational use of 50% of the users and with slight changes this could be increased to 75%. Some users will have to include other data collection techniques to meet their requirements.

GEODYNAMICS PROJECT

What is the Geodynamics Project 7 It is an International program of research on the dynamics and dynamic history of the earth with emphasis on those phenomenon, such as earthquakes and volcanoes, which affect the surface and near surface of the earth.. The project was initiated by the International Council of Scientific Unions /ICSU/ and is coordinated by the Interunion Commission on Geodynamics /ICG/, ICG involves participation by earth scientists, geophysicists, geologists, geochemists and related sciences from 49 countries.

The Deep Sea Drilling Project begun in 1968 uses the Glomar Challenger as a drilling vessel. By 1972, 263 sites were drilled in the world's oceans helping to determine the age and processes of development of the ocean basins. 285 scientists participated with 87 of these coming from 20 countries other than the U.S. The World Wide Standard Seismograph Network determined accurately earthquake epicenters and contributed important information about present movements of the earth's crust and upper mantle. Integrating these two sets of information with land-based research of past years, a model was developed to explain present and past earth activities. The model suggests that the surface of the earth is divided into a mosaic of large plates, each of which is in motion, independent of the others. Some plates slide past each other, others converge with compressive forces forming mountains and volcanoes in narrow belts along their margins. Earthquakes indicate movement along plate boundaries. In some places the plates are moving apart as in the mid-atlantic ridge where new molten material moves vertically upward to replace the seabed. This information came from a study of the magnetic properties of the seabed. In other areas the old oceanic crust is being thrust downward into the interior of the earth along plate boundaries, where it is assimilated into the mantle and destroyed. This process which creates and destroys crustal material is basic to the plate tectonics model. Recognition of the promise of this model initiated the Geodynamics Project, which will investigate the theoretical basis for this earth activity.

What are the practical implications of the global tectonics model? Location of volcanic and earthquake prone areas is

recognized. Then rates of crustal movement can be measured and predictions made with some degrees of accuracy as to where volcanic eruptions, earthquakes and tsunamis might occur, and when. To do this requires an understanding of the processes cannot be d in crustal movements. The processes cannot be stopped, but losses to life and property can be minimized. Certainly, we should be able to plan and build more efficiently than is being done now.

Much of the worlds geothermal activity is concentrated along plate margins. These can be one of the major sources for the energy of the future. Economic concentrations of minerals are not randomly distributed, but are related to tectonic processes of the present and the past. Most minerals with surface manifestations have been found and exploited. Future successful exploration will depend on a better understanding of the relation between these deposits and geodynamic phenomenon. The location of nuclear power plants, of oil pipelines, dams and other large installations is dependent on a thorough knowledge of the crustal activity where they are to be situated.

Earthquakes occurred near Denver as a result of the underground disposal of fluids. This indicates, that as we use deeper crustal regions in many ways, we will need knowledge of the stress within the rocks and the effect of perturbations upon them.

It has been said that each man has two countries, his own and planet earth. Satellite surveillance of this planer and further results of the Geodynamics Project's model of the earth give us tools for global land use planning. New sites for homes, farms and industry, and further development of preexisting ones can be accomplished wisely. Necessary water, and mineral resources can

be discovered, thermal areas and agricultural lands pinpointed, pollution located and controlled, and natural disasters minimized or avoided Scientists and Engineers from every nation working together should lead the effort to improve the quality of life for present and future generations. Will you join us?

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FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

J. Eleonora Sabadell

**REMOVAL OF Cd, Cu, Ni,
AND Pb FROM IRRIGATION
WASTEWATER BY FOREST
AND WOODWORKING
RESIDUES**

**Section 2: Spatial arrangement of
human environment.**

Printed according
to the author's original

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Land Disposal of Wastewaters and Sludges.

Heavy Metals Impact On the Environment.

Utilization of Forest and Woodworking Wastes.

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REMOVAL OF CA, CU, NI, AND PB FROM IRRIGATION WASTEWATER BY FOREST AND WOODWORKING RESIDUES

ABSTRACT

Land application of wastewaters has several environmental problems and some of high importance are related to the, presence of toxic materials in the effluents of municipal, industrial and mining operations, in particular when these pollutants are heavy metal ions. The object of the present work is to determine the feasibility of using forest residues and woodworking wastes to remove heavy metal ions from wastewaters and sludges by adsorption. The ion exchange character of these cellulosic materials and their availability in certain locations make the potential utilization of these solid wastes quite attractive. Equilibrium studies were performed, and the selected solid phases were sawdusts and shavings of two hardwoods oak and ash, and one softwood, cedar. The solutes used were salts of lead, copper, cadmium cobalt and nickel. The solutions had one and two counter-ions, at diverse concentrations, and the isotherms were measured at room temperature. The results show that adsorption occurs in all the experiments; that lead is the cation with the highest selectivity; and that oak sawdust is the best adsorbent. From the results of this preliminary work, it can be concluded that further equilibrium and rate studie on diverse species and parts of trees, with special attention to the particle size of the samples used, should ensue.

Introduction

Sewage effluents are rich in nutrients .and the application of these waste to the land has been practiced since the B.C. period, and it represents the simplest

method for wastewater treatment. Irrigation, overland flow, and infiltration-percolation are the three basic approaches to land application, where the soil acts as a biological, physical and-chemical filter. Many studies have been conducted on the responses of crops and forest when irrigated with sewage effluents, at different rates of application, over various lengths of time and of diverse amounts (1). The nutrient removed by some crop harvest, as well as the growth responses of several hardwoods and softwood species have been measured and for the most part the conclusion is that this practice is beneficial to the vegetation because the crop yields and the growth of the trees was observed to have increased significantly (2).

But together with these and other advantages, land application of wastewaters has also environmental problems related to the presence of toxic materials in the effluents of municipal, industrial and mining operations. Heavy metal ions belong to this particular class of pollutants and their toxicity has been proved in many studies (3).

Some of the consequences of applying wastewaters that contain this- type of cation are:

a. The possible retention of these metallic ions by the soil that, upon changes in the system's conditions can be leached out of the soil and into the groundwaters with the resultant contamination of the aquifers;

b. The uptake of these heavy metals by microbial population and plants with the possible danger of entering the food chain (4);

c. The effect on the growth of plants, crops and forests produced in these lands (5-11);
and

d. The toxic buildup of the soil that can cause the abandonment of the site. It is evident from this list that any method able to increase the adsorptive capacity of the soils or to remove the heavy metals present in the wastewaters before coming into contact with the soil and consequently be uptaken by the vegetation, would be of great value.

A tremendous amount of unused wood in various forms is produced in forested regions each year as the result of harvesting operations, insect disease, fire damaged timber and precommercial thinning; as primary mill residues in the form of slabs, sawdust, veneer cores, and as secondary plant residues. In the United States alone, an estimated total of fifteen billion cubic feet are produced yearly (12). Considerable progress has been made in the utilization of these materials as much- filtering media, sintering, insulation, adhesives, molded shapes, etc., but the magnitude of these solid wastes challenges researchers into finding more economical and environmentally sound additional uses for these resources.

The object of our study was to determine the possibility of removing heavy metals present in soil wastewaters by adsorption on forest and woodworking residues, taking advantage of the physico-chemical characteristics of cellulose and cellulosic materials found in previous works (13-15).

Experimental

The wood samples used in these studies were provided by the New Jersey Bureau of Forestry and were selected from a variety of sawdusts and shavings from mixed hard and softwoods. These samples were:

1. mostly oak sawdust with some gum,
2. mostly ash shavings with some oak, and
3. mostly cedar sawdust with some hardwoods.

Other samples were not utilized because of the unknown amounts and nature of the mixtures.

The first measurement performed was the moisture content by drying a known weight of sample in a vacuum oven at 80°C and 20 inches of vacuum until constant moisture-free weight.

The first group of equilibrium studies were conducted in batch arrangement and the heavy metals used were: lead copper, cadmium and nickel; the salts used

were all chlorides except for $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$. The range of concentration was between 2 and 0.2 meq of cation per liter of solution and in each batch 100 ml of solution was in contact with 2-3 grams of wood sample. Only one counter-ion was present in each of the four sets of solutions used in these experiments, and the runs were performed in triplicate.

After reaching equilibrium (1-2 weeks) aliquots from the supernatants were collected and analyzed by atomic absorption technique with a Varian Tcchtron AA 120 spectrophotometer. Blanks were prepared with demineralized water and the supernatants were also analyzed for heavy metal content but none was detected. Several of the samples were left for 4-5 weeks to determine if any degradation could be observed in the wood samples. These measurements were done by filtering - and collecting the solid phase quantitatively and drying in the vaccum oven as done for the moisture determinations, until constant moisture-free weight. By mass balance it was calculated that during this time no appreciable degradation had occurred.

The second group of equilibrium studies were performed with two counter-ions present in the solution used in the batches, instead of one as in the previous experiments. The reason was to find-out the influence, if any, one cation uptake had an the uptake of the other cation by the wood samples when in contact with two counter-ions at the same time. The cation pairs studied were: Pb-Cu, Pb-Cd, Pb-Ni, Pb-Co, Cu-Cd, Cu-Ni, Cu-Co, Cd-Ni, Cd-Co, and Ni-Co. Their uptake was measured on the three Wood samples, oak, cedar and ash, and all the data were obtained at 24°C and in duplicate.

Results and Conclusions

The moisture content of the oak sawdust was 17.19%, of the ash shavings 5.88%, and of the cedar sawdust 15.50%. The results of the first group of equilibrium studies (with one counter-ion in solution) are shown in Tables 1, 2, 3, and 4. They indicates that in all the cases pb^{++} is the cation that presents the highest

selectivity for all the wood samples. As with ion exchange resins, the equilibrium isotherms have positive slopes with respect to the concentration of the liquid phase C_i^0 (Figures 1-3), and that the oak sawdust has the highest capacity of the three wood samples for all the cations studied. The functional relation between the concentration of the cation adsorbed on the wood sample in equilibrium with the solution, and the initial concentration of the solute in the solution is

$$\bar{C}_i = \frac{(C_i^0 - C_i) \times 0.1 \times 100}{(100 - \%W) \times g \text{ wet wood}}$$

where

C_i^0 = initial concentration of specie i, meq/ l of solution

C_i = concentration of specie i at equilibrium, meq/l

W= moisture content of wood sample, g/g wet wood

$\bar{C}_i$ = concentration of adsorbed specie i, meq/ g dry wood

The procedure and calculations used for the second group of equilibrium studies were similar to the procedures and calculations described above, and the results are shown in Tables 5-7. From these data it can be concluded that the uptake by the wood samples of one cation is, in all cases, decreased by the presence of another counter-ion in the solution with which it is in contact. Also, the uptake of lead is the highest regardless of the nature of the second cation in the system, and Cd is the least adsorbed in almost all the cases. The mean total capacity of each wood sample was calculated statistically from ten measurements in each case, and the results for an initial concentration of each cation in the solutions of 2 meq/l are:

oak sawdust	:	0.0982 meq/g dry wood
ash shavings	:	0.0721 meq/g dry wood
cedar sawdust	:	0.0683 meq/g dry wood

In Figures 4-6 the uptake of CU^{++} , Ni^{++} and Cd^{++} have been plotted against the uptake of the second cation of the system at equilibrium. These results

were calculated by difference with the mean capacities.

To bring these results into perspective, assume that a municipal plant that treats 4 million litres per day of wastewater that has a lead content of 100 ppb has to produce an effluent with 50 ppb of Pb (the proposed concentration limit for Pb for public water supply). The total amount of lead entering the plant in one day would be around 4 Kg, and approximately 2 Kg of Pb^{++} should be removed to reach an appropriate level in the effluent. If the total capacity of the adsorbent (e.g., oak sawdust) is taken to be 0.1 meq/g wood, and the process adopted is land spraying of the wastewater effluent from a secondary treatment for example, 0.25 acres of land could be covered with 2 feet-deep of wood waste. In such a case, and according to Helfferich (1962), the time required to remove 50% of the lead present in the effluents would be around 50 mins, for a particle size of 1 mm, a solution volume of $4 \times 10^{10} \text{ cm}^3$, an adsorbent volume of $6.16 \times 10^8 \text{ cm}^3$, and a diffusion coefficient of approximately $10^{-5} \text{ cm}^2/\text{sec}$. The total capacity of such a volume of adsorbent would be 3.6×10^3 equivalents or 370 Kg of lead, which signifies that the site would be operative for five to six months, at which time the cover could be removed and replaced, and a recovery process for the metal content could follow. Such an arrangement could be especially attractive in instances where land application of wastewaters and sludges is already practiced and due to the limited capacity of the soils, a toxic build-up can occur causing abandonment of the site. A removable adsorptive cover therefore would increase the useful life-length of a land application site with the added benefit of making almost impossible the contamination of the aquifer and surrounding ecosystem, if used properly.

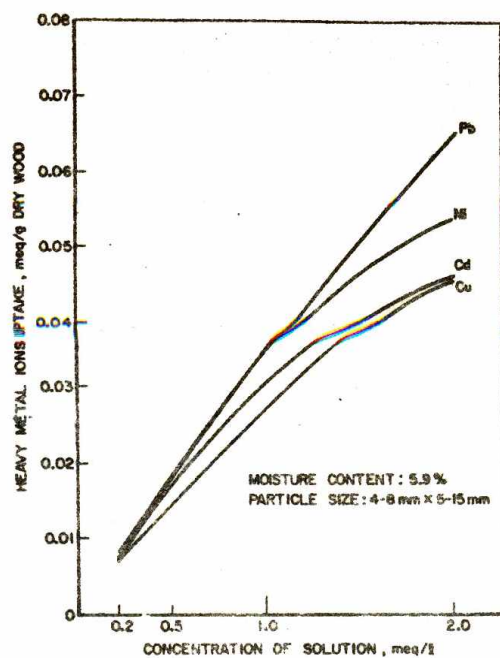
Acknowledgment

Appreciation is expressed to the Pinchot Institute Consortium for Grant 23-595, under which part of this work was performed.

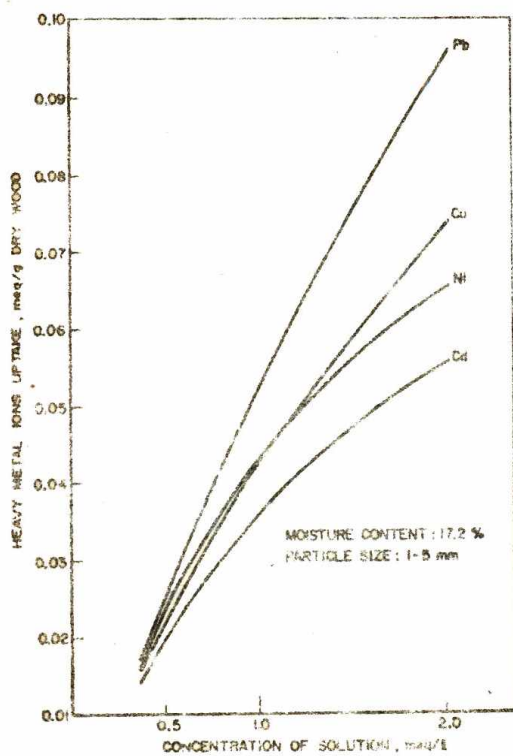
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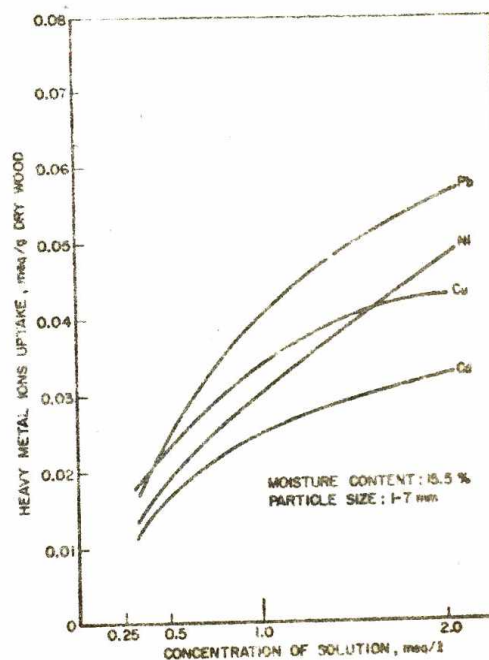
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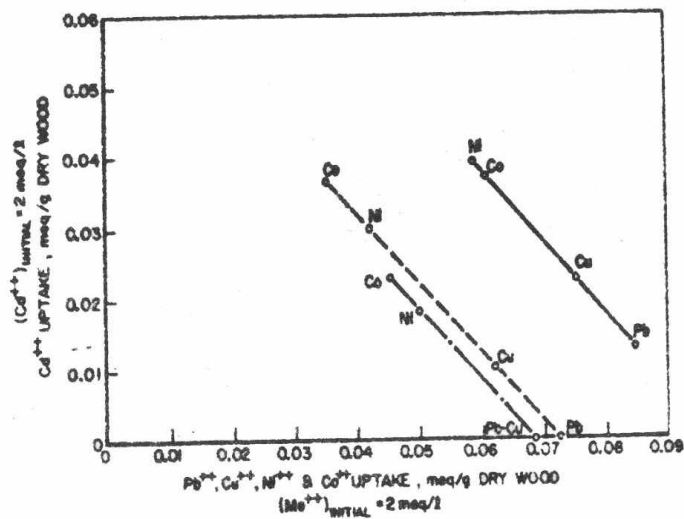
SORPTION ISOTHERMS OF Pb^{++} , Ni^{++} , Cd^{++} AND Cu^{++} ON ASH SHAVINGS AT 24°C



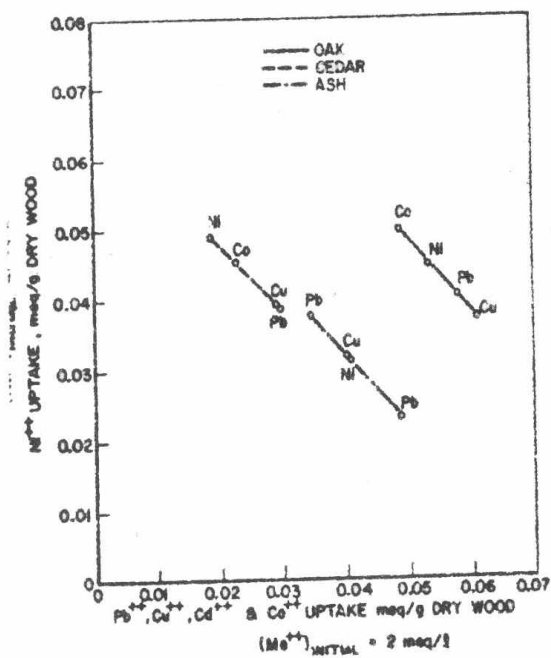
SORPTION ISOTHERMS OF Pb^{++} , Ni^{++} , Cu^{++} AND Cd^{++} ON OAK SAWDUST AT 24°C



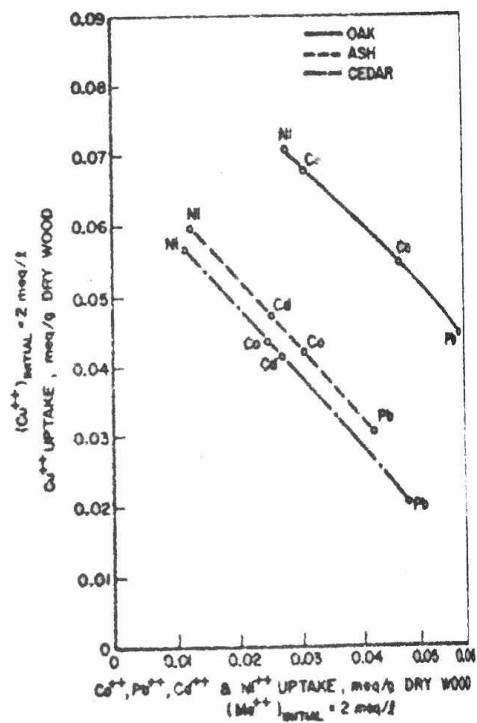
SORPTION ISOTHERMS OF Pb^{++} , Ni^{++} , Cu^{++} AND Cd^{++} ON CEDAR SAWDUST AT 24°C



Cd^{++} UPTAKE FROM A TWO-COMPONENT SOLUTION



Ni^{++} UPTAKE FROM A TWO-COMPONENT SOLUTION



Cu^{++} UPTAKE FROM A TWO-COMPONENT SOLUTION

**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Carolyn F. Phillips

**RATIONALE FOR SAFETY
AND HEALTH STANDARDS**

**Section 2: Spatial arrangement of human
environment.**

Printed according
to the author's original

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RATIONALE FOR SAFETY AND HEALTH STANDARDS

INTRODUCTION

As nations industrialization the air contaminant levels, both outside and within the factories tend to increase. The first question raised is: When and to what degree should control be exercised? Without question, lack of any kind of controls would result in many potential health implications.

Each year in the USA about 250,000 new chemicals are added to the two million already registered and above 500 new chemicals are used commercially. The list of known potential health hazards in industrial use is long growing longer. In our modern industrial social solvents, plastics, lasers, noise, ultraviolet, etc. Offer subtle threats. New techniques and processes often involve hazards to the workers who use them. Little is known of possible synergistic action; that is the combined intensified effect of several toxic agents.

Occupational illnesses and injury are preventable. Health maintenance is primarily the responsibility of the individual, but the employers have an obligation to provide a safe work environment for their employees. They also have a valid interest in the prevention of loss of work time and work efficiency resulting from nonoccupational illness as well as occupational illness. Thus they may provide certain preventive measures in a given situation. The health of employees represents a major factor in profit or loss to industry and costs to government. In the USA, our National Health Survey has estimated that the average worker has six days of absence because of job related illness or injury with costs in excess of 60 million dollars.

The World Health Organization has estimated that at least 80% of all malignancies are attributable to environmental exposures. Some environmental hazards are present in almost all activities and these figures are for our total environment not just the workplace.

DEVELOPMENT OF STANDARDS

One of the important principles upon which the occupational health programs in the United States are based is that exposure to a toxic agent may be permitted up to some limit of tolerance above zero, within which man can cope successfully with the insult with no significant threat to his health. The ideal situation of "zero levels" must be considered in light of the total social, economic impact.

Throughout our history of concern with occupational health problems, the development of standards for the control of exposures has been done by what are essentially private, professional groups. The resultant criteria and standards are termed consensus standards. There are four basic groups involved: ACGIH (American Conference of Governmental Industrial Hygienists), ANSI (American National Standards Institute), AIHA (American Industrial Hygiene Association) and ASTM (American Society for Testing Materials). The majority of the resultant standards and guides are concentration values for exposures based on time-weighted average concentrations for a normal workday. The recommended concentrations do not generally denote a precise line of demarcation between, safe and unsafe exposures but are intended to be used as guidelines in control of occupational exposures.

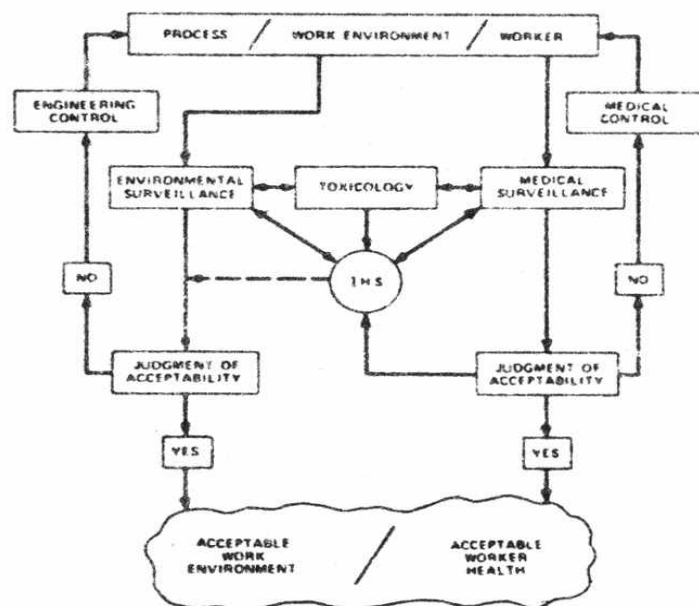
As an example, hearing conservation depends on the overall noise level, composition of the noise duration, distribution of exposure during a typical workday and total exposure time during a work life so that a single level is impossible. Each situation needs evaluation by professional judgement.

Improvements are continually needed in the criteria and standards for judging the work environment. Some basic guidelines for development of standards can be summarized. Standards must be based on scientific facts. If the data base is incomplete, then provisional standards may be developed with that concept carefully noted. All standards as well as the basic criteria must be documented and publicized. Unnecessarily severe limits must be avoided. Realistic levels must be determined and it must be realized the industrial exposures are customarily greater than can be allowed for the general population mainly due to the differences in makeup of the two Populations There is very little documented information as to the effects of the lower levels of exposures in industrial settings on such conditions as chronic diseases, diseases

common to the general population, productivity, delayed disability and longevity. There is also a need to determine if there is any significant additive or synergistic effect to that of nonoccupational exposure.

ENVIRONMENTAL EVALUATION

The actual control of the potential hazards in the work environment cannot be complete unless we can systematically utilize the information available. A complete evaluation involves monitoring of output, comparison with standards evaluation of discrepancies system modifications and subsequent reevaluation. The figure below shows an overall system for occupational health. (7)



It shows feedback on the controls used, documentation of exposure to validate standards and medical surveillance of the worker. The process, the environment, and the workers are not independent parts. Each is affected by the other two and in many cases one cannot alter a process or change a job procedure without changing the work environment. A worker often has enough latitude in his procedures that he can change the degree of exposure.

A well developed dose-response relationship will provide the basic information for establishment of standards and subsequent control procedures.

GOVERNMENT INVOLVEMENT

On December 29, 1970, the Occupational Safety and Health (OSH) Act was signed into federal law. This new legislation, designed to assure safe and healthful working conditions for the nations working men and women and to preserve our human resources, provides broad authority to the Department of Labor and the Department of Health, Education and Welfare. It is basically a workplace standard applied to some 57 million workers with a voluntary compliance aspect emphasized. It is intended to cover the total environment of the employees when they are actively working at their jobs.

The enforcement aspects of the law are in the hands of the Labor Department. They were authorized to set mandatory occupational safety and health standards applicable to business affecting interstate commerce. In addition, the law includes provisions for encouraging employers in their efforts to develop new programs for exploring ways to discover latent diseases, establishing causal connections between diseases and work in specific environmental conditions, providing medical criteria, appropriate reporting procedures and an effective enforcement program.

The National Institute for Occupational Safety and Health (NIOSH) was established within the Department of Health, Education and Welfare with the charge to "conduct research, experiments and demonstrations relating to OSHA", including studies of psychological factors involved and relating to innovative methods, techniques and approaches for dealing with Occupational Safety and Health problems. They are also charged with the responsibility for educational programs to supply an adequate supply of personnel to carry out the purposes of the law.

Some governmental groups that get involved directly or indirectly in related health areas are the Federal Food and Drug Administration, the Environmental Protection Agency (air and water pollution), Atomic Energy Commission (radiation), the National Institute of Health, the Bureau of Mines, National Aeronautics and Space Administration (NASA) and Department Defense (DOD).

The one aspect that must be remembered in all cases is that regulations will never be a sufficient substitute for professional judgement.

INTERNATIONAL INVOLVEMENTS

Initially, some people were concerned that the cost of meeting the OSHA standards in the U.S. would place them at an economic disadvantage as regards foreign competition. Efforts have been put into translation of foreign standards. Review of these efforts highlighted the fact that many other countries have equaled or surpassed U.S. efforts in occupational safety and health requirements at the mandatory level. In some countries, however, either the development of standards was slow or the enforcement was weak.

OSHA is becoming more involved in international standards work particularly through involvement in the International Labor Organization (ILO). ILO in turn has made use of some U.S.A. standards, adapted for use in appropriate areas.

At the 1973 -International Organization for Standardization Meeting- there were several sessions focused on the role of international standards in the areas of world trade, safety and health, etc. The impact of standards on a multinational corporation was discussed. In the U.S.A. companies have been concerned with a variation in standard between states and now their is concern with variations between countries. There has been more impetus for international standards in air and water pollution as changes can affect other countries directly.

Various countries have approached the solutions to these problems in different ways. In general both older, industrialized countries and the emerging countries have adopted some form of factory inspections with government authorization enforceable regulations and some form of appeal. In many countries, benefits to disabled workers/ families are social insurance with support from government funds as versus the U.S. when private insurance carriers (a profit-making entity) are more involved.

Important international organizations in the field of occupational health and disease control are the International labor Organization and the World Health Organization. The ILO is the oldest remaining unit of the World War I League of Nations (1919). It is composed of government delegates one employer and one union representative from each member country. They have a permanent safety and health section that promotes continuing interest in labor problems, publishes details of good practice in various items such as lead poisoning, medical examinations, maternity problems and worker protections.

The World Health Organization is a more recent agency of the United Nations. It is active in the field of occupational hazards and one branch is devoted to the study of hazards arising from radiant energy in collaboration with the International Atomic Energy Commission.

The U.S. is fostering international cooperation and research through its Special Foreign Currency Program (SFCP) which supplements our domestic research programs directed at establishing objective criteria for occupational health standards. The program is supported by U.S. owned foreign currencies. It has included projects in Egypt, India, Israel Poland and Yugoslavia. The activities have emphasized the recognized occupational health problems of chest diseases toxic industrial chemicals and the physical hazards. Also development of tests for early detection of potential health effects of toxic agents. As examples studies in Poland and Yugoslavia have uncovered a simple biological test for determining the tolerance of workers to carbon disulphide and aid in reducing neurological circulatory complications in CS₂ sensitive workers. Other studies have examined the roles of metallothion in detoxication of mercury and the metabolic and excretion kinetics in industrial toxicology problems.

A "Report on the Workplace Environment" was prepared by the Swedish Trade Union Confederation and the Swedish Central Organization of Salaried Employees and presented at the European Trade Union Conference in Geneva Switzerland. 1975. The report includes statements on the needs for better documentation of the hygienic threshold limits with a clear indication of dose and response; safety and ergonomic aspects of safety and design and production planning. It states that international cooperation on workplace environmental problems will become increasingly vital if viable solutions are to be found.

A somewhat different approach appears in the Soviet Union where they have stated that every individual in the general population should be protected from the effects of any agent in the atmosphere which can be demonstrated to produce a physiological effect, even if the effect cannot be shown to be harmful. The basic tenets are as follows: (2)

1. The maximum allowable concentration is defined as the concentration of gases vapors or other substances encountered in the working environments such that daily working in these environments will not result in any deviation in the normal state of the organism as well as not result in disease.

2. The setting of such concentrations should be based entirely on presence or absence of biologic effects without regard to whether it is feasible to reach these concentrations in practice.
3. The values set should represent maximum concentrations rather than time-weighted average.
4. Regardless of the value set, the optimum value and goal to be sought is zero concentration.

International communications amongst the professionals in the field does exist. Next week, the XVIII International Congress on Occupational Health will be in Brighton, England and the following week is an International Conference on Inhaled Particles and Vapours, in Edinburgh, Scotland hosted by the British Occupational Hygiene Society.

SPECIAL PROBLEMS

One area of concern, particularly to the members of this conference, is a need for intensified research and control programs focusing on the special problems of pregnant workers. Among them physical strain and injury from toxic substances. More information is needed on fetal development and maternal physiology, particularly in relation to absorption and excretion of toxic substances. Some countries, notably those of Eastern Europe, have reviewed the experiences of pregnant women in hazardous work conditions but few standards in the world deal with special materials known to have effects on the development of the fetus. The number of women in the workforce is increasing and the above will have more meaning for the world's population. NIOSH has a list of known toxic substances and 21 materials on that list have shown evidence of teratogenicity.

Another area of concern when evaluating research results and attempting to apply them to the world's population is the possibility of nutritional influences on the toxicity of environmental pollutants. Pollutants of importance in this area include pesticides, minerals and oxidants. A number of minerals that appear in the environment in trace amounts are both toxic and essential to life. A diet deficient in sulfur-containing amino acids increases the toxicity of some chlorinated hydrocarbon pesticides. Americans appear to have a lower body level of chromium than citizens of the rest of the world resulting from dietary differences and food processing. Mercury is

another well known toxin and it is possible that some dietary deficiency may have augmented the toxicity of mercury in the deaths at Minamata, Japan.

SUMMARY OF NEEDS

The promotion of industrial health and safety is a part of the broader task of building a healthy industrial environment, physical, mental and aesthetic for improved efficiency of operation. There is a lack of research, knowledge and statistical information in the fields of health and safety. The relationship between human health and specific contaminants are often tenuous and evaluated systematically. It is in the industrial situation that man is first exposed to the materials which subsequently contaminate our air and water potentially affecting the whole population.

If the appropriate studies for evaluating the impact of environmental factors are to be evolved large populations that cannot be found in a single country may be required. Systematic epidemiological studies can best be compiled through international cooperation. It is often difficult to learn of research results at a national level and international compilation of documentation on studies and results would be essential.

There is a need for uniformity in evaluation of research results, in methods of measurements in establishment of the final standards and criteria. Eventually, codes of practice between countries may be the outgrowth. One result might be the prevention of harmful techniques from being exported to countries which have less developed standards of safety and health.

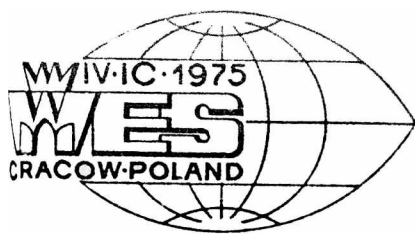
Nations that are just becoming industrialized may need assistance in establishing basic occupational safety and health guidelines to be incorporated during the development process rather than as an expensive after thought.

The time has come for improved communication and cooperation at the international level in the areas of health and safety. The conflicts between contaminant control and economic impact is only going to worsen. In the application of technology and its relevance to human life we, as engineers and scientists, cannot afford to be passive observers.

No country can afford to misallocate its human resources. There is need for balance and judgement in providing protection for the worker.

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FOURTH INTERNATIONAL CONFER OF WOMEN ENGINEERS AND SCIEN

Renee R. Stone

THE AIR WE BRRATHE A BLUEPRINT FOR SURVIVAL

**Sekcja 2: Spatial arrangement
human environment
transport problems**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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Who is Who in American Women - 1965.

The World Who's Who of Women 2nd Edition - 1974.

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THE AIR WE BREATHE - A BLUEPRINT FOR SURVIVAL

"Clean Air" is fast becoming an expensive and non-existing commodity in our modern society, and unless we all cooperate to keep it clean we are all doomed to perish.

When one considers the atmosphere which every man, woman, and child breathes and which surrounds us at all times and all places, it is difficult to conceive how anybody could completely escape air pollution.

In a modern free industrial society with our continuing pursuit of an ever higher standard of living we continuously help pollute the air we breathe. But as we the individual citizen complain of malodors, soiling and unsightliness, seldom do we stop to consider our contribution to the problem.

The fuel we use to heat and cool our dwellings and working areas release

- Sulfur Oxides, 3 million tons
- Carbon Monoxide, 2 million tons
- Hydrocarbons, 1 million tons
- Nitrogen Oxides, 1 million tons
- Particulate Matter, 1 million tons

Incinerating the mountain of refuse we generate each year creates

- Carbon Monoxide, 1 million tons
- Hydrocarbons, 1 million tons
- Particulate Matter, 1 million tons
- Nitrogen Oxides, less than 1 million tons
- Sulfur Oxides, less than 1 million tons

The industries we spent our time working everyday discharge every year into the atmosphere

- Sulfur Oxides, 9 million tons
- Particulate Matter, 6 million tons
- Hydrocarbons, 4 million tons
- Nitrogen Oxides, 2 million tons

Power plants which run these industries add to their pollution particularly the sulphurous contaminants

- Sulphur Dioxide, 12 million tons
- Nitrogen Oxides, 3 million tons
- Particulate Matter, 3 million tons
- Carbon Monoxide, 1 million tons
- Hydrocarbons, less than 1 million tons

Hence it can be seen that nobody escapes responsibility for creation of or contributions to air pollution. It should be equally apparent, because we all live in a sea of air, that we cannot completely escape the consequences of polluted atmospheres, therefore even if it not too

obvious, it is the fact that each of us will have to pay for abatement and control.

The Pollutants and Their Sources

The controversy over air pollution extends even to its definition. In the strictest technical sense, any substance added to the air that is not present in pure air is an air pollutant. Based on this measure, nature herself is a mighty polluter of the atmosphere, contributing 30 million tons per year of dust and pollen from natural sources. Such pollution is generally not harmful to man. At any rate little can be done about it. What can be harmful are the nearly 150 million tons of additional man-made pollutants that are discharged into the air each year. The "Clean Air Act of 1963", expresses it rather succinctly - "The growth in the amount and complexity of air pollution brought about by urbanization, industrial development, and the increasing use of motor vehicles, has resulted in mounting danger to the public health and welfare, including injury to agricultural crops and livestock, damage to and the deterioration of property and hazards to air and ground transportation. It is this concept of "danger to public health and welfare" that is commonly used by control officials to define air pollution.

There are two basic classifications of air pollutants. They are particulate and gaseous matter. Combinations of particulates and gases, such as common smoke, occur more frequently than not. Particulate are further classified by particle type and method of formation. They usually result either from mechanical sources or from condensation. The rate of settling depends on particle size, weight and motion of the air.

Typical settling rates of spherical particles in still air are as follows:

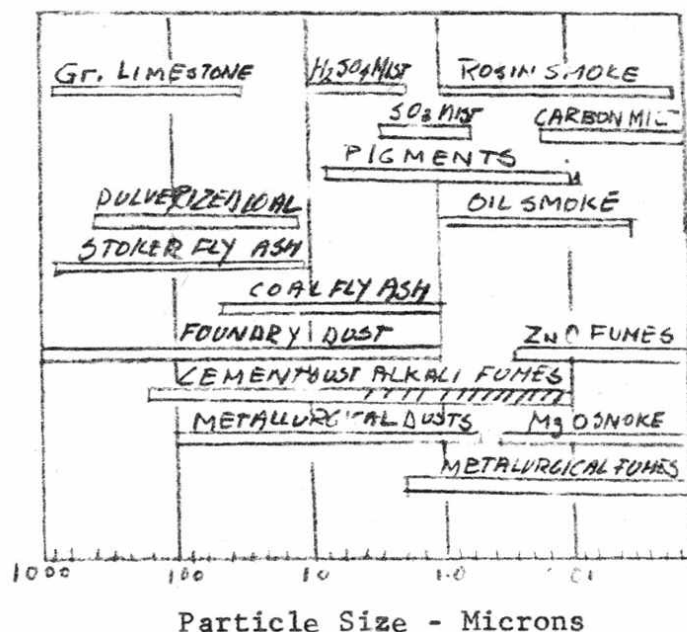
<u>Particle Diameter</u> <u>Microns</u>	<u>Settling Rate</u> <u>ft/min.</u>
100	59.0
10	0.6
1	0.006
0.1	0.00006

Dusts and Sprays are mechanical dispersoids in solid or liquid form. The ability of dust or spray to become airborne determines its upper size limit. Uncontrolled heavy emissions of dust usually only creates nuisance conditions or property damage adjacent to the emitter. Obviously known hazardous materials containing arsenic, beryllium, cadmium, fluoride, lead, etc. must be tested carefully both because of their potential danger and their scare value to the community. Sprays, even if harmless in themselves, sometimes carry solid contaminants along with them which are released as the droplets settle or evaporate.

Fumes and mists, again solids and liquids respectively, are particles condensed from a gaseous state. They arise from chemical or

metallurgical rather than mechanical processes. Generally speaking, a visible discharge from a chimney or stack will have a particulate matter count of 0.05 gr/sef or over. Handling this type of effluent can involve difficulties all out of proportion to the real pollution potential of the material.

Size Range of Industrial Air Contaminants



There are potentially just about as many gaseous pollutants as there are different kinds of gasses.

Sulfur oxides represent the greatest potential health hazard, and have received the widest amount of public attention. Health officials maintain that sulfur oxides contribute to the origination and the development of diseases such as the common cold, chronic bronchitis, asthma, tuberculosis, emphysema and even lung cancer. Sulfur oxides and the sulfuric acid that forms from them also corrode metal, damage paint, and erode stone and concrete structures.

Hydrocarbons are composed of various combinations of the elements hydrogen and carbon. Hydrocarbon gases and vapors are harmful only in very high concentrations rarely found in ambient air.

Carbon Monoxide is a product of incomplete combustion of any carbon bearing substance. While carbon monoxide pollution is a potentially serious national problem, most industrial sources are insignificant in comparison with motor vehicle engines.

Nitrogen oxides are gaining increased attention in public health and pollution control circles as more is learned of their effects on health and the part they play in photochemical reactions. The manufacturing industries in general release about 1/6 of all nitrogen oxides emissions. The odor of nitrogen dioxide is detectable at a concentration of two to three parts per million. Nitrogen dioxide has

been observed to irritate and inflame the smaller bronchi and other lung passages of humans. Continued exposure to high nitrogen dioxide levels has caused pathological lung changes in test animals.

Photochemical pollutants are formed by the action of sunlight on nitrogen dioxide and the more complex reactions of sunlight, nitrogen oxides and hydrocarbons. The olefinic class of hydrocarbons are particularly reactive since they are unsaturated, i.e., they do not contain as many hydrogen atoms as they are capable of holding. The entire subject of photochemical oxidation is far from completely understood. Most is known about ozone and its effects. For example, at levels detected during severe pollution conditions ozone irritates mucous membranes and interferes with lung function. During test exposures of 0.6 to 0.8 ppm ozone for a period of two hours, reduced lung capacity, bronchial irritation, coughing, and chest soreness were noted among test subject. Further, these conditions persisted for up to 24 hours in some of the subjects.

Odorous gases occur in wide variety and stem from almost countless sources. Odorous gases in low concentrations more often represent nuisances other than health hazards. However, this nuisance value can be great.

Smog is a subject without which no discussion of air pollution could be complete. There are two distinct types of smog. One is called the "London type", which has been held responsible for disasters such as occurred in Bournemouth, Pa., in October of 1948 and in London in 1952 and 1962. It is most present at night or on cold foggy days. Major components of London smog are sulfur compounds and smoke fumes, soot or flyash. "Los Angeles" type is photochemical smog, on the other hand, occurs on warm sunny days when sufficient amounts of nitrogen oxides and hydrocarbons are present in the air.

Both types of smog are most severe under stagnant air conditions or in areas with poor natural ventilation.

The Methods of Air Pollution Control

The ideal method of air pollution control would be to eliminate it at its source. Even though it may not be possible to do this, there are steps that can be taken to at least reduce the problem. In American metropolitan areas pollution concentration is by and large a function of population density. As a dispersant the wind is the factor of primary importance. Precipitation is next in effectiveness. In dry weather with low wind speeds intensity of solar radiation governs the production of irritating oxidants. Persistent stagnation conditions with low level inversions will create in some industrial regions hazardous levels of pollution with increasing frequency.

There are numerous types of control systems to handle specific pollution problems. The task of choosing the type which will most effectively and economically handle the specific pollution problems is no easy task.

Mechanical Systems Devices in this group depend on velocity change, direction change or impingement to separate particulates from the gas stream.

The gravity collector is the simplest type - it consists of an enclosure which is relatively large in comparison with the inlet duct. The velocity of the gas stream reduces as it enters the chamber, and the entrained particles settle to the bottom of the unit.

Impingement separators - the gas stream is forced to change direction in order to pass through a series of baffles. If the particles in the gas stream have enough inertia, they will strike these obstructions and fall from the gas stream.

Cyclone collectors - a rapidly whirling motion is imparted to the entering gas stream. The velocity increases as the collectors walls taper to a smaller diameter toward the bottom. Entrained particles are thrown out of the spinning gas stream by centrifugal force. The particles fall to the bottom of the unit and the cleared gas moves upward again and exits from the top.

Multi-cyclone units consist of a number of smaller cyclons arranged in parallel. Pressure drop in simple cyclones usually ranges up to 2 to 3 inches of water. It runs from 2 to 6 inches in the more efficient multi-cyclones. In general, cleaning efficiency increases with greater draft loss, but so does operating cost.

Cloth filler collectors operate on a principle similar to that of the ordinary household vacuum cleaner bag. They are often called bag type collectors since their most common arrangement is in the form of a number of cylindrical bags, mounted vertically within an enclosure. Bags are usually several inches in diameter and range up to 30 ft. or more in length. Cloth filter collectors are available in small self-contained units, larger standard modules, and huge custom designed and erected installations, called bag houses. Pressure drop in cloth filter collectors is several inches of water, approximately the same as in cyclone collectors. The prime attributes of this type collector are simplicity and high cleaning efficiency for extremely fine particles.

Electrical, Wet and Other Systems. Electrostatic precipitators use the phenomenon of electrical attraction to remove particulates from a gas stream. Electrostatic precipitators can achieve high rates of cleaning efficiency, especially in removing particulates in the submicron to ten micron range. Their open internal construction offers little impedance to gas flow, so that pressure drop seldom exceeds 0.5 inches of water. They are capable of operating at high temperatures up to 1200°F. Moist or saturated gases represent few operating problems to precipitators.

Scrubbers and absorbers are wet systems that can be used for removing particulate or gaseous pollutants from an air stream. The system is generally called a scrubber if the cleaning agent is water. There are many different scrubber and absorber designs in existence. Some of these have extremely specialized applications.

Direct flame and catalytic incineration are techniques that can be effectively applied to eliminate combustible effluents. These methods are particularly applicable to odorous organic compounds.

Absorbion using materials such as activated carbon, silica gel etc., is another technique that can be used for eliminating obnoxious gases and vapors. Absorbant regeneration costs generally limit this method to those cases where re-useable solvents or some other valuable product can be recovered. This is far from a complete review of all the techniques and equipment that can be used to solve pollution problems. The key to effective air pollution control lies in your own imaginativeness and ability to analyze their particular problem.

The proceeding pages have described the most common pollutants, their source and some of the available methods of controlling air pollution. In order so for a successful control of air pollution essential keys involve the development of an active public policy on air conservation, a dynamic organization with active support by top management, the use of long range planning to attain a communities realistic goals for air quality.

Much is being said today about the need to manage our air resources and it is timely to define these terms explicitly. Webster's unabridged dictionary gives the following definitions:

Air	-the invisible, odorless, tasteless mixture of gases which surrounds the earth
Resource	-a new or reserve source of supply or support
Management	-judicious use of means to accomplish an end
Concept	-thought; an opinion; an idea of what a thing in general should be

In the scheme of things the basic use of our air resource is to sustain life. All other uses must yield to the maintenance of air quality that will not degrade, either acutely or chronically, the health or well being of people.

Two major areas of possible adjustment exists: the aesthetic and the economic impact of air pollution and its control. The cost borne by society to achieve a desired quality of air should therefore, be in balance with the benefits to be attained.

Up until very recent times the control of air pollution has been based upon the correction of existing problems. Little or no consideration has been given to long range or to how proposed community or regional master plans might influence the existing or future ambient air quality. This lack of coordination planning has tended to maximize air pollution problems. As long as this type of a situation exists one can expect air pollutants to be created faster than they can be resolved. One might ask, what are the driving forces that impel us now to cope with the air pollution problem at all levels of governments and industry? There is no longer any question that air contaminants have serious adverse effects on plants, animals, property and human beings. The opportunity is here now, to introduce systematically into our operating

programs, scientific knowledge gained through research. Some of the elements one might suggest for an air resource management program are:

1. Complete development of a public policy on air conservation.
2. An international organizations framework and staff capable of operating along functional lines (e.g. engineering, technical services, field services) and the necessary funding to support it.
3. Assessment, continuously, of existing air quality on a world wide bases through the use of computer technology.
4. Assessment in depth on a continuing basis of the emission from all existing and future pollution sources.
5. Development of the necessary information about factors that influence the transports of air pollutants.
6. Design of remedial measures and programs calculated to bring about the air quality desired.
7. Development of long range air use plans that are fully integrated with plans for land use, transportation, recreation, refuse disposal, etc.
8. Development of an understanding of the broad implication of science and technology on air resources and the potential effect on the social and economic character of modern society.
9. Development of an effective information and educational program to inform the community at large of present and future problems and of the need to solve them promptly and effectively.

Long range planning must be an integral part of an air resource management program. For example, as one means of reducing pollutant emissions, in a 25 year plan, consideration could be given to eliminating certain existing combustion operations and substituting different sources of energy as means for heating.

Simply stated the air resource management concept is an operating principle, feasible in an age of science that is needed because of the complexities of our present lives. This concept is dedicated to obtaining the highest beneficial use of the limited air resources in which we live and work; thus, the optimum degree of air purity for the promotion of the public health and the adequate protection of the welfare and property the people is assured.

In conclusion, if we are to be unshackled from the horns of the dilemma of survival" standards and controls of the "air we breathe" have to be established on a world wide basis.

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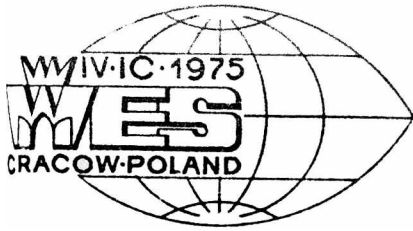
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FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Stella Casiello De Martino

**LA REQUALIFICATION ET LA
REUTILISATION DU PARTI-
MOINE ARCHITECTURAL DES
VILLES ET LA RENCONTRE EN-
TRE ANCIEN ET NOUVEAU**

**Sections 2: Environnement de l'homme
et problèmes transport.**

Printed according
to the author's original

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LA REQUALIFICATION ET LA REUTILISATION DU PATRIMOINE
ARCHITECTURAL DES VILLES ET LA RENCONTRE ENTRE
ANCIEN ET NOUVEAU

Au cours de cette dernière décennie, nous avons assisté à une lente évolution du concept de sauvegarde des biens culturels. Dès 1964 à Venise on avait mis au point la signification de monument historique, incluant dans la plus vaste catégorie des biens culturels, en dehors des bâtiments isolés et de valeur individuelle, les sites urbains même, naturels et ruraux, et partant, les ensembles ambiants. Au niveau international, donc, le Conseil d'Europe, ayant pris conscience de toute la série de problèmes relatifs à la tutelle de ces biens, est en train de poursuivre depuis quelques années ce nouveau type de discours et adresse sa propre attention à la sauvegarde du patrimoine architectural urbain, à la protection et à la réanimation des ensembles et à la conservation intégrée. Ensuite on a analysé les applications pratiques de cette nouvelle doctrine, de sorte que, en 1969, les Ministres européens responsables, réunis à Bruxelles, ont donné des directives qui posent la conservation dans le cadre de la planification urbaine et régionale, en tenant compte des exigences des 'patrimoine culturel immobilier' comme "ensemble: des créations conjointes de la nature et de l'homme, qui constituent le cadre de notre existence". On analyse, ensuite, la valeur de ce patrimoine qui est irremplaçable et constitue un capital non renouvelable et non pas des biens de consommation.

La Conférence suggéra aux Ministres européens une série d'actions visant d'un côté, à coordonner l'activité de sauvegarde des biens culturels avec celle de planification urbaniste, et, de l'autre, à moderniser les lois en vigueur dans les différents pays, dans le but de passer des formes actuelles de protection passive à celles de la conservation active. L'action développée par tous les Etats européens pendant plusieurs années dans le domaine de la sauvegarde des monuments et des sites, a donné lieu à la création, au sein du Conseil d'Europe, en 1971, d'un "Comité des Monuments et des Sites" destiné à devenir l'instrument de cette action qui s'insère dans le cadre du programme de travail du Conseil même. Dans le domaine opérationnel, ce Comité a poursuivi un programme européen de "réalisations types", dans le but de montrer concrètement qu'il est possible d'intervenir sur des tissus urbains ou ruraux de valeur historico-artistique, sans en altérer l'intégrité et en créant, en même temps, des conditions de vie plus humaines. Plusieurs rencontres internationales ont permis d'approfondir l'étude des problèmes posés par la réalisation du programme. Et en plus, l'année 1975 a été proclamée par le Conseil d'Europe "Année Européenne du Patrimoine Architectural", dont la campagne publicitaire est consacrée à attirer l'attention de tous les niveaux de la population sur les buts sociaux de la politique de conservation et à assurer l'application des mesures de protection nécessaires au patrimoine architectural.

La Pologne même, dans le cadre des manifestations de l'Année Européenne du patrimoine architectural, a organisé une exposition itinérante, présentée récemment à Rome aussi, relative à la politique de conservation qu'on conduit dans le pays.

L'intérêt du monde entier pour la sauvegarde des biens culturels montre que des raisons bien plus profondes que celles qui sont le propre du domaine culturel poussent. L'homme à conserver le patrimoine ne historique, artistique et ambiant. En effet, la défense et la

alorisation des ensembles historiques représentent une sorte de réaction, non pas contre le progrès matériel de la civilisation moderne, mais plutôt contre les excès et les dégénération auxquelles le progrès même a mené; cette attitude est un refus actif de la soumission passive de l'homme à la technique. Il n'est donc pas exagéré d'affirmer que ces ensembles, créés par l'homme pour l'homme jouent un rôle de "Modérateurs" dans une évolution de la civilisation qui procède par de fortes secousses, et ils en assurent la continuité. Toutefois, ils ne pourront jouer cet important rôle que dans la mesure où la société, ayant pris conscience de sa valeur inestimable, décidera d'en ralentir la dégradation et de les utiliser à leur profit.

L'intérêt suscité aujourd'hui, par les villes anciennes et par les sites historic-artistiques, dans tous les pays du monde, nous montre encore, comment, malheureusement les nouvelles techniques dont l'homme disposait ont été mal employées dans le secteur de l'architecture et de l'urbanisme: non seulement elles ont causé la faillite du nouveau, mais elles risquent aussi de détruire l'ancien. On a déjà mis en relief l'importance du rôle des milieux anciens dans une société où les valeurs de la civilisation sont en pleine désagrégation. À peine dire les raisons de la crise de notre civilisation, c'est-à-dire, celles qu'on retrouve dans les structures urbaines aussi bien dans tout autre aspect de la vie associée, ne sont pas à rechercher seulement dans la faillite de l'architecture et de l'urbanisme, mais aussi qu'en l'a soulignée récemment (cf. R. Di Stefano, *La speculazione sul patrimonio ambientale*, Naples, 1975, p.14) dans "perte graduelle et accélérée" de tout intérêt spirituel dans la vie des hommes, visant exclusivement à la conquête fébrile d'un bonheur purement matériel. Voilà l'équivoque entre le "bonheur" en tant que conquête du bien-être matériel et la "joie de vivre", qui est, au contraire la conquête d'un état de satisfaction spirituelle". C'est dans les biens culturels qu'on peut chercher une solution à notre problème. En effet, ils permettent à l'homme de s'échapper de l'aliénation-

tion totale, de la perte de sa conscience individuelle et de retrouver sa véritable dimension. Si cela est vrai, toute exhortation à donner de l'essor à l'instruction publique devient fondamentale ; un appel capable de provoquer une prise de conscience des problèmes relatifs aux biens culturels n'est pas seulement fin lui-même, mais trouve sa validité dans le fait que les maux que nous déplorons ne dépendent pas exclusivement de la soumission totale des forces économiques et politiques, mais plus souvent d'une insuffisante connaissance qu'on a de ces biens. Malheureusement, même tout le monde le sait, il n'y a pas en Italie un catalogue systématique des biens culturels ; et pourtant, comme il est reconuniversellement, notre pays est l'un des plus avancés dans la problématique urbaniste des centres historiques. (I)

Mais en revenant à notre sujet principal, nous rappelons que le problème de la ville historique est aussi un problème d'architecture. À partir de la révolution industrielle, les interventions sur les centres historiques ont trouvé des justifications théoriques différentes : des démolitions brutales réalisées sous prétexte d'accomplir un assainissement hygiénique, aux reconstructions "à l'italienne", aux espacements visant à isoler les monuments dans un cadre, et de les mettre en valeur. On est arrivé, ensuite, grâce au Mouvement Moderne, à englober le problème de la ville historique dans un projet pour la ville moderne. Mais les discussions qui suivirent dans l'après-guerre ont fini par avoir presque toujours un caractère de secteur et, à l'idée de la stricte conservation s'est jointe celle du renouvellement des bâtiments et de l'adaptation de la nouvelle architecture ou celle d'une affirmation plus nette des valeurs modernes. En d'autres termes, le motif dominant est celui de la rencontre entre ancien et nouveau ; sur ce sujet, on a alimenté pendant des années, de graves ambiguïtés, comme, par exemple, celle d'avoir considéré les centres anciens en tant que réalités autonomes dont le destin pouvait être décidé indépendamment de celui du contexte urbain. Pour

dépasser ces limites, il est donc nécessaire d'envisager le problème du rapport entre ancien et moderne, en tenant compte, dans le plan de la ville nouvelle, des mémoires du passé et des plans qui ont pris forme à travers les siècles.

Or, de telles réflexions nous permettent d'insérer nos problèmes dans un cadre de culture plus vaste, dépassant même l'exigence fondamentale que la ville ancienne soit conçue dans un plan urbaniste plus général. "En effet, nous remarquons que, au-delà de cette exigence, nous parviendrons à une intégration réelle des anciennes préexistences dans la ville actuelle seulement quand l'architecture aura acquis de nouveau des significations plus humaines" (Cf. R. Pane, *Attualità dell'ambiente antico*, Naples 1967, p.38). Le milieu dont nous nous occupons, en effet, représente surtout le résultat de l'organisation de l'homme dont les édifices n'en sont que le support, car chacun d'eux est construit pour accomplir une fonction et fait partie d'un milieu urbain, d'un cadre plus vaste, d'un siège de mécanisme économique et social plus complexe. Ensuite, la mise en valeur de ce milieu ancien ne peut être conçue sans une "réanimation" qui se base sur la réorganisation des activités économiques, sur le rétablissement d'un équilibre social et démographique et sur l'utilisation des anciens édifices et 1 l'intégration des nouveaux.

Il faut préciser, à ce moment-là., que dans tout le tissu de la ville ancienne, sur lequel nous allons opérer le renouvellement urbain, nous pouvons distinguer la vaste zone du centre historique où nous allons opérer la restructuration urbaine et la partie plus ancienne que nous appellerons centre ancien, sur lequel nous allons exécuter des restaurations urbanistes. Parmi celles-ci on prévoit aussi le remplacement des bâtiments, visant toute la problématique de la rencontre entre ancien et nouveau, ce qui pose de remarquables difficultés. C'est pour cela qu'on trouve encore dans plusieurs centres anciens des villes européennes le "classique modernisé" et le "moderne adapté"; il est donc opportun d'insister, encore une fois, sur le fait que l'ar-

l'architecture nouvelle à l'intérieur des tissus anciens devra être complètement moderne, mais qu'elle devra respecter les conditions dictées par la planification, parmi lesquelles il y aura, sans aucun doute, la conservation des dimensions qui définissent le centre ancien au tant que rapport urbaniste général.

Les deux opérations dont on vient de parler, restructuration urbaine et restauration urbaniste, entraînent des modifications du milieu urbain strictement liées à l'emploi et au choix des matériaux. La gravité de la situation internationale impose, cependant, une réflexion sérieuse quand on essaie de récupérer les villes existantes. On ne peut pas appliquer des solutions valables pour tous les cas: il est possible seulement d'établir des critères théoriques et méthodologiques de fond, car la restauration change suivant le cas. Cela est valable pour la restauration urbaniste, non seulement si l'on considère les différences entre les centres anciens des grandes et des petites villes, mais aussi entre les centres anciens de différentes grandes villes. Il suffit de remarquer la différente évolution historique. Les différentes caractéristiques des formes architecturales, des données climatiques, des conditions économiques, pour se rendre compte de la diversité des situations. On assiste par exemple à des interventions tout à fait différentes de pays à pays et de ville à ville, dans un même pays. Vis-à-vis de ces problèmes souvent les autorités, les architectes, les opérateurs manquent de renseignements; il y a lieu, donc, de craindre que, sans la diffusion de ces connaissances, le patrimoine culturel immobilier, qui est une richesse globale et collective ne risque d'être gravement endommagé. L'intégration de ce patrimoine, donc, dans la vie de différentes nations n'est pas l'apanage d'une élite de spécialistes, mais constitue une responsabilité de chaque pays-vis-à-vis du monde entier. L'adaptation de ce patrimoine au confort que les modernes conditions de la vie exigent entraîne des frais qui doivent être évalués non seulement sur le plan économiques, mais sur le plan humain et social aussi.

On ne peut pas cependant employer des solutions généralisées au niveau de différents pays, ni non plus à l'intérieur d'une même ville; il faut, en effet, étudier de différentes interventions de restructuration et de restauration pour chaque p^oté de maisons. C'est justement de l'exigence des nouveaux types d'interventions sur le même tissu que naît la difficulté de décision de l'opération; entre autres, on prévoit des interventions de restructuration de bâtiments qui devraient être exécutées par l'emploi de nouvelles techniques et de nouveaux matériaux. On devrait même faire de plus nettes distinctions entre les différents espaces culturels; il n'existe pas en effet de formations urbaines identiques entre elles, au contraire, de remarquables différences dans les techniques et dans les matériaux de construction par lesquels on a réalisé, par exemple, les centres anciens du nord de l'Europe (pour la plupart en bois), ou ceux du bassin de la Méditerranée (riches en bâtiments à voûtes à extrados). Il est vrai aussi que, en général, il faut adopter de différentes solutions non seulement dans les transformations des bâtiments anciens, mais aussi dans le plan général du projet de restauration.

Les expériences italiennes montrent comment dans notre pays aussi les différentes typologies de construction présentées dans les centres historiques des différentes villes soient conditionnantes; les difficultés d'intervention et d'installation de nouveaux équipements à l'intérieur des édifices changent remarquablement quand on passe des constructions basses de beaucoup de villes italiennes aux bâtiments à plusieurs étages d'autres centres, tel celui de Naples.

Le projet des installations techniques (accenseurs, conduits qui traversent les pièces, réseaux électriques etc ..) peut donc subir des conditionnements tout à fait particuliers, pour ce qui concerne le respect des valeurs architecturales et, à son tour, il peut conditionner aussi la distribution des pièces dans leurs nouveaux usages. En d'autres termes, les travaux nécessaires dans l'adaptation moderne des anciens bâtiments

our les installations sanitaires, le chauffage, l'électricité, gaz etc..., peuvent causer des altérations remarquables dans les caractères typologiques des édifices, au risque de créer ainsi non seulement le contraste entre ancien et nouveau, mais aussi entre vieux et moderne. Si l'on veut donc garder les marques du passé, il faut choisir parmi les destinations d'usage; choix devra tenir compte de ces aspects techniques et devra être conforme à l'art. 5 de la "Charte de Restauration". C'est dans cette direction que les aspects techniques de l'intervention deviennent déterminants et notre discours s'insère parfaitement dans le sujet général du Congrès "Nouvelles techniques du service de l'humain".

Dans la restauration des édifices de remarquable intérêt architectural donc, l'emploi des techniques sera très important dans la restauration et toutes les adaptations ne seront pas possibles. Ce problème est aussi d'une extrême importance à cause des difficultés, au niveau de l'urbanisme, pour ce qui concerne des aqueducs, les égouts et les réseaux électriques et téléphoniques à installer dans le sous-sol. Les installations qui concernent l'ensemble urbain, ainsi que les implantations relatives aux édifices entraînent souvent la nécessité de créer de nouveaux espaces qui doivent être opportunément aménagés et cachés.

Malheureusement dans le domaine de la recherche tous ces problèmes ont été souvent négligés par rapport aux problèmes plus généraux relatifs à la restauration urbaniste, toutefois nous savons qu'ils sont très importants pour la restauration, aussi bien des édifices que des centres anciens, justement parce que l'usage inconditionné des techniques peut causer - ainsi qu'on n'a rien de le dire - des altérations typologiques et par conséquent des résultats inacceptables. "Toute restauration correcte doit prévoir une utilisation correcte des bâtiments et des centres anciens; aujourd'hui, au contraire, on risque de provoquer des altérations inacceptables au point de vue architectural, dans des édifices restructurés suivant les exigences des temps modernes; ou bien d'avoir des édifices restaurés correctement sous le profil architectural, mais qui ne satisfont pas à ces exigences. La solution correcte ne consiste pas dans l'emploi simpliste

de technologies traditionnelles, mais dans la recherche de nouveaux matériaux et de nouvelles infrastructures qui s'adaptent aux exigences primaires de la restauration qui sont: le respect à la fois de l'exigence historico-esthétique et de l'exigence technologique.

Il faut reconnaître cependant qu'au cours des dernières années on est parvenu à de bons résultats dans le domaine technique par l'emploi des résines époxydiques pour la consolidation; des silicones dans les maladies des pierres; avec l'application de méthodes modernes dans des interventions particulières, tel le déplacement de bâtiments ou avec l'introduction de structures métalliques à l'intérieur des structures, et ainsi de suite. Ces systèmes devraient être, bien sûr, beaucoup plus approfondis, ce qui ne se produit pas à cause du faible intérêt montré par les industries pour ce type de problèmes, car la demande est très modeste.

En réalité il n'existe pas de règles exactes, il faut plutôt s'engager plus rigoureusement, afin qu'on puisse faire face à de nouvelles solutions avec une plus grande conscience culturelle. Comme nous l'avons déjà dit, la défense des centres anciens constitue une exigence fondamentale qu'on peut réaliser en fonction de la ville nouvelle et non pas en antithèse avec elle, et le passage du passé au présent et de l'architecture ancienne à l'architecture moderne devra être une continuité de la civilisation.

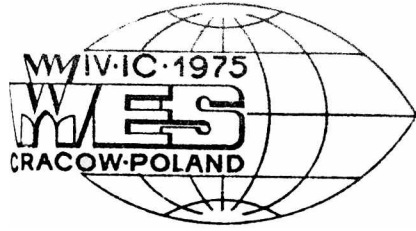
En concluant, le principe de la conservation des monuments se base sur la condition qu'un lien de continuité culturelle et historique puisse et doive exister; mais ce sera toujours l'homme qui choisira son propre destin en s'imposant aux instruments qu'il a créés lui-même et non pas en s'y soumettant.

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- (1) A ce propos je fais présent que dans ma région, la Campanie, dans les derniers mois, par l'initiative de la Direction régionale de la Sauvegarde des Monuments et des Beaux-Arts, une importante expérience a eu lieu. Au mois de juillet 1974 une loi pour le recensement des biens culturels et naturels de la Campagne a été promulguée. Suivant ses dispositions on a institué à Ravello (Salarne) le cours - réservé aux licenciés - pour la formation des spécialistes dans les activités de recensement, catalogage et

1) suite

inventaire des biens culturels de la Campanie et on en a confié l'accomplissement à l'Ecole de Perfectionnement en Restauration des Monuments de l'Université de Naples - dont je fais partie et dont le directeur est le prof. Di Stefano, spécialiste du secteur - en collaboration avec le Centre d' Etudes pour les centres anciens de l'Université de Salerne.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Asuncion B. Ka1alo

THE INTEGRATION OF THE HUMAN SETTLEMENT PROGRAM INTO PHILIPPINE INDUSTRIALIZATION AND INVESTMENT POLICIES

Section 2: Spatial arrangement of human environment..

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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Asuncion B. KALALO
Board of Investments

Philippines

THE INTEGRATION OF THE HUMAN SETTLEMENT
PROGRAM INTO PHILIPPINE INDUSTRIALIZATION
AND INVESTMENT POLICIES

I. Introduction

The advent of the Philippine New Society in late 1972 triggered off a series of national programs designed to improve the quality of life of the Filipino. One of these programs was the proposal for a Human Settlement Program in the country. Its primary concern is the infusion of human settlements in the country's approach to development.

As a result, the Task Force on Human Settlements was created on September 19, 1973 by the President of the Philippines. The Task Force was charged with the –

1. preparation of a National Framework Plan for human settlements as a general scheme for all development projects;
2. preparation of a Metro-Manila Development Plan including programs for the Manila Bay Region, frontier and slum resettlements, area development of tourist areas; and
3. preparation of a National Housing Program.

The Task Force was composed of the President of the Development Academy of the Philippines /DAP/ as Chairman and heads of various agencies as members.

The Task Force has completed the first two assigned charges, The third- task of preparing a National Housing Program was transferred to the formal body created to take over the functions of the Task Force.

In March of this year, the President directed the creation of the Human Settlement Commission to effectively coordinate and expedite the projects completed by the Task Force and to continue the Task Force's studies on land use, planning and management. The creation of a Commission represented an important Step in the implementation of the Human Settlements Program. Coordination of activities with different government agencies has been effectively carried out resulting in an integrated approach to human settlement. Whereas prior to the Program there was no significant concern for human welfare, the Program seeks to infuse this element into existing and proposed policies and programs for national economic development.

II. The Human Settlements Program

The Program centers on the concept of directed development through judicious resource planning and allocation. Prior to the Program, many planning efforts have been largely compartmentalized, isolated and sometimes overlapping. The human settlement policies brought into focus the needed coordination and integration of general development policies of the various sectors of economies, transport, social and community services and other government agencies.

A National Framework Plan was prepared and set up to design guidelines and approaches to an integrated and comprehensive human settlements program for the country. The Plan studied existing environment conditions and developmental levels to be able to identify critical areas as well as areas of greatest potential for development.

The study showed that with the growing urbanization based on 1960-70 figures, the rural-urban population ratio has decreased since 1960. However, the majority of Filipinos still live in rural settlements. There has been an increase in the number of towns with populations over 20,000, the number being 230 in 1960 and 577 by 1970. The growth of urban areas was problematic in one respect: there was a concentration of people in the Metro-Manila Area.

Furthermore, there is no clear singular pattern of ranking on key indicators such as roads, electrical consumption, number of establishments and population density being used in the study of existing conditions.

In terms of development computed on four /4/ indicators, namely; density, road kilometer, electric consumption, establishments, the top scores were registered by Manila and Rizal, with Bohol province down south as third. Other top ranking provinces were Pangasinan, La Union, Batangas, Laguna, and Albay in Luzon, and Cebu and Negros Occidental in the Visayas. There is an absence of provinces with high development scores for the Mindanao area.

In view of these findings, the Program recommends

1. an integrated rural development program;

2. the establishment of a coordinating body on national resource utilization to establish priorities;
3. the planning of new urban centers with the growth of Metro Manila in a controlled and guided manner; and
4. the preparation of studies on natural environmental problems to determine ways of minimizing their destructive effects.

In order to accomplish this, certain strategic measures were recommended:

- a) The use of the growth center strategy to control the growth of the major urban center to change somewhat the primary structure and to delineate the intermediate sized centers which may bridge the gap between small towns and large urban centers in order to produce an urban settlement hierarchy
- b) the classification of land capability which can result in the formulation of a program on land productivity and capacity;
- c) the provision of economic incentives for industrial dispersal in order to direct investments in chosen action areas.

In addition to these recommendations, the program recommends some priority areas as critical action measures:

- a) there should be a strictly controlled growth of the Central Manila area in terms of economic activity and population growth
- b) development efforts should be deliberately concentrated in areas outside the central Manila area according to the controlled growth strategy;

- c) feasibility studies should be undertaken for determination of relief centers in big areas of the country as well as in potential growth centers in Cebu;
- d) there is need to intensify food production and investments should be channelled to countryside development programs; and
- e) further studies are /needed to investigate adverse effects of the energy crisis specially in terms of intermediate technology.

Due to the primacy of Metro Manila and its determined influence on the growth of the peripheral provinces, a detailed study for its controlled growth was undertaken. The study pinpointed the action areas. These include Looc, Tondo and the Marikina Infanta settlement areas. These areas are considered as action areas since they have the immediate housing on human settlements in the region and feasibility studies are being undertaken for controlled development.

The Program also assessed the housing situation in the country and emphasis was given to the housing in transitional urban settlements "Which refer to many forms of slums, squatter settlements and other such settlements developing countries. There are three /3/ existing resettlement areas within the outlying area: Carmona in Cavite; San Pedro, Tunasan in Laguna; and Sapang Palay in Bulacan. Three ether proposed sites are: Dasmarinas in Cavite; Montalban in Rizal; and Navotas in Rizal. It appears from available information that relocation operations have been ineffective: only 51% of the total relocated families have been effectively resettled. As of June 30, 1973, 45% from San Pedro,

Tunasan and 41% from Sapang Pa1ay have moved to other squatter colonies. The lack of a minimal mix of sites and. service facilities essential to a decent form of living and the absence of suitable sources of livelihood within reasonable commutable distance from the resettlement sites have caused many settlers to leave. The government has undertaken the task of relocating squatters to resettlement areas under a priority classification scheme. Also, the government has involved five government agencies in the finance and construction of low cost housing and with this, a. study of two major problems related to housing management was recommended to be undertaken: the maintenance of physical facilities and tenancy.

III. Industrial and Investment Policies Pursuant to the Program

In the implementation of the Program, the then TFHS started the setting up of coordination work among different government agencies concerned with industry and investments. The major policies being implemented in line with the Program may be classified into general investment policies, countryside development policies, policies for specific industries and polic1es for settlements resettlement areas.

A. General Investment Policies

The Board of Investments /BOI/ is charged with the task of directing investments into desirable economic activities and annually comes out with an Investment Priorities Plan /IPP/ and Export Priorities Plan /EPP/ identifying areas of investments for which government incentives are to be extended. Furthermore, the BOI regulates foreign investments in excess

of Thirty /30%/ per cent of equity/ownership in any business activity.

In support of the Program the BOI implements In the discharge of its duties the following policies:

1. Provide for tax credit equivalent to one hundred /100%/ per cent of the amount spent to set up infrastructure and the like in areas considered as complying with regional dispersal program.
2. Provide tax incentives in the form of deduction from taxable income of a portion of labor training expenses. Incurred to update the productivity and skill of unskilled labor. To date one /1/ firm has availed of this incentive amounting to P12, 000.
3. Provide for clearance from and coordinate with the National Water and Pollution Control Commission /NWPPC/ on establishment of anti-pollution devices and measures.
4. Require new plants to be established fifty /50/ kilometers outside Manila, in accordance to a Presidential Directive issued on December 1973. As of December 1974, ninety /90/ BOI-approved and registered firms have complied with this ruling. The BOI allows three /3/ exceptions to this ruling namely:
 - a) cost of production and marketing, will rise by more than 15 per cent if project is located outside the 50-kilometer perimeter compared to a suitable site in Metro Manila;
 - b) project will absorb workers from resettlement areas near Manila; and

- c) proximity to airport and labor is critical to the operation of the enterprise.
- 5. Designate specific locations for certain areas of investment which is necessary for proper resource allocation.

The first three /3/ policies are implemented in line with the government's strategy to promote regional industrial dispersal and export-oriented industries. They were implemented even prior to the formulation of the Program. However, the last two /2/ policies are the direct result of the Program.

While the BOI implements a "positive list" of investments through the Priorities Plan Investment Priorities Plan under R. A. 5186 and Export Priorities Plan under R.A. 6135/ and through its regulatory power over foreign investments, the Investment Coordinating Committee of the: National Economic Development Authority /NEDA/ on the other hand implements certain policies on "negative areas" of :investment. Investments in such areas are not encouraged since there is sufficient capacity to service the domestic demand and such areas include soft drinks, cement, beer, brewing, alcoholic beverages, matches, etc. However, in cases where the investment will be set up in an area where regional development is needed and the export potential is to be serviced, exemptions from the negative list may obtained.

To further support the BOI in the implementation of investment policies, the government financial institutions such as the Development Bank of the Philippine /DBP/, the Philippine National Bank /PNB/, the Government Service Insurance System /GSIS/, and the Social Security System /SSS/, give

preference to BOI-registered firms in the extension of financial support whether through direct investments, or through loan or guarantees. The same is true for most private development and finance companies:

NEDA as the over-all planning agency of the government coordinates with the various implementing agencies in the preparation of the National Industrial Sector Program. The Sector Program takes into account existing and potential capacity, infrastructure, power and budget research requirements of the industry.

B. Countryside Development Policies

The government has undertaken a massive countryside development program. With the creation of the Department of Industry, it has launched: Medium and Small- scale Industries Community Assistance Project /MASICAP/ teams all over the country in order to assist the small entrepreneurs in the preparation of feasibility studies and other technical assistance. DBP/IGLF and other civic minded private organizations have financially assisted in pushing for the growth of small and medium-scale industries in the rural areas. The development of agricultural produce has been encouraged and financial assistance is being extended.

C. Policies for Specific Industries

Since 1971, the textile industry has undergone a rationalization largely thru BOI coordination with the private sector. Regional dispersal and an intensive export promotion drive was made since then and this has borne fruits for the

country. Export of textiles increased annually from \$22,284, 370 in 1971; \$22,416,630 in 1972; \$44,780,133 in 1973; and \$59,078,803 in 1974. Two /2/ new plants were approved by the BOI for location outside Metro Manila, with total investments amounting to P71,022,000 and a labor generation equivalent to 1,334 since January 1974.

No new plants are allowed to be established within Metro Manila area and products resulting from expansion for existing plants have to be exported.

For the garment industry, the government has likewise implemented the policies of regional dispersal and export orientation. The industry is unique in that it can be undertaken for a small or medium- scale basis and is labor intensive. For this industry, utilization of labor in a resettlement or settlement area may merit an exception to the establishment of new mills outside a 50-kilometer radius.

Regional dispersal is also applied to the electronics industry .The development of this industry is encouraged by the government's granting pioneer status to the manufacturer of electronic components such as semiconductors and electrolytic capacitors. Simplified feasibility studies are designed to ease registration procedures and evaluation of projects are shortened to facilitate the availment of incentives. Lastly, the BOI endorses requests for bonded warehouse in connection with the electronic firms manufacturing operations. The export performance of the industry has tremendously improved from \$ 281,045 in 1971, \$444,001 in 1972, \$938,850 in 1973, to \$2,128,957. Fourteen /14/ new firms were approved by BOI with a labor generation equivalent to 14,749 as of December 1974.

For the coconut oil mill and the activated carbon industries, the BOI has implemented the policy of locating the firms near the source of raw materials. Limits have been set for the plants that may be established within the region. Firms of the above-mentioned industries, being highly pollutive and hazardous in nature, are subject to inspection by the Chemical Board to check the threat to the quality of the environment in the areas. The export of coconut oil showed a poor performance in 1972 and 1973 - S82,889,518 and S152,648,368 respectively. However, there was a general increase in export from S216,164,116 in 1971 to S380,731,841 in 1974. Twelve out of the fourteen /14/ BOI-approved and registered coconut oil firms are new projects with total investments amounting to P325,296,000 and a labor generation equivalent to 1,157.

Being a new industry, export of the activated carbon started only in 1973 with a total of S231,000. 1974 export was registered at \$289,000. Five /5/ firms were registered with the BOI as of 1974 under pioneer status. Of these, four /4/ are new projects with an equivalent total investments of P23,398,292 and a labor generation equivalent to 360.

D. Specific Policies on Resettlement/Settlement Areas

In order to help the resettled families effectively resettled, the government through the Human Settlement Commission, the Board of Investments and the Presidential Assistant on Housing and Resettlement Agency, has encouraged the establishment of light and medium scale industries near or within such areas. Firms seeking to establish new plants and re-

gistering with BOI are requested to consider the settlement/resettlement areas prior to a decision on plane site. Further, as mentioned earlier, the BOI and HSC may grant exceptions to location outside a 50-kilometer radius should the proposed firm utilize labor from these areas. To date, BOI has approved six /6/ new firms planning to utilize labor from settlement/resettlement areas.

IV. Outlook

The policies being implemented co-exist with the Human Settlements Program and pending the results of other studies, other policies may soon come to fore. With the election of the Philippine Representative Miss Helena Benitez to the Presidency of the United National Environment Programme /UNEP/, active participation of the government in the implementation of the HSP is foreseen. The Eastern Regional Organization for Planning and Housing /EAROPH/ has likewise elected a Filipino as President of this year's activities, and the results of the congress work can be utilized for the benefit of the Filipino worker. The Philippines will try to develop the workers environment habitat and well-being at the same time the economic situation is progressing.

**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Henryka Wałęcka

**LE ROLE DES AUTOROUTES
DANS LA FORMATION DE
L'ENVIRONNEMENT DE
L'HOMME ET L'AMENAGEMENT
D'ESPACE**

Section2: Environnement de l'homme.

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
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Henryka WAŁECKA
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Bureau d' Etudes des Autoroutes
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LE ROLE DES AUTOROUTES DANS LA FORMATION DE L'ENVIRONNEMENT DE L'HOMME ET L'AMENAGEMENT D'ESPACE

1. Les traditions de la planification d'espace et de la formation de l'environnement

L'urbanisme moderne naquit dans le monde au tournant des XIX et XX siècle. Devant une rapide extension des processus d'urbanisme et à base du développement de l'industrie nationale, on s'est rendu compte de la nécessité de protéger des gens contre l'effet dangereux de l'industrie de cette époque - là.

Les cadres des urbanistes polonais faisaient alors leurs études dans des Ecoles Supérieures d'Europe. Par conséquent la Pologne est devenue le point de croisement de nombreuses influences des écoles étrangères.

Des jeunes urbanistes instruits en dehors de leur pays ont réussi à profiter des expériences obtenues à l'étranger. Avec cela on voit se former une tendance à créer, sur cette

base, une école polonaise d'urbanistes. On a créé entre autre un plan de Grande Cracovie comprenant des communes voisines. On a attaché une importance particulière à la solution adéquate du système de communication, surtout aux artères périphériques. Les premiers travaux présentés au congrès médical et publiés dans le magazine "Santé" prouvent que leur but principal consistait à la protection de santé de l'homme.

Il faut noter que toute l'activité ayant le caractère national se passait dans le pays sous l'occupation étrangère. Après avoir obtenu l'indépendance en 1919 on s'est mis dans le pays à l'éducation des spécialistes.

En 1923 on a créé la Société d'Urbanistes Polonais qui réunissait des spécialistes. Ensemble ils ont commencé les études sur le problème de l'urbanisme, ils ont formé sa base scientifique et popularisé les idées liées avec l'amélioration des conditions de vie de l'homme. La Société d'Urbanistes a groupé des gens de différentes spécialisation: architectes, ingénieurs, médecins, sociologues et économistes.

Dans les projets élaborés, le bien de l'homme et les raisons fonctionnelles suggéraient la façon de planifier de nouveaux systèmes de communication, nouveaux quartiers, zones et arrangements de verdure.

Dans les années trente parurent les bureaux de planification régionale élaborant les plans de toutes les grandes

régions de pays. On a créé aussi le Bureau d'Etudes du Plan National. Le développement de la planification régionale cause le changement de la manière de traiter des problèmes d'espace.

La ville devient un élément lié organiquement avec la région, la région avec le pays.

Ces travaux ont été interrompus par la II-ème guerre mondiale. Après la chute de septembre en 1939 l'état de stupeur désespérée durait relativement court.

A Varsovie on a formé 3 centres clandestins d'urbanisme du caractère interdisciplinaire qui faisaient les études sur la reconstruction et modernisation de la capitale, et aussi sur les petites villes. Au fur et à mesure du développement des événements l'équipe des urbanistes devenait de plus en plus petite. Mais les travaux étaient continués jusqu'à la fin de la guerre même pendant l'insurrection à Varsovie.

En dehors du pays pendant la guerre, la plus grande concentration des urbanistes s'est formée en Angleterre. Là, on a créé la filiale de la Société d'Urbanistes Polonais et L'Ecole Supérieure Polonaise d'Architecture et d'Urbanisme à Liverpool. Les études et les travaux de planification menés pendant la guerre par les urbanistes anglais exerçaient une grande influence sur la direction des travaux du centre polonais d'urbanisme.

Après la II-ème guerre mondiale en 1945, parut le Bureau de Reconstruction de la Capitale à Varsovie complètement détruite. Dans les conditions après la guerre ce bureau

s'est mis à l'élaboration de l'Ensemble Urbain de Varsovie, prenant en considération démographie, problèmes sociaux - économiques, physiographie, communication, rapports d'eau et d'entourage de l'homme avec la verdure, problèmes énergétiques. Ce premier atelier d'urbanisme en Pologne possédait les traits du modèle qui est actuel jusqu'à présent.

On a organisé les discussions publiques sur la nouvelle forme de la capitale.

En même temps s'établit l'Office Central de Planification d'Espace qui a pris la surveillance de tous les problèmes de planification d'espace /national, régional et local/. Dans toutes les voïvodies on a convoqué les postes de planification régionale.

Ces premières années après la guerre étaient la période d'une abondante activité urbaniste.

L'enthousiasme et élan avec lesquels on a commencé cette activité n'avaient pas de précédents.

L'une des forces motrices de ce dynamisme était la conviction que la révolution sociale et économique a mis à notre disposition des moyens illimités pour réaliser les projets en perspective. En 1949 on a fait éditer la Loi de la protection de la nature. D'après celle-ci la protection de la nature signifie la conservation, la restitution et la disponibilité convenable des ressources de la nature aussi bien que des produits de nature vivante et non - vivante dont la protection constitue l'intérêt public en égard aux fonctions sanitaires, scientifiques, esthétiques, histo-

riques - commémoratives et sociales et aussi à cause des traits caractéristiques du paysage.

Dans la même année on a créé aussi le Comité d'Aménagement d'Espace du Pays à l'Académie Polonaise des Sciences. Avec le temps on a développé dans tout le pays le réseau des bureaux urbanistes dressant les plans des villes et des campagnes. En 1961 parut l'un des meilleurs actes juridiques en Pologne, la Loi sur la Planification d'Espace. Selon elle le but de la planification d'espace est en outre la formation des conditions pour satisfaire les besoins de la population sous tous ses aspects et la protection des sources et des valeurs naturelles.

La Loi est toujours actuelle et se basant sur celle-ci on est en train d'élaborer un projet national, projets régionaux et locaux.

En 1972 on a formé - une nouvelle administration centrale, le Ministère de l'Aménagement du Territoire et de la Protection de l'Environnement, et ensuite l'Institut de Formation de l'Environnement.

2. La système projeté des autoroutes en Pologne

Le développement général du pays et de nouveaux besoins dans le domaine de transport et de motorisation provoquent un rapide accroissement du chargement du réseau routier de notre pays et aussi la formation de grands flux du trafic. Cette circulation pourrait être réalisée uniquement sur les routes qui se caractérisent par une grande capacité de circu-

2. /Lwów/ - Rzeszów, Cracovie - Katowice - Wrocław - Trzbień - /Berlin/

- autoroutes sur la direction Nord - Sud:

1. /Ostrava/ - Katowice - Łódź - Toruń - Grudziądz-Gdańsk

2. /Praha/ - Wrocław - Poznań - Bydgoszcz - Grudziądz – Gdańsk

et les autoroutes auxiliaires:

Varsovie - Łódź - Wrocław

Varsovie - Toruń

Varsovie - Radom - Kielce – Cracovie

Des autoroutes polonaises conviendront aux standards et normes européens des routes internationales. Les principales conditions techniques sont suivantes: vitesse de base 120 km/h, largeur de voie 3,75 m.

Le système des autoroutes sera complété par les routes à grand débit. Elles vont relier le réseau routier avec de grandes agglomérations, et ces agglomérations entre elles. La longueur totale des routes à grand débit dans le système de direction est environ 2300 km.

En 1972 la Présidence du Gouvernement a pris une décision concernant les travaux préparatoires à la construction des autoroutes.

L'Administration des Autoroutes qui - avait été créée à la suite de cette décision, a élaboré "Le programme de réalisation de la I-ère étape de la construction des auto-

lation dans les conditions de sécurité convenables.

On a décidé donc de chercher la solution de ces problèmes dans le développement des autoroutes, des routes d'express, des voiries rapides sur les territoires de grandes agglomérations.

Dans les années soixante on s'est mis en Pologne aux premiers travaux sur le schéma perspectif et directeur des routes de circulation rapide. En profitant des matériaux du plan national qui concernent les perspectives du développement économique, démographique, urbaniste et de modernisation on a élaboré le système national des autoroutes.

Comme il s'ensuit des calculs les trajets les plus chargés sont:

Katowice-Cracovie, Katowice-Częstochowa - Piotrków,
Katowice - Wrocław, Kraków - Tarnów, Gdańsk - Włocławek,
Varsovie - Łódź.

La prognose de circulation a donné la base à une élaboration du système des autoroutes, avec la longueur totale du réseau de 3000 km. Ce système renferme les directions de la plus grande intensité existante et prévue de circulation et prend en considération les fonctions nationales et internationales, touristiques et économiques.

On a prévu dans ce système des séries fondamentales suivantes:

- autoroutes sur la direction Est - Ouest:

1. /Moskwa/ - Terespol - Varsovie - Poznań - Swiecko – Berlin

routes en Pologne". Ce programme a prévu les tâches les plus importantes concernant les travaux d'études, de projection, de réalisation, d'équipement, de matériel et aussi les problèmes liés à la formation des cadres qualifiés.

3. La technique nouvelle d'élaboration des études des autoroutes sur la base de la stratégie de la planification d'espace et de la protection de l'environnement.

On a cité plus haut les directions fondamentales des trajets des autoroutes. L'établissement plus précis du cours de trajets dans les directions particulières exigées études techniques et économiques plus poussées. La réalisation juste de ces études n'est possible que si l'on tient compte de la planification d'espace et de tous les problèmes du milieu naturel.

Dans ce but le Bureau d'Etudes des Autoroutes de l'Administration des Autoroutes a élaboré le système d'étude technique et économique.

Dans ce système, outre les éléments techniques de planification de l'autoroute on traite par ex. des questions suivantes:

- aménagement d'espace des territoires et la protection de l'environnement
- classification du sol, utilisateurs et équipement
- géologie
- aménagement des voies de l'autoroute
- analyse économiques

Les problèmes d'aménagement de l'espace et de protection de l'environnement sont élaborés dans les études des autoroutes sur la base des plans obligatoires d'aménagement de l'espace du pays, des régions, des agglomérations et des localités particulières.

Comme je viens de mentionner, ces projets sont réalisés sur le territoire de tout le pays. C'est un grand avantage permettant de construire des autoroutes de qualité.

Au cours d'élaboration des études, on consulte des organes de la planification économique, de la planification d'espace, des organes de la protection de l'environnement, des organes ruraux de l'économie forestière et toutes les institutions intéressées.

4. L'analyse des rapports entre l'aménagement de l'espace d'environnement de l'homme et les trajets des autoroutes.

Si l'on étudie les rapports entre l'environnement de l'homme, l'aménagement de l'espace et les trajets des autoroutes, il faut se rendre compte de ce qu'il faut, d'après nous, changer et comment, quels processus l'aident et développent et quels autres freinent et évitent.

La structure de l'aménagement de l'espace du pays est déterminée par des facteurs de base, comme par exemple:

- 1/ différenciation des conditions naturelles de l'environnement
- 2/ dislocation de la population,
- 3/ dislocation de l'industrie,

4/ système de communication.

ad 1/. Le premier facteur est considéré comme le plus stable et en meme temps le plus menace.

Tous les changements qui ont lieu dans l'environnement naturel sous l'influence de l'activité technique et économique ont un caractère stable et ils sont irréversibles ou difficilement réversibles.

L'environnement naturel se compose de nombreux éléments, par exemple: eau, territoires ruraux, territoires humides, forêts et paysage.

L'eau. Une autoroute peut avoir un effet essentiel sur le bilan d'eau, si elle traverse la région de sources. Elle peut alors capter et infecter l'eau de source avec des huiles, de l'essence et des lubrifiants, ce qui provoques son inaptiude á la consommation.

Les impuretés de l'essence, des huiles et des lubrifiants sont dangéreuses pour toutes les eaux courantes et stagnantes et causent la mort de flore et de faune aqueuse. Pour la protection des eaux les trajets doivent passer á coté des teritoires de source. Dans les enviroes des rivières ayant des valeurs naturelles et du paysage, et aussi prés des bassins d'eau du caractère surrégional et régional, les autoroutes doivent être situées á une distance d'un

km des eaux.

On ne doit pas faire évacuer les eaux de routes dans lacs. Si on fait les projets des installations à côté de l'autoroute, par exemple stations d'essence et de réparation, parkings et motels, il faut prendre en considération l'établissement des stations d'épuration et d'évacuation des ordures. Pour garder des réserves des eaux sous-terrains, il est nécessaire d'éviter les territoires avec une nappe d'eau élevée, ou du moins d'éviter les déblais qui baissent cette nappe; il est aussi obligatoire de tracer les routes parallèlement à la direction d'écoulement des eaux souterrains.

Les terrains ruraux. Les terrains ruraux diminuent de plus en plus et la demande de nourriture augmente. Un grand nombre de terrains sera occupé par les autoroutes. La largeur de la voie des autoroutes à quatre voies, avec un remblai d'1 m de haut prend environ 50 m, c'est-à-dire 1 km de l'autoroute occupe 5 ha de terrain.

Les terrains ruraux sont préservés dans les projets d'espace et protégés par la Loi du Conseil des Ministres sur la protection des terrains ruraux.

Il faut donc tenir compte du fait que l'autoroute ne peut pas passer par les terrains ruraux d'une grande valeur. Elle ne doit pas non plus changer de conditions de terre et d'eau dans son entourage. Un moyen qui peut en partie recompenser les pertes dans l'agriculture causées par la

construction des autoroutes est la plantation d'arbres et de buissons le long d'une voie de l'autoroute. Les arbres protègent contre l'érosion d'altération du terrain et ils abritent des oiseaux qui exterminent des insectes et se nourrissent de la semence de mauvaises herbes.

Les terrains humides. Les terrains humides comprennent: prairies, marais, tourbières et eaux basses. On exploite assez intensément les prairies qui sont une des sources du fourrage. Les marais et les tourbières sont très souvent considérés comme terre improductive pendant qu'ils sont en réalité un énorme réservoir d'eau. On estime que nos tourbières peuvent emmagasiner au moins 5 milliards m³ d'eau, c'est-à-dire plusieurs fois davantage que 5 les plus grands réservoirs d'eau construits jusqu'à présent.

Les tourbières qui alimentent en eau les terrains voisins, conditionnent l'existence des bois, des forêts et des récoltes de foin. Certaines tourbières forment d'unique ensembles marécageux d'une très grande valeur biologique. On peut y trouver de rares ensembles de plantes et des espèces d'animaux et d'oiseaux protégés.

Pour prévenir l'extirpation de la flore et de la faune marécageuses spécifiques, on a voté en 1971 une convention internationale sur la protection des terrains humides. La tourbe possède aussi certaines valeurs pour le traitement médical pour l'exportation et elle sert de sous-sol à la culture jardinière.

L'autoroute traversant l'ensemble de marais trouble les conditions d'eau, la végétation de plantes et aussi l'existence des animaux. L'action de découvrir la tourbe provoque sa décomposition rapide et sa combustion sans flammes. En conséquence après quelques décennies la tourbe disparaît en laissant le terrain sablonneux. Les gaz de combustion exercent une mauvaise influence sur la qualité des herbes récoltées sur les prairies. A la suite du caractère dépressif des prairies, l'air vicié des autoroutes y tombe et y demeure.

Les herbes absorbent des substances toxiques et le foin qui se trouve de 100 - 200 m des deux côtés de l'autoroute devient inutile.

On doit éviter de construire des autoroutes sur les terrains des ensembles de marais et de prairies. On ne devrait pas détruire les terrains marécageux. Il n'est pas désirable de faire de longs remblais ininterrompus qui dérangent le passage des eaux et de l'air. Il est profitable de planifier les autoroutes sur les estacades au moins en partie.

Les forêts. Elles constituent le plus grand producteur de l'oxygène sur le continent, et en même temps elles sont un filtre absorbant les gaz et les poussières. Elles garantissent aux hommes une récréation psychique et physique et procurent le bois. Les forêts augmentent le degré d'humidité dans leur milieu et ceci est essentiel, car une grande par-

tie du territoire en Pologne risque de devenir une steppe. La forêt diminue la possibilité d'inondation et elle est une barrière contre les vents. Une forêt naturelle constitue un bien que l'on ne peut pas remettre à neuf.

Pour prévenir les destructions il faut construire des autoroutes à une distance de 1- 4 km des parcs nationaux, parcs de paysage et réserves. On croit nécessaire de faire passer des autoroutes à côté de chaque ensemble forestier ou au moins par ses secteurs de moindre importance. S'il est indispensable qu'une autoroute traverse une partie de forêt, il ne faut pas qu'elle le fasse dans la ligne droite mais que son entrée et sa sortie soient placées sur un arc. En outre il est nécessaire de conserver les passages existants pour les animaux, en construisant des estacades.

Le paysage. On trouve les plus beaux paysages sur les terrains des forêts les plus précieuses, des prairies et des eaux de surface. Il y a quelques années le Conseil National de la Nature a initié la formation des parcs de paysage et des zones de paysage protégé.

Les parcs de paysage sont des territoires relativement petits qui présentent cependant une grande valeur naturelle, et qui offrent des conditions nécessaires pour le tourisme actif. Les zones de paysage protégé occupent des terrains plus vastes. Dans ces zones on ne prévoit pas de changement en ce qui concerne le développement de l'industrie et de l'urbanisme; Cependant on prévoit l'augmen-

tation du boisement et la construction des réservoirs d'eaux. Sur ces terrains on installe des centres de repos. Compte tenu des inconvénients provoqués par une route rapide il faudrait tendre à ce que tous les terrains cités ci-dessus soient libres d'autoroutes. Cela est facile à réaliser dans les parcs nationaux de petite surface.

Mais les zones de paysage protégé sont plus grandes. Un moyen réel de la protection de ces zones est la construction des autoroutes dans les rétrécissements ou les secteurs éloignés des objets naturels et des centres de repos.

5. Les autoroutes - élément qui forme et arrange l'espace.

J'ai consacré beaucoup d'attention aux problèmes liés à la protection de l'environnement de l'homme parce qu'ils ne sont pas encore assez connus aux techniciens.

D'autres facteurs formant la structure de l'espace, par ex. la répartition de la population et de l'industrie changent avec le temps. Mais on sait bien que Varsovie, Łódź, Katowice, Cracovie, Poznań et aussi Gdańsk seront des agglomérations principales en Pologne. On sait également que l'augmentation du niveau de vie sera inévitablement accompagnée d'un développement de l'industrie de consommation dans ces agglomérations, localisée à côté des routes à circulation rapide. Le système d'autoroutes sera donc un élément important pour la répartition de la population. La construction des autoroutes peut provoquer une grande activité de certaines régions et l'exclusion des autres de la vie économique et culturelle. Tous ces problèmes sont pris en considération au cours des études sur les autoroutes. La création d'un système national convenable des autoroutes va garantir un développement harmonieux de l'aménagement de l'espace en Pologne.

6. La participation de l'opinion sociale dans la planification des autoroutes.

L'opinion sociale en Pologne s'intéresse beaucoup aux trajets des autoroutes.

Les solutions des autoroutes sont discutées et critiquées en public par l'intermédiaire de la presse et dans les milieux des agglomérations particulières. Souvent sous la pression publique, dans les cas justifiés et compte tenu des raisons de l'urbanisme et de la protection de l'environnement, les plans du parcours des trajets des autoroutes sont changés.

7. Les conclusions et les postulats.

1. Les autoroutes construites à présent sont des réalisations durables et elles serviront au XXI siècle.
2. Le système des autoroutes doit accomplir d'une façon convenable toutes les fonctions liées à la circulation rapide au niveau international, régional et local.
3. On doit réaliser avant tout les autoroutes qui lient la Pologne avec le système des autoroutes européennes.
4. Les autoroutes en transformant l'image du pays et l'environnement de l'homme, constituent un élément important de l'aménagement du territoire.
5. En planifiant les autoroutes il faut tenir compte des résultats qui en découlent pour l'aménagement de l'espace et l'environnement de l'homme. Par conséquent il faut chercher à niveler l'agressivité de l'autoroute dans l'environnement de l'homme sur les terrains urbanisés ou soumis à l'urbanisme. Il faut respecter les conditions naturelles existantes de l'environnement de l'homme.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Wanda Pencakowska

**INFLUENCE DES
REALISATIONS DES SYSTEMS
HYDROTECHNIQUE S SUR
L 'AMENAGEMENT DES
TERRITOIRES MONTAGNEUX**

Section 2: Environnement de l'homme.

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

Świętojerska 5/7
00-236 Warszawa

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Pologne

INFLUENCE DES REALIZATIONS DES SYSTEMS HYDROTECHNIQUES SUR L'AMENAGEMENT DES TERRITOIRES MONTAGNEUX

L'importance des ressources d'eaux des terrains montagneux dans le système de l'exploitation des eaux, surtout dans le domaine de la retention, nous incite á examiner les prcjets d'investissement du génie d'eau dans le temps et dans l'espace et á les considerer comme problème'strictement lié á la manière d'aménagement des terrains montagneux.

Le cycle de la réalisation des systèmes des constructions hydrotechniques qui va se poursuivre dans la région des Carpathes environ 20-30 ans, s'effectuera sur les terrains où, en même temps, se développera l'activité économique qu celle d'investissement /cycles plus longs ou courts de réalisation/-comme p. ex. formation de la colonisation, l'organisation du loisir, développement du réseau routier, boisement, changements de la structure agricole etc.

En prévisiom des importants travaux d'ingénierie du

domaine de l'exploitation des eaux, il paraît indispensable de créer à présent de telles prémisses en vue de l'aménagement de l'espace des zones potentielles de leur localisation, qui permettraient de mettre sur pied les objectifs hydrotechniques sans troubler les conditions du milieu géographique. Le contrôle des procès de colonisation, d'industrialisation et de manière d'exploitation du terrain, peut dynamiser les profits résultant des systèmes de la construction hydrotechnique, et en même temps diminuer ses conséquences fâcheuses.

Le but de cet exposé est de présenter les problèmes en question basant sur les vallées des rivières des Carpathes aussi bien sur celles qui possèdent un système de barrages/Soła/, que sur les autres qui sont soit aménagées partiellement/Dunajec/, soit en train de réalisation /Raba/, soit prévues pour des étapes ultérieures /Swaka/.

Les problèmes fondamentaux, portant sur l'influence de la réalisation des systèmes de constructions hydrotechniques, sur la manière de l'aménagement de l'espace des terrains montagneux, nous pouvons définir comme suit:

- localisation des zones fonctionnelles et d'espace pour l'investissement et l'exploitation du terrain dans les bassins des rivières des montagnes,
- définition des principes qui régissent les processus de l'aménagement de l'espace des terrains montagneux en vue d'une planification régulière des investissements des systèmes hydrotechniques.

Les zones fonctionnelles et d'espace

Vu les fonctions qu'ils remplissent, on peut diviser les bassins des rivières dans les montagnes en zones propices à l'investissement industriel et en celles où domine le tourisme, la récréation et certaines possibilités de développement de l'agriculture. Les terrains colonisés liés avec les secteurs mentionnés de l'économie nationale ne constituent pas une zone séparée.

Critères admis en vue de tracer la limite sud de la localisation de l'industrie:

- limite nord des terrains montagneux,
- terrains situés au bas cours des rivières par rapport aux systèmes hydrotechniques, ce qui protège les eaux contre l'influence néfaste de la civilisation industrielle /"région des eaux pures" d'après St. Murczyński/
- terrains où le pourcentage des employés dans l'industrie va sans cesse croissant en dépassant la moyenne,
- terrains où se manifeste le plus grand nombre des villes et des villages.

Dans les bassins de Soła, Skawa et Raba la frontière passe par les Sub-Carpathes en indiquant les points principaux des régions industrielles habitées: Kety, Andrychów, Wadowice, Kalwaria. La Ville de Myślenice, bien qu'elle soit située sur cette ligne, devrait être en principe éliminée des plans de l'industrialisation en raison du bassin d'eau pota-

ble pour Cracovie qui est en construction, à Dobczyce au bas cours de Raba.

Dans le bassin de Dunajec, cette limite vu les grands investissements du système d'eau projetés /Witowice, Melsztyn, Olsz yny/, devrait se situer au nord du barrage envisagé à Olszyny, donc exclure les terrains de Sądec czyzna des plans de localization de la grande industrie. Etant donné le potentiel d'infrastructure technique et sociale y existant-on peut envisager l'utilité de l'investissement des certaines catégories des établissements de transformation.

Le problème du tourisme et loisir lié étroitement aux systèmes des constructions hydrotechniques, il reste seulement à signaler que les lacs rétenteurs à grande surface peuvent servir aux sports nautiques /navigation, canotage/ tandis que les petits réservoirs dans les vallées latérales, qui ne troublent pas en général la structure démographique, peuvent être exploités dans le but récréatif en été.

Les vallées de Raba et de ses affluents peuvent servir d'exemple. Force est de signaler, que les réservoirs situés sur les hautes parties des rivières peuvent être d'une utilité plus restreinte pour des raisons techniques.

L'influence de l'exploitation des eaux et des investissements hydrotechniques sur l'organisation du tourisme et du loisir sur les terrains montagneux, concerne avant tout la zone d'influence directe des réservoirs d'eau, car c'est là que doivent être localisées toutes les installations de

bains et installations sportives, La possibilité du repos au bord de l'eau, /est actuellement l'une des façons les plus répandues du passe-temps en été, et contribue à ce que tous les phénomènes liés à la récréation au bord de l'eau revêtent un caractère de masse. Pour éviter la spontanéité non contrôlée des procès d'investissement et d'exploitation des terrains voisins des réservoirs, ces derniers doivent être envisagés sous forme des solutions complexes planifiées, qui ayant trait aux réseaux routier et à la démographie, devraient constituer une partie intégrale des plans d'aménagement de l'entourage des réservoirs.

Les bassins Soła, Skawa et Raba se distinguent ettement par un complexe des terrains d'une grande valeur pittoresque et récréative dont le trait caractéristique est le relief, l'abondance de forêts et le climat favorable.

Il faudrait attirer une attention particulière sur les terrains qui englobent: les chaînes de Beskid de Silésie et de Żywiec y compris la montagne Pilsko, les massifs de Babia Góra et Polica, Podgórze Makowskie. Ils prennent ensuite la direction de Kotoń et Zębatowa, englobent la chaîne de Beskid Wyspowy et se terminent dans le bassin de Raba dans la partie nord des montagnes Gorce. La chaîne montagneuse en question, enrichie de systèmes hydrotechniques, devrait être sujet non seulement à la protection mais aussi à la formation consciente du paysage due au boisement et à la conservation de la limite régulière des terrains agricoles-

paturables-forestiers.

La vallée de Dunajec, qui constitue une région hydrographique à part /d' après la carte hydrographique de Pologne/par rapport à la région des bassins de Soła, et Raba, représente un ensemble de contrées géographiques d'une valeur exceptionnelle pour les touristes. Les Tatry, Pieniny, la vallée de Poprad représentent la plus haute catégorie des sites paysagers à l'échelle nationale et même internationale. L'indispensable protection du milieu naturel et du paysage aura une influence avantageuse sur l'exploitation des eaux sur ces terrains.

Principes de contrôle des procédés de peuplement /colonisation/

dans les bassins des rivières dans les montagnes effectués en vue de mettre sur pied sans perturbations les installations hydrotechniques.

La réalisation des systèmes hydrotechniques apporte chaque fois des transformations et des changements fondamentaux à la structure économique, sociale et d'espace des terrains, qui réalisent des investissements hydrotechniques.

Les frais de construction des nouvelles cités de la restauration du réseau de communication, les phénomènes sociaux fâcheux / la perte de maisons d'habitation et d'ateliers/ auraient pu être sensiblement diminués si on avait entrepris des mesures pour contrôler les procédés de colonisation peuplement dans les vallées des rivières.

La pratique en cours dans ce domaine se bornait à freiner toute activité d'investissement sur le territoire des réservoirs envisagés, ce qui a eu évidemment une répercussion nuisible sur la vie économique et sociale de la région. Comme exemple des “travaux préparatifs” effectués sur le terrain destiné à la construction du réservoir, nous pouvons citer l'ensemble des villages de la région de Czortyszyn, où pendant 20 ans les habitants n'étaient pas autorisés à construire et restaurer les maisons d'habitation et d'exploitation agricole.

Il semble que la méthode de freiner les investissements dans l'attente des réservoirs et surtout de ceux qui seront aménagés dans des étapes ultérieures, ne doive pas faire cas dans l'exploitation moderne planifiée des terrains montagneux. Cela nous amène à la conclusion que le contrôle des procédés fonctionnels et d'espace devient nécessaire sur les terrains que nous pouvons déjà qualifier d'indispensables pour les besoins de l'exploitation des eaux et des systèmes hydrotechniques dans les montagnes.

Il s'agit surtout des fragments des vallées des rivières principales dans les montagnes dont les constructions et les éléments d'infrastructure technique /routes, réseau énergétique etc./ devraient être progressivement éliminés. La politique de la localisation devrait contribuer à des stimulants et des conditions favorables aux investissements au-delà de la zone où le rôle dominant jouent les systèmes hydrotechniques. En apportant des changements à la disposi-

centras d'habitation surtout á ceux d'un caractère agricole, il Faudrait aboutir au déplacement progressif des centres ruraux á l'extérieur par rapport aux terrains du bord du lac. Le déplacement progressif des services surtout agricoles en faveur des villages plus éloignés de la rivières et constituerait un élément décisif dans ce procès.

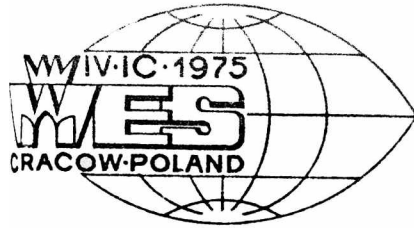
L'intéret qu'on-porte á la localisation des investissements dans les vallées des rivières, pourrait diminuer avec le temps ce qui créerait la possinilité d'une libre décision dans le choix des solutions hydrotechniques.

L'expression de cette idée pourrait trouver sa solution dans la conception de la dislocation des centres d'habitation dans les valées latérales /disposition, coulisse"/ ou bien sur les versants de la vallée principale, après avoir tracé la ligne d' investissements stable.

Le premier type de solution représente la vallée de Raba, où les cités d'habitation peuvent être localisées dans les vallées latérales de Stróža, Krzczonówka ou Kasinka, tandia que le deuxième se manifests dans le bassin de Skawa, où les terrains de la rive droite aux environs de Maków et Osielec peuvent être aménagés sur le versant. Ce procès commence déjà á se manifester.

Le rôle et l' importance des rivières dans les montagnes pour l'exploitation des eaux en Pologne, exigent la création des nouveaux objectifs hydrotechniques sur les terrains montagneux du Sud.

Le degré de l'utilisation des techniques pour la réalisation des objectifs de notre vie moderne, depend de la bonne connaissance des corralations et conditionnement entre les projets et la réalisation des systèmes hydrotechniques et les besoins du développement économique permanent dans les cadres définis des vallées montagneuses.



IV^é me CONFERENCE INTERNATIONALE DES FEMMES INGENIEURS ET SCIENTIFIQUES

Maria Czerniewska

LE PHOTOINVENTAIRE DES ROUTES

Section 2: Environnement de l'homme

Imprimè d' après l' original
de l' auteur

Organisateur de la Confèrence
et editeur:

Ośrodek Postępu Technicznego NOT
ul. Świętojerska 5/7
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Elle est auteur de quelques articles publiés dans les périodiques professionnels.

En 1974 elle a accompli au C8Dada le stage technique de 3 mois en matière de génie de la circulation routière.

Actuellement, elle est engagée au poste du Spécialiste routier au Bureau des Projets "Metroprojekt".

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LE PHOTOINVENTAIRE DES ROUTES

La description de la méthode et de l'étendue d'application.

1. Introduction

Au cours de derniers quinze ans, dans les pays fortement motorisés et disposant de réseau des routes bien développé, notamment aux Etats-Unis et au Canada, on propage une nouvelle méthode de recueillir les informations sur les routes existent, méthode qui élimine rapidement une méthode traditionnelle de dresser l'inventaire des routes et des constructions routières. En appliquant la technique photographique on obtient une image complète des routes et l'entourage le plus proche de celles-ci enregistrées sur la pellicule photographique qui constitue une banque des informations accessible à tout moment, sans la nécessité de départ des ingénieurs sur place en vue de réaliser les visites des routes ou les mesurages des paramètres géométriques des routes ou des constructions routières.

Une nouvelle méthode consiste dans la prise de vues

photographiques de la route et de son entourage de la voiture roulante où le caméra photographique est installé. Les vues sont effectuées dans les différentes distances, le plus souvent tous les 1/100 du mille ce qui correspond à 16 mètres. La pellicule photographique obtenue avec les vues de la route ne donne pas l'image mobile qu'on obtient à l'occasion de la prise de vues avec la fréquence de 24 cadres par seconde. A la suite du photoinventaire on effectue un cadre du film par seconde étant donné que la voiture se déplace avec la vitesse de 36 milles/h. c'est-à-dire 57,6 km/h. Pourtant la voiture ne doit pas maintenir la même vitesse, car le caméra est habituellement déclenché dans les distances égales par les impulsions électriques à l'aide du dispositif spécial lié à l'odomètre.

A la suite de l'intérêt porté pour cette méthode nouvelle de la part des Etats particuliers de l'Amérique du Nord / le photoinventaire a été réalisé pour la première fois en 1959 à l'Etat Iowa/, en 1970 on a effectué à Washington les recherches expérimentales, qui ont confirmé la possibilité de l'exploitation de cette technique par le Système Routier entre les Etats intraaméricains/IHS/ et ont permis de recueillir les informations sur l'appareillage nécessaire et les méthodes de prise de vues des routes et leur entourage.

Les expériences ultérieures obtenues dans l'application de la méthode du photoinventaire aux Etats-Unis et au Canada

ont été présentées lors de la conférence routière tenue à Washington en 1973. L'étendue de l'application de la méthode aux Etats-Unis est importante et accuse une tendance croissante. La documentation photographique des routes a été dressée sur les territoires de 21 Etats, de 3 villes autonomes et de 2 Parcs Nationaux.

2. L'application du photoinventaire

Les expériences américaines dans le domaine de l'utilisation de l'enregistrement photographique de l'état de routes permettent de préciser les modes suivants de l'application de cette méthode nouvelle:

1. la revue générale des conditions qui régissent sur la route comme l'état de surface, des accotements, la présence du profil urbain, des barrières et d'autres installations de protection, des parkings, des accotements pour stationnement, des lieux de repos et l'appréciation de l'entourage de la route,
2. la fixation des paramètres géométriques déterminés de la route, en utilisant d'un réseau gradué spécial mis sur l'écran de l'appareil de projection, réseau qui rend possible la mesure de la largeur du revêtement routier; des accotements, des fossés etc. ainsi que la mesure des constructions situées le long de la route ou à proximité de celle-ci;
3. L'inventaire de la configuration horizontale et verticale et de l'inégalité du revêtement routier qui est pourtant

possible á condition de l'installation dans la voiture des instruments de mesurage appropriés;

4. L'analyse des endroits routiers dangereux, où a lieu le nombre d'accidents de la route particulièrement élevé;
5. L'inventaire de marquage vertical et horizontal et la fixation de la régularité de ce marquage ainsi que l'inventaire des installations servant á régler la circulation telles que la signalisation lumineuse;
6. L'appréciation de l'éclairage des routes et des rues;
7. L'inventaire des barrières et d'autres installations de protection;
8. L'appréciation de la distance de la visibilité dans la route et la localisation des endroits á mauvaise visibilité;
9. La localisation des barrières contre la neige et des endroits particulièrement enneigés á condition de prendre les vues en hiver;
10. La localisation et l'appréciation du degré de l'exploitation des parkings, des accotements et des lieux de repos;
11. Les études relatives á l'aménagement des terrains situés au bord de route, notamment relatives á l'aménagement des terrains suburbains, urbains et ceux de zones d'habitation;
12. La base servant á l'appréciation des dommages et des destructions causés par les calamités naturelles;

13. La collecte des données á l'usage de certains travaux d'études;

14. L'enregistrement des données pour les buts historiques et en vue de rendre possible la présentation á l'opinion publique des problèmes routiers et des situations dangereuses causées par les conducteurs lors des actions d'information et d'éducation organisées pour la société;

15. L'appréciation et la comparaison entre elles, de différentes solutions concernant l'architecture du paysage. De plus, la présentation visuelle des routes peut être utile dans les décisions prises au sujet de la planification des investissements routiers futurs, dans la détermination du degré d'urgence et de priorité de la réalisation des constructions et de la modernisation des routes ainsi que elle exonère les ingénieurs de la nécessité de partir très souvent sur place.

3. L'appareillage photographique applicable au photoinventaire

3.1. Le caméra, ses positions et équipement

Sur la base des expériences américaines on a constaté qu'il est permis de se servir, á des fins du photoinventaire, de caméras á largeur de la pellicule de 8 mm., 16 mm et 35 mm. Pourtant, en vue d'obtenir les images plus grandes et plus nettes, on se sert le plus souvent de caméras de 35 mm.

Les caméras doivent se prêter aussi bien á la prise de vues photographiques qu' á l'exécution de vues

particulières par la méthode d'après-cadre et doivent être équipés en dispositifs automatiques infaillibles qui servent à régler les conditions optimales d'exposition/du diaphragme optimal/.

L'objectif grand angulaire, le viseur et les filters appropriés doivent faire partie de l'équipement du camera.

Le caméra photographique est installé dans la voiture de livraison.

On emploie trois positions suivantes du caméra dans la voiture:

- sur le plancher, à la hauteur des phares avant;
- sur le support, à la hauteur des yeux;
- sur le toit de la voiture.

A la suite des expériences on a constaté que le choix de la position du caméra doit dépendre du but principal du photoinventaire dans chaque cas individuel;

L'équipement élémentaire du camera se compose de la boîte des données spécialement projetée qui rend possible de mettre sur chaque photo une plaque d'information. Cette plaque ne peut pas occuper plus que $\frac{1}{4}$ de la surface du cadre de la pellicule et comprend le plus souvent la teneur suivante: la date, la direction de la circulation de la voiture, le numéro de la route, kilométrage en milles anglais, la dénomination de la région.

Indépendamment des indications enregistrées sur la pellicule, l'appareillage photographique peut être équipé en élément transmetteur supplémentaire servant à traiter

les données ci-dessus mentionnées en valeurs numériques et en dispositif enregistreur qui rend possible l'enregistrement automatique de ces données sur la pellicule perforée en vue de faire introduire ces données recueillies à la machine électronique.

On emploie aussi le codage manuel des informations contenues sur les vues photographiques dans les formulaires spécialement élaborés qui a pour tâche d'utiliser le matériel recueilli dans le programme approprié pour la machine électronique.

En dehors de la boîte des données, le caméra doit être équipé en boîte de commande qui commande le caméra à l'aide d'une série de commutateurs et de câbles.

En vue d'obtenir les vues photographiques dans les distances égales, p. ex. 100 cadres par mille on installe un dispositif qui déclenche le caméra par une impulsion électrique liée à l'odomètre.

3.2. Les pellicules

En vue de dresser le photoinventaire on applique la pellicule en couleur à largeur de 35 mm., bien que les pellicules blanches et noires et les pellicules de 8 et 16 mm soient également en usage.

Le plus utile est d'appliquer la pellicule négative encouleur, dont les copies diapositives ont la qualité meilleure et sont plus nettes au moment de la lecture que la pellicule diapositive. De plus, en se servant de la pelli-

culé négative, il est permis d'obtenir le nombre voulu de copies, dont le coût n'est pas très élevé, pendant que le négatif peut être déposé aux archives, n'étant pas exposé à la destruction ou à l'endommagement.

Les bobines – photographiques longues de 100 pieds / 30 mètres / qui correspondent à 16 milles / 26,6 km / de la route, sont le plus souvent en exploitation. Ces bobines sont plus faciles à y retrouver les vues demandées, et leur format à diamètre d'environ 10 cm. est très commode pour les garder dans les tiroirs équipés en index spécial des pellicules.

La documentation photographique démontre cet avantage qu'elle peut être gardée pendant la période illimitée, elle n'exige pas beaucoup de place, elle est facile à transporter, elle peut être gardée, dans les locaux ordinaires, par l'imaginaire non seulement des spécialistes mais aussi des laïques, elle rend possible à un travailleur qui utilise ces images, une bonne orientation dans la topographie de la route de telle manière s'il y était réellement présent.

3.3. Les appareils de projection servant à analyser les films.

Deux types des diapositifs sont appliqués à l'analyse de la documentation photographique:

- le type populairement utilisé à dépouiller les films, où la pellicule se déplace manuellement ou mécaniquement et il peut être appliqué à la prise de vues de tous les formats. Son défaut consiste dans l'impossibilité d'obtention du mou-

vement,

- le type de l'appareil de projection équipé en diaphragme et réglage qui rendent possible le dépouillement des films avec la vitesse voulue de 24 cadres par seconde. L'appareil en question peut être arrêté à tout moment, ce qui permet d'analyser les cadres particuliers. Grâce à ces traits caractéristiques, il se prête mieux à trouver le cadre nécessaire dans la bobine.

Le film est projeté sur l'écran illuminé par derrière ou bien sur le mur ou sur l'écran. L'écran illuminé par derrière est équipé en réseaux spécialement gradué en vue de prendre des mesures nécessaires des paramètres géométriques.

3.4. La voiture

Pour le photoinventaire on se sert de la simple voiture de livraison où on installe le caméra d'une manière ci-dessus décrite. En dehors de l'équipement du caméra, la voiture peut être équipée en dispositif d'avertissement comme la lumière jaune étincelant et à l'intérieur de la voiture en laboratoire obscur ou en place qui peut protéger contre la lumière où le film peut être développé et chargé.

La vitesse de la voiture doit être inférieure de 10 à 15 milles/h. c'est-à-dire de 16 à 24 km/h. par rapport à la vitesse moyenne de la circulation routière, pour qu'on puisse éviter le dépassement d'autres voitures au cours duquel les vues peuvent s'avérer être incomplètes.

On a constaté dans les conditions américaines que les

meilleurs résultats on obtient avec la vitesse de la voiture de 40 milles/h.c' est-à-dire 64 km/h.

4. L'appréciation économique de la méthode du photoinventaire

4.1. La durée du travail

En s'appuyant sur les expériences de l'Etat de Virginie Occidentale on a constaté que les prises de vues doivent être effectuées par l'équipé composée de deux travailleurs instruits spécialement pour la service du matériel photographique, don't l'un conduit la voiture d'inventaire.

Selon les expériences obtenues dans l'Etat de Washington, 1e photoinventaire de 12480 milles /environ 20 mille km./ durait 16 mois oe qui se lève á 62,4 km. par jour.

Ce calcul prend en considération tous les obstacles et les avariee qui se sont opérées telles que la réparation des défauts du caméra, le mauvais temps, la réparation de la voiture, et de plus, les congés, les jours chômés, les maladies, l'hiver etc.

4.2. Les frais

Les frais d'exécution du photoinventaire des routes dépend de plusieurs facteurs, parmi desquels il faut compter surtout le genre de l'appareillage photooptique employé, le enre du matériel photographiqu /16mm., 35mm./, le nombre de copies, la fréquence d'exécution de la documenta-

tion technique/2,4 ans ou plus/.

L'Administration fédérale des voies publiques des Etats-Unis a recueilli toutes les données possibles et a accompli le relevé de frais.

Si l'on prend des vues tous les 1/100 du mille /16 km/, dans le réseau routier ayant 10,000 milles /16.000 km/ de long, les frais moyena calculés sur la base des expériences de deux Etats exécutant le photoinventaire sur la pellicule de 16 mm et de quatre Etats qui le font sur la pellicule de 35 mm, se chiffrent d'une manière suivante:

	Spécification des frais	Film	
		16mm	35mm
1	2	3	4
	Les frais d'équipement. Le caméra cinématographique et le matériel auxillaire 151	8.000 dol.	9.000 dol.
	La voiture - 10 centimes par mille dans le parcours de 15.000 milles	1.500 dol.	1.500 dol.
	Deux appareils de projection	13.000dol.	13.000 dol.
	Total	22.500 dol.	23.500 dol.
2.	Les frais des films et le développement de ceux-ci Film	2.650 dol	9.100 dol.

1	2	3	4
	Le développement/avec les deux copies/	15.700 dol.	19.700 dol.
	<u>Total</u>	18.350 dol.	28.000 dol.
3.	Le coût de la main d'oeuvre/l' équipe de deux personnes/ 1e traitement de base avec 1a prime	28.000 dol.	28.000 dol.
	Les indemnités	4.000 dol.	4.000 dol.
	<u>Total:</u>	32.000 dol.	32.000 dol.
	Somme totale:	72.850 dol.	84.300 dol.

Il est permis donc de constater que 1e coût d'exécution de la documentation photographique des routes á l'aide de la technique dite "fotolog" s'élève environ á 7,30 dollar par un mille de la route, en admettant une direction de filmage, á condition d'utiliser un caméra de 16 mm á 8,40 dol. par un mille de la route en cas d'utilisation du caméra de 35,mm. Les frais au-dessus mentionnés comprennent également le coût intégral de l'achat de l'appareillage nécessaire.

Les expériences américaines, malgré une grande portée d'application du photoinventaire, ne permettent pas encore de relever les sommes concrètes épargnées par les autorités compétentes en comparaison avec les frais liés á la réalisa-

tion traditionnelle du photoinventaire de l'état réel des routes. Il a été constaté et calculé en général les sommes élevées par le fait d'élimination de nombreux départ sur place.

5. Conclusions

Une méthode nouvelle du photoinventaire des routes à l'aide de l'enregistrement de l'état existant sur la pellicule photographique rend possible la détermination des paramètres géométrique des routes, l'inventaire de la configuration horizontale et verticale, du marquage, des barrières et d'autres installations de protection et permet d'apprécier la distance de la visibilité et de la solution de l'architecture du paysage aux secteurs particuliers de la route. La présentation visuelle de l'état des routes est utilisée également aux différents travaux d'étude, de projet ou analytiques par ex. à une analyse des endroits dangereux et peut s'avérer utile à l'occasion de la prise des décisions relatives aux futurs investissements routiers.

Les quantités principales de l'adite méthode consistent dans l'enregistrement multilatéral de l'état existant du réseau routier, dans la vitesse et la simplicité du photoinventaire /plus de 60 km par jour ayant à la disposition une équipe de 2 personnes/ de même que dans la possibilité de la conservation facile et longue des résultats et dans l'accessibilité presque immédiate de la documentation photographique du secteur voulu du réseau routier..Il existe

aussi la possibilité d'enregistrer les résultants sur la bande perforée ou de coder autrement et de les utiliser dans les programmes destinés aux machines électroniques.

La possibilité de disposer de la banque photographique des données surtout la nécessité des départs des données élimine surtout la nécessité des departs sur place en vue d'exécutee les visites et les mesurages routiers.

Vu les qualités au-dessus présentées ainsi que la limitation du travail humain, la méthode du photoinventaire des routes a trouvé une large application dans les pays disposant du réseau routier et d'autoroutes développé tels que les Etats-Unis, le Canada et la République Fédérale d'Allemagne.

Malgré le coût assez élevé de l'appareillage photooptique nécessaire/environ 20.000 dollars/ la méthode du photoinventaire des routes entraîne des économies considerable par rapport au coût de l'inventaire dressé par la méthode traditionnelle.

**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

E. Hilda Blount

**THE FUNCTIONS OF LAW AND
ENGINEERING IN PROMOTING
THE SAFE CONSTRUCTION OF
MOTOR VEHICLES**

**Section 2: Spatial arrangement of
Human environment**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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THE FUNCTIONS OF LAW AND ENGINEERING IN PROMOTING THE SAFE CONSTRUCTION OF MOTOR VEHICLES

Introduction

The title of this paper was intended to suggest that both Law and Engineering have a contribution to make in the promotion of Vehicle Safety. Reading the literature on this topic one might suppose that a lawyer had no part to play since most work has been done by engineers and administrators; a lawyer reading this paper will find that the approach is somewhat rudimentary, but this was necessary because the legal tools used have been very simple. There have been several accounts (1) of the development of vehicle safety regulations already so that, in this particular examination, the engineer may feel that not enough reference has been made to her contribution. It is intended to subject the regulations to a certain amount of critical appraisal.

It seems desirable to begin by sorting out what is meant by "Law".

Natural Law and Law of Nations

If one heats water it will boil at 100°C at normal barometric pressure. Such a repeatable experiment is commonly named a Natural Law. When such a law is established, the technologist will exploit it in the service of man.

When a lawyer speaks of natural law or natural justice, she is normally speaking of that view of a dispute which an ordinary reasonable disinterested person would take, but such views can vary under as small a stimulus as the weather or the time of day. Following this proposition it is quite easy to see that the laws of nations, each of which has been subject to wars, famine, disease, prosperity and different rulers, can vary a good deal. However, once it is decided that a course of action is correct and should be enforceable then a system of national law can usually devise a method of doing it.

In this paper a reference to Law or Civil Law means the kind of law which nations make to rule themselves; a reference to Natural Law means that established by scientific observations of natural phenomena. However, please do not trust the definitions beyond the confines of this paper.

Enforceability

One of the lawyers functions is to try to determine the limits of enforceability. These limits are not delicate, but they are definable.

Firstly, the problem must be real. It is quite pointless for a country to pass a law saying that water should boil at 100°C at normal barometric pressure, similarly no civil law is required to put the driver of a vehicle in front facing forwards. She is there by derivation from a number of applications of natural law.

The next limit which is common custom is more subtle. In England we notoriously drive our cars on the left hand side of the road, but there is no law that requires this. So very commonly accepted is the custom of driving on the left, that any person not doing so would be prosecuted for dangerous driving. In similar circumstances most legal systems would be safe in relying on common custom.

Another limit is enforceability itself. This may be illustrated from the argument about seat belts. Statistically (2) it can be shown that the wearing of seat belts will reduce the number of road fatalities and the serviceness of injuries. However, some people feel trapped if held into their seat by a belt. It is also a nuisance and no ordinary sane person goes about his business in continual contemplation of imminent death. There is, therefore, little inducement to wear the belts. Traffic Police are usually over-worked and have enough to do without doing random spot checks stopping cars to see if the occupants are wearing belts. The Australians have made it mandatory to wear belts and claim they are

making the law work.

If this limit is somewhat imponderable, the fourth limit, Acceptability, Is even more so. It is observable that if a Government wants a quiet contented population it responds to the mood of the people particularly in little things. Of all the controversies which have affected the United Kingdom of recent years, one of the roughest receptions was reserved for British Standard Time. This measure, meant merely to line the British clock up permanently with the rest of Western Europe, made Winter mornings darker, but Members of Parliament had some of their heaviest post-bags about British Standard Time, and the legislation was repealed without regret.

If engineers working in the field of standardisation, and even more so where standards are to be legally enforced were to keep these concepts in mind, time and effort could be saved. The questions to be asked are'-

1. Is the problem real?
2. Is the practice so universal that there is no real likelihood of argument?
3. Is the proposed specification enforceable?
4. Is the proposed specification acceptable?

If the answers to questions 1, 3 & 4 are in the affirmative and to question 2 in the negative, then we are in a field where lawyers and engineers can co-exist. The last two present the most difficulty.

Subjective and Objective Specifications and Performance

A lawyer tends to keep very clearly divided the law and the facts of the situation which are to be matched to that law, and it is the skill of the lawyer to advise whether or not the particular facts lie within the law or not. The decision is always subjective in the last analysis. Thus the lawyer will not necessarily object if the test applied is a subjective one.

An engineer with the task of designing a vehicle or part of a vehicle will have the job of making it to a specification. If the specification is restrictive it will impose problems. In order to appeal to the market it is intended for, it must be different from other models whereas regulations tend to make all vehicles the same.

A homologation engineer is in a different position. Her job is to be able to show an inspector or administrator that the vehicle complies with a legally enforceable specification. A generally worded specification requiring subjective assessment is very unhelpful and leads to great uncertainty.

For instance; fifteen years ago, it was not uncommon for a country to require a vehicle to be fitted with two headlamps having a main beam and a meeting beam, which illuminated the road, ahead of the vehicle, and so that the meeting beam did not dazzle the oncoming driver. The lawyer would be quite happy with this. The meaning of the words is clear. What is being advocated is not illegal. The designer would be happy. She could produce a good design, However, the homologation engineer is in a different position. If the vehicle inspector disagrees with the assessment of the designer, and refuses to pass the vehicle then a difficult situation arises. The lawyer's answer is location, but this is held to be impracticable at the stage when vehicle inspection usually takes place. Vehicle inspection is done on an early production model in order to be sure the sample is typical and the production line is usually firmly established. At this stage major changes would be very costly and any prolonged delay in introducing the model would be commercially disastrous. Therefore, it is highly necessary that a large degree of agreement as to the meaning of a regulation should exist in advance.

Ideally, therefore, a specification should be objective if possible, and the criteria should be able to be assessed simply and with certainty. In achieving objectivity, it is all too easy to lose sight of the necessity for a performance specification.

Objective Specifications and Enforceability

Here is an example of a test taken from the old California Test. "The lens if plastic should have a flame applied to it. It should bum steadily, should not support combustion, should not drip and give off an odour of fruit." It represents in many ways a very good sort of standard. The test is simple, repeatable and very easily assessed. The trouble is that it confines use solely to acrylics. No other material can be used. It is not a true performance specification.

However, in certain circumstances the lack of a development capacity in a specification can be justified. A few years ago the American standard for headlamps was completely fixed (3). It has this great merit. Should a unit fail, it is possible to go into any petrol station and get a replacement no matter what the franchise of the petrol station, the make of the vehicle or (most important) the taste and fancy of the purchaser. The reason is that a driver needs to see ahead, but he also needs not to be dazzled by an oncoming driver. On a straight level road, this is merely a matter of photometric design. However, in practice there is always an area where a compromise must be reached, or some departure from the principle of stationary headlamps with a main and a meeting beam permitted. In that situation the best solution is to make sure that vehicles have lighting systems that are sufficiently similar so that each driver will experience roughly the same amount of discomfort from the other's lights and be persuaded to take precautions.

Enforceability and Acceptability

The fixed American headlamp specification is now being criticised from several quarters. The amount of similarity required between headlamps is very much an open question, and vehicle styling fashionable at the moment demands elliptical or rectangular lamps. Despite the precautions, vehicles still motor around with only one headlamp, and it is a matter of conjecture how much deterioration in this situation there would be if the availability of bead lamps was not so universal. Clearly, having achieved enforceability, one is falling foul of acceptability.

Achieving Enforceability - Europe

The amount of attention given to lighting and light-signalling equipment on motor vehicles in Europe in the early days may be traced to the subjective element already mentioned and to the difficulty attached to monitoring the performance of lights. Another device which attracted a lot of attention in the early days was the reflex reflector. Its performance cannot be assessed by visual inspection. Therefore, in several European countries, samples of devices had to be submitted for test before they could be used on vehicles and when approved a mark with a serial number was ordered to be added to the face of the device. Headlamps also began to carry these approval marks as they were tested and approved for use. A situation was reached where reflex reflectors were having to carry three or four different approval marks, and headlamps, all producing substantially the same beam were produced using three different styles of bulb cap and holder (French, German and British) and a further alternative carrying a Dutch approval mark, and with the possibility of carrying marks for several other countries as well.

In March 1958 a Treaty was signed in Geneva known as the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts (4) was concluded. It was promoted under the auspices of the Economic Commission for Europe of the United Nations. Working Party 29 on Road Transport has charge of this treaty. Officially the procedure is that any two countries may promote a specification for a part or aspect of a motor vehicle and have it annexed as a Regulation to the treaty. In practice a great deal more negotiation goes on. The first regulations attached to the ECE treaty were started off by a Working Party which was jointly set up by the International Standards Organisation and the International Commission on Illumination. In view of the national regulations from which they developed, it is not

surprising that they are type approval standards. The approval mark is a capital E in a circle together with a number which indicates the country of origin, a serial number and the distinguishing mark of the applicable regulation. At present all subsequent products of the same type are allowed to be marked, although in every regulation provision is made for checking conformity of production.

By the terms of the Treaty a country may have ratified or acceded to it, but is under no obligation to adopt every regulation. Even if adopted it may be enforced either exclusively or as an alternative to an existing national standard. The only obligation is to protect the 'E' mark from abuse. In England we have designated the 'E' mark a trade description and it is protection under the Trade Descriptions Acts (5).

(Table 1 shows Countries who have ratified the Treaty and the Regulations already annexed, Figure 1 shows the ..)

Later regulations are being devised by Groups of Rapporteurs set up by WP29 itself. These were in turn serviced by committees set up by the Bureau Permanent Internationale des Constructeurs d'Automobiles.

This is by no means the whole story. A recent paper (6) listed 259 organisations with an interest in vehicle legislation. The membership of WP29 (See Table 2) is not confined to the signatories to the Geneva Treaty and the USSR regularly chairs the meeting and Japan and the USA send representatives to its meetings so that the views of any of the Industrial, Governmental, Academic, or Consumer organizations concerned may influence WP29. The proceedings of WP29 are not disclosed to the press and public until the text of the regulation is finalised and, as the membership shows, the interests of the consumer are represented by ISO and his government, but it is his educated trained responsible interest which is reflected and not the mood of the moment. The consumer is more likely to get what is good for him rather than what he likes.

A clause in the Geneva Treaty states that a component or aspect once marked should be acceptable in all countries but there is evidence (7) that where there is particular objection in a country to some aspect, some extra local requirement can be invoked. Even where the Regulations are fully accepted they can be interpreted differently in different countries.

As every lawyer knows, no matter how carefully a document is drafted, the chances of achieving wording which means exactly the same thing to all persons who read it are really quite small. It is very difficult to eliminate the last traces of subjectivity.

English lawyers learn a convenient fiction - that the Law on any topic exists in a correct form, and all that lawyers have to do is to discover and state what it is. Everyone knows that this is not so, but it induces a correct humble approach, and no single lawyer, however eminent, is expected or expects herself to be right every time.

If this attitude or something like it could be superimposed on the ECE system, then there would be some hope of the kind it works as intended. If the Administrators operating vehicle inspection could be brought to realise that they might occasionally be wrong, and the manufacturer submitting his vehicle could be confident that an appeal against the judgement of an Administrator would not be misinterpreted as an act of gross hostility, then there would be much more chance of genuine harmonization of construction regulations.

It was started earlier that there was no litigation because of cost and delays at inconvenient moments but only source will realize that litigation costs less than uncertainty in some instances. Fortunately article 10 contains provision for arbitration in case of a dispute between parties to the Treaty.

ECE Regulations have not brought to the sticking point on acceptability either. The administrators and experts need to keep a weather-eye open for the Regulation that although sponsored and attached to the is adopted by few countries and is more honoured in the breach than less observed in the court where it is adopted. Despite its technical

merits, and its relevance to safety or environmental protection, they ought to recognise that they have made bad law.

The European Economic Community

EEC has also issued Directives and one Regulation on the Construction of Motor Vehicles. (A list of these is given in Table 3) Unlike the ECE Regulations these are compulsory and must be accepted. Similar consultative processes led to their promulgation, and it should be noted that where the same topic is under consideration EEC frequently adopts the text of ECE. Continuing the theme of acceptability it is noteworthy that one or two member countries have taken a long time to enforce the directive. The EEC has machinery to enforce its directives but it remains to be seen how effective this is in this field (8).

The USA and Safety

So far I have hardly mentioned safety. However, the development of the U.S. regulations and public concern with safety are inextricably bound together and I intend now to follow through the developments in the USA. There is plenty of material to illustrate the twin themes of enforceability and acceptability.

When the writer entered the industry in 1958, the philosophy of safety was quite different from that in existence to-day. Reference has already been made to the human lack of concern with imminent death or injury. The early philosophy was either that it is always the other fellow who would be killed or maimed and the subject would always save herself by means of her consummate driving skill and the superb handling and braking qualities of her vehicle; or she was one of the meek economy brigade, who pottered along at safe speeds, well within the capabilities of her motor vehicle. If an accident happened, it would always be the other fellow's fault, and the subject's bad luck. Only slowly did the idea emerge that the construction of the vehicle could have a great deal of bearing on the safety of its occupants in a crash situation. A few years before the U. S. Traffic Safety Act, the Ford Motor Company had been developing means of decreasing the risk of injury in accidents (9) but this attracted little public attention at the time.

To understand the rest of the background, it is necessary to appreciate just a little of the working of the United States constitution. It is based on the theory of the Separation of Powers in its strictest form (10). The theory is that the Legislature which makes the law, is a completely separate entity to the Administration, and this again is separate from the Judicature. Checks and balances have to be built into the Constitution to prevent one function from overrunning the duties and privileges of another.

The 1966 Transportation Legislation was borne on the wings of a growing concern in the USA about all aspects of traffic safety. So far as the motor vehicle was concerned, this was exemplified by the Book "Unsafe at any Speed". In this the author Ralph Nader launched an attack on the U.S. manufacturing industry, condemning many aspects of design of passenger cars, claiming that they were blatantly and irresponsibly unsafe. In defence of the Motor Industry it must be stated that until that time, safety was not a pre-occupation of the customer either. The Transportation Act (11) set up the U. S. Department of Transportation, and as a section of the Department, the National Highway Traffic Safety Administration. The Federal Motor Vehicle Safety Standards are formulated by what is known as informal rule-making procedures. The Traffic Safety Act passed in September 1966 contains the rules of the system.

The Administration was required to produce the first safety standards by January 31st 1967 and new and revised standards by 31st January 1968. A motor manufacturer was required to certify compliance of vehicles be manufactured. One of the complaints made against the Industry was that if a vehicle design was released for production and a fault in design or manufacture relative to safety was subsequently discovered, no public announcement was made. Sections of the Act were designed to prevent secret rectification. The fact of certification makes the manufacturer automatically liable in a civil action against him by

the purchaser. In addition any violation of the provisions of the Act or regulations invokes liability to a civil penalty of \$1,000 per violation per car, although the penalty is a maximum of \$800,000. Even for the giant motor manufacturers this is a sizeable item to be debited against them.

Whereas in Europe the regulations are a matter of dialogue between experts and administrators, in the USA everything has to be done in public. The Administrator publishes his proposals and any person or body is entitled to comment. While it has been suggested that in Europe the processes are not sufficiently aggressive to achieve certainty, the processes in the United States are excessively so. As I have mentioned the separation of powers is very strict and the Courts which interpret and enforce the law are available to the private citizen or corporate body as well as to the Administration. The Industry commented on the proposals in a very threatening manner, supported by many affidavits endeavouring to show that the proposals of the Administration were too hurried and too unreasonable. At the same time the consumer lobby were trying to show that the Administration were not being tough enough with the Industry, and they too were threatening litigation. The speed of the operation meant that mistakes were made and the excessive aggressiveness meant that relationships were soured and communications have remained difficult.

It should not be assumed that no standards, existed in the USA prior to the 1966 Act. The Industry in the personality of the Society of Automotive Engineers had set its own standards, in the then usual fields of lighting, braking and performance. Indeed the Lighting Standards were the most advanced in the world in the 1950's. Some of these standards have been adapted and adopted into the Federal Motor Vehicle Standards.

Those which were new were those which were aimed at reducing injury to persons. Such things as seat bells, interior projections, collapsible steering columns (13). These are known as "secondary" safety standards: they do nothing to prevent accidents. They are also "secondary" from the point of view that they cannot be tested for directly. So compliance with these tests must be done by controlled experiment with manikins. The effectiveness of these standards in use is a matter of great controversy.

The dilemma of "acceptability" may be illustrated by the history of the safety belt interlock in the USA. It is agreed as a fact that safety belts save lives. Many people (including some medical opinion, and some engineers) have questioned this, but the weight of statistical evidence is in favour of the belt. However, there is still tremendous user-resistance. The NHTSA therefore brought in a standard for a safety belt interlock and buzzer. The plan was that if a driver attempted to drive his car without fastening his belt, a buzzer would sound and the ignition would not turn on until the belt was fastened.

The proposed regulation was put out for public comment. Industry was able to give in full its opinion on the cost and state of technology. . The Rule was made, but it has since been abolished by an Act of Congress over-ruling the NHTSA (13).

The fate of this standard is extremely interesting from the point of view of acceptability. The reason given for its failure has been said to be that the device is insufficiently reliable. This was clearly a matter of opinion since the NHTSA made the standard, and did not with- draw it voluntarily.

The Final Dilemma

The final dilemma on the acceptability of safety standards is the terrible problem of costing human lives. It is the opinion of the present writer that at this point both the engineer and the lawyer having presented the possible solutions must bow out and leave the matter to the politician, and what happens then is outside the scope of this paper, and of this Conference.

Conclusions

If the making of enforceable safety standards is done without considering the legal implications and excluding the use of legal processes, the enforcement of standards may be

arbitrary and the meaning of them remain ambiguous in some particulars. The success of any law depends on its acceptability to a large proportion of the interested population. Both these aspects tend to lie outside the field of the engineer, but a lawyer is by training and experience able to see where they impinge on a topic and to advise to some extent on both.

The views expressed in this paper are those of the writer alone although she wishes to acknowledge her indebtedness to her employers and colleagues in the Lucas group of companies.

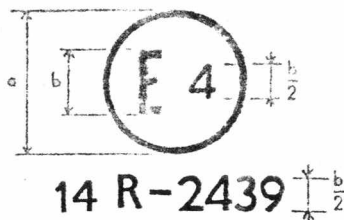
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12. Public Law 89 - 563 89th Congress S. 3005;; September 9th 1966. Short title "National Traffic and Motor Vehicle Safety Act of 1966".
13. Code of Federal Regulations. Title 49 Transportation. Chapter V. Subchapter A Part S71 Federal Motor Vehicle Safety Standards.571-209,571-210,571-201,571-204.
14. Public Law 98-492 33rd Congress S355 October 27 1974 "Motor Vehicle and School Bus Safety Amendments of 1974".

TABEL 1

‘E’ REGULATIONS AS AT MARCH 1975 WP29 MEETING		E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	
No.	Subject	Germany (W)	France	Italy	Netherlands	Sweden	Belgium	Hungary	Czechoslovakia	Spain	Yugoslavia	United Kingdom	Austria	Luxembourg	Switzerland	G.D.R.	Norway	Poland (Antic.)
1	Headlamps Units	X	X	X	X	X	X	X	X	X	X	X	X		X			*
2	Headlamp Bulbs	X	X	X	X	X	X	X	X	X	X	X	X		X			*
3	Reflex Reflectors	X	X	X	X	X	X	X	X	X	X	X	X		X			*
4	Number Plate Lightning	X	X	X	X	X	X	X	X	X	X	X	X		X			*
5	Sealed Beam Headlamps	X		X	X	X	X	#	X	X	X	X	X		X			
6	Direction Indicators	X	X	X	X	X	X	*	X	X	X	X	X		X			*
7	Stop, Tail & Side Lamps	X	X	X	X	X	X	*	X	X	X	X	X		X			*
8	Halogen Main & Dipped Units H1	X	X		X	X	X	*	X	X	X	X	X		X			
9	Noise			X				*	X	X	X							*
10	Radio Suppression	X	X		X	X			X	X	X	X	X		X			
11	Door Latches & Hinges	X	X		X	X	X		X			X						
12	Steering Column Collapse	X	X		X	X	X		X			X						
13	Braking			X	X													
14	Seat Belt Anchorage	X	X		X		X		X		X	X						
15	Pollution (Petrol Engines)	X	X	X	X		X		X	X		X			X		X	
16	Seat Belts	X	X		X		X		X	X					X			
17	Seats and their Anchorage	X	X		X	X			X			X						
18	Anti Theft	X	X		X		X		X	X		X						
19	Foglamps	X	X	X	X	X	X		X	X		X	X		X		X	
20	Halogen Main & Dipped Units. H4	X	X	X	X	X	X	*	X	X		X	X		X			
21	Interior Fittings	X	X			X	X		X			X						
22	Protective Helmets (M/C's)				X	X	X											
23	Reversing Lights	X	X	X	X	X	X	*	X	X		X						
24	Pollution (Diesel Engines)	X	X					*	X	X								
25	Head Rests	X	X		X				X			X						
26	External Projectors		X		X	X	X					X						
27	Advance Warning Triangles							*										
28	Audible Warning		X			X	X		X		X							
29	Occupant Projection CV Cab				X		X											
30	Tyres				X	X						X						
31	H4 Sealed Beam Headlamps					X						X						
	Anticipated acceptance*																	
	Full acceptance X																	

**ARRANGEMENT OF THE APPROVAL
MARK**



	a	b
Minimum dimensions	12	5,6

(millimetres)

TABLE 2

United Nations Economic Commission for Europe Working Party on Road Transport - List of Delegations

Australia	Hungary	Switzerland
Austria	Italy	United Kingdom
Canada	Japan	U. S.A.
Denmark	Netherlands	U. S. S.R.
Finland	Poland	West German Rep.
France	Spain	Yugoslavia
German Dem. Rep.	Sweden	

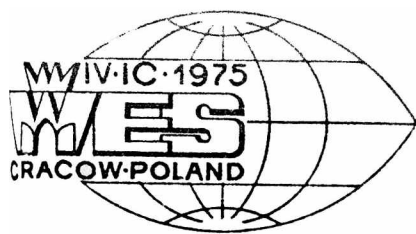
Non Governmental International Organisations

Permanent International Bureau of vehicle constructors (BPICA).
Liaison Committee of the Manufacturers of Vehicle Equipment & Parts (CLEPA)
International Standards Organisation (ISO)
Brussels Working Party 1952 (G. T. B.)
International Union of Road Transport (IRU)
International Union of Public Transport (U. I. T. P.)

TABLE 3.

E. E. C. DIRECTIVES

<u>Directive No.</u>	<u>Title</u>
70/156/EEC	Motor Vehicle Type Approval
70/157/EEC	Vehicle Noise Levels and Exhaust System
(as amended by 73/350/EEC)	
73/350/EEC	Vehicle Noise Testing and Exhaust System
70/220/EEC	Vehicle Emissions (petrol Engines)
(as amended by 74/290/EEC)	
74/290/EEC	Vehicle Emissions (Petrol Engines)
70/221/EEC	Fuel tanks and Rear Protection
70/222/EEC	Rear Number Plates
70/311/EEC	Vehicle Steering
70/387/EEC	Door Locks and Hinges
70/388/EEC	Acoustic Signalling Devices
71/127/EEC	Rear View Mirrors
71/320/EEC	Vehicle Braking
(as amended by 74/132/EEC)	
74/297/EEC	Driver Protection - Safety Steering
74/346/EEC	Rear View Mirrors - Agricultural Tractors
74/347/EEC	Forward Visibility/Windscreen Wipers - Agricultural Tractors
74/408/EEC	Strength of seats and their anchorages
74/483/EEC	Motor Vehicles - External Protusions
Regulation No. 1463/70	Tachographs
74/132/EEC	Vehicle Braking
72/245/EEC	Ignition Suppression
72/306/EEC	Diesel Emissions
74/60/EEC	Passenger Cars Interior Fittings
74/61/EEC	Anti-Theft Devices
74/150/EEC	Agricultural Tractors Type Approval
74/151/EEC	Agricultural Tractors Technical Requirements
74/152/EEC	Agricultural Tractors Maximum Speed/Loading



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Zofia Chitulesku
Maria Grzybowska

PRELIMINARY RESULTS OF A COMPREHENSIVE SURVEY OF PERSON MOVEMENT IN ŁÓDŹ

Section 2: Spatial arrangement of human environment.

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
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Poland

PRELIMINARY RESULTS OF A COMPREHENSIVE SURVEY OF PERSON MOVEMENT IN ŁÓDŹ

Transport planning is an essential part of the planning cities and regions and the importance of this problem is understood by both the professionals and the community at large, who want to have quick and easy connections between the origins and destinations of their journey.

In order to meet the needs for the existing transport and for its permanently increasing volume and to ensure high standards of travelling it is necessary not only to have adequate sources of money but also to point out how this money can be spent in the most effective way.

A Sound basis for the assessment of alternative courses of action and the evaluation of particular transport proposals is the examination of The existing travel requirements and the relationships between the present travel needs and the existing urban environment.

To get such information various kinds of surveys are carried out and a comprehensive traffic survey provides the greatest amount of data on the existing travel patterns

on a conurbational scale.

In Poland, some such surveys have been carried out. The first survey of this kind took place in Warsaw in 1969. One of the more recent and largest surveys undertaken in Poland is a comprehensive traffic survey, which has been carried out in Łódź and its vicinity in 1973. The results of that survey will be used in forecasting traffic and travel needs in Łódź and in the current improvement of the existing transport facilities.

The survey area covers 425km² and includes Łódź and the surrounding area connected with Łódź: Pabianice, Zgierz, Tuszyn, Konstantynów, Andrespol, Rzgów, Ksawerów. The population of the survey area was about 945 000 in 1973.

The first phase of work involved surveys of person journeys on an average weekday made in the survey area by residents of this area and by persons coming in from outside of the survey area. In order to make a survey of such a large community a representative sample technique was used and according to its principles the information obtained from the survey of a sampled group of people may serve as a basis for establishing the overall travel pattern for all residents.

This information has been obtained by two basic kinds of survey:

- home interview with the residents of the surveyed area from a 4% sample of the resident population, this gave about

13 000 households selected for interviewing.

- cordon line survey at 20 cordon points, where a questionnaire in a pre-paid form was issued to the passenger of buses, trams, trains and cars entering the surveyed area; about 6 000 questionnaires have been returned, which gave about 8% representativeness of the total number of persons travelling in an inbound direction during 24 hours. So far the survey has been information collected on all journeys made by residents and non-residents who were asked for details of every journey made on the survey day:

origin and destination of journey
purpose of journey
time of journey at start and end
mode of travel

In addition background information about households /structures of household, level of earnings, car ownership/ and about members of households /their job, sex, age, / were collected.

In 1974 supplementary survey of a 20% sample of car owning households was carried out. It was necessary to undertake this separate survey, because a 4% sample, from all the households together with a low level of car ownership in Łódź was too small to ensure accurate information on the travel behavioural pattern of a group of car owning households. It is worth underlining that the level of car ownership in Łódź in 1974 was about 36/1000 persons /eg. 1 car per 10 households/. The information obtained

from the survey has been processed in a form making it possible /to work out the quantitative and qualitative characteristic of the current traffic patterns of person movement. Since the first phase of processing the data from survey of person journeys has been completed we would like to present to you the general initial results of the survey, describing the traffic and travel patterns in Łódź. On a typical working day in 1973 the residents of the survey area make about 1.760.000 journeys and the majority of them were made by public transport /1.030.000/ about 50.000 by cars and 15.000 by other modes of travel. The rest of journeys /665.000/ were walking trips.

The average mobility of the residents of the survey area is 189 for all types of journeys per 24 hours period and

- 1.11 journeys by public transport
- 0.08 by other modes of travel
- 0.70 walking trips.

This information is directly used for forecasting purposes. At the same time to be able to make comparisons to other cities, the coefficient of the 24 hours non -pedastrian journeys per a statistic resident of Łódź has been calculated. It is 1,46 and it can be compared to a similar factor in Warsaw which is higher mainly because of the capital function of Warsaw and equals 1.89 in 1969. Geographical distribution of journeys made by public transport in terms of density of journeys per 1 ha is shown in fig. 1.

About 5% of the total area in Łódź has a density of 200 public transport journeys per 1 ha. At the same time it is not the area of domination of these group of journeys in total. It was found that the percentage of journey by public transport is inversely proportional to the density of journeys which ended in a given area.

In fig.2 it can be clearly seen that districts with a high percentage /60%/ of public transport journeys are placed in the outer part of Łódź, while the higher density of journeys exists in the central part of the town /fig.1/ It results, among other things, from a large concentration of working place in the centre and of course from the function of the centre itself, which make it possible to make short journeys, mainly walking trips. Besides, it results from the growth of the car journeys to the centre, which has been practically possible so far because of no limitation in the use of this mode of travel.

The percentage of walking trips .in the total number of journeys is high in Łódź. It equals 38% in the survey area, when walking trips of the distance of 100 m are taken into consideration.

Car journeys are only 3% in total. Public transport make up a basic mode of travel in Poland cities and also in Łódź journeys made by public transport are 59% of the total. /in the above considerations other modes of travel such as bicycles, motorcycles, vans have been neglected/.

The travel mode is chosen according to the trip purpose. These relationships are shown in fig.3. And so journeys to work are made mainly by public transport/77%/ and over half of journeys to school are made on foot. 50% of journeys for other purposes are walking trips and 4% of these journeys are made by car. The highest percentage /7%/ of car journeys was found in non-home based trips. As public transport journeys, car journeys and walking trips are considered separately, it can be found that public transport is a mode of travel in 57% resident journeys to and from work, and car of 35% those journeys. However car is a mode of travel in 44% resident journeys for other purposes than work and school and of 19% of non-home based.

The choice of the travel mode is also connected with the time of day. The highest percentage of public transport journeys are made between 6.30-7.30 a.m. and it is 72% of the total journeys in this period.

Peak hour covers period; between 15.00-16.00 p.m... At this hour the residents of the survey area made 13% of the total 24 hours journeys and 14% of the 24 hours public transport journeys. Finally, it should be emphasized that the results of this survey are contained 400 tabulograms and are used in the further phases of the transport planning process in Łódź. What is particularly essential is to establish the relationships between the traffic patterns and the main factors which govern them - population,

employment, land use, car ownership, public transport, development etc. and to express these relationships as mathematical models, used to forecast what traffic patterns are to be expected on the basis of various assumptions for the future.

X X X

At the end I would like to say that all the work connected with designing and organizing the above survey, data processing, analyses of results, and the forecasting has been done by cooperation these units:

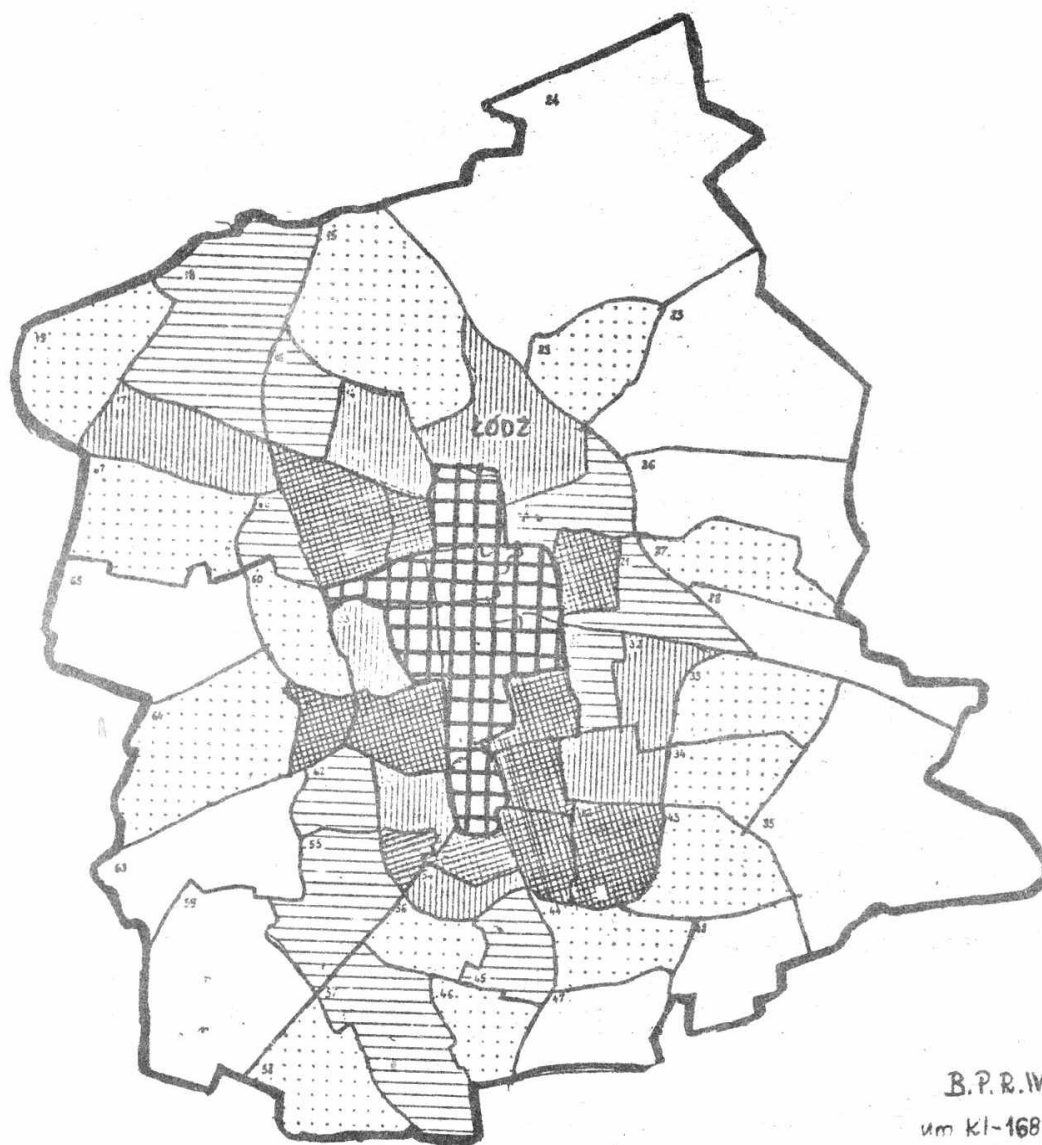
The Instytut of Environmental Research
Warsaw Town Development Planning Office
Łódź Town Development Planning Office.

All the data have been computed in Warsaw Computer Center with IBM-360, using TAMS standard programs.

The above study of the person movement in Łódź is a part of a larger study "The Development of Road Network in Poland" made with the help of UNDP.

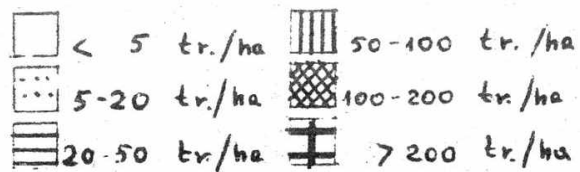
DENSITY OF INTERNAL PERSON TRIPS BY TRAFFIC DISTRICTS

- public transport / trips / ha /



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Fig 1



PERCENTAGE DISTRIBUTION OF PUBLIC TRANSPORT JOURNEY
- internal person trips

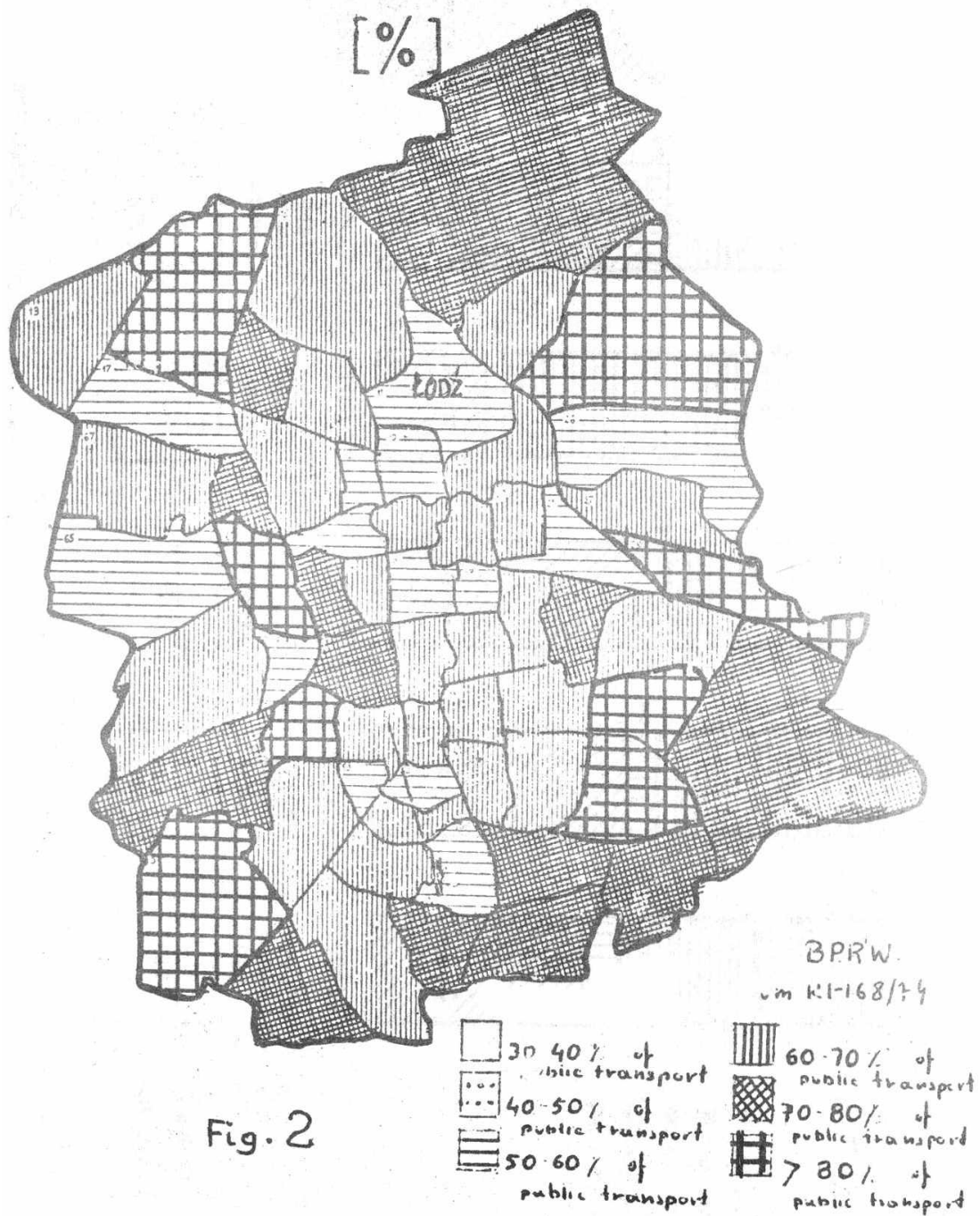
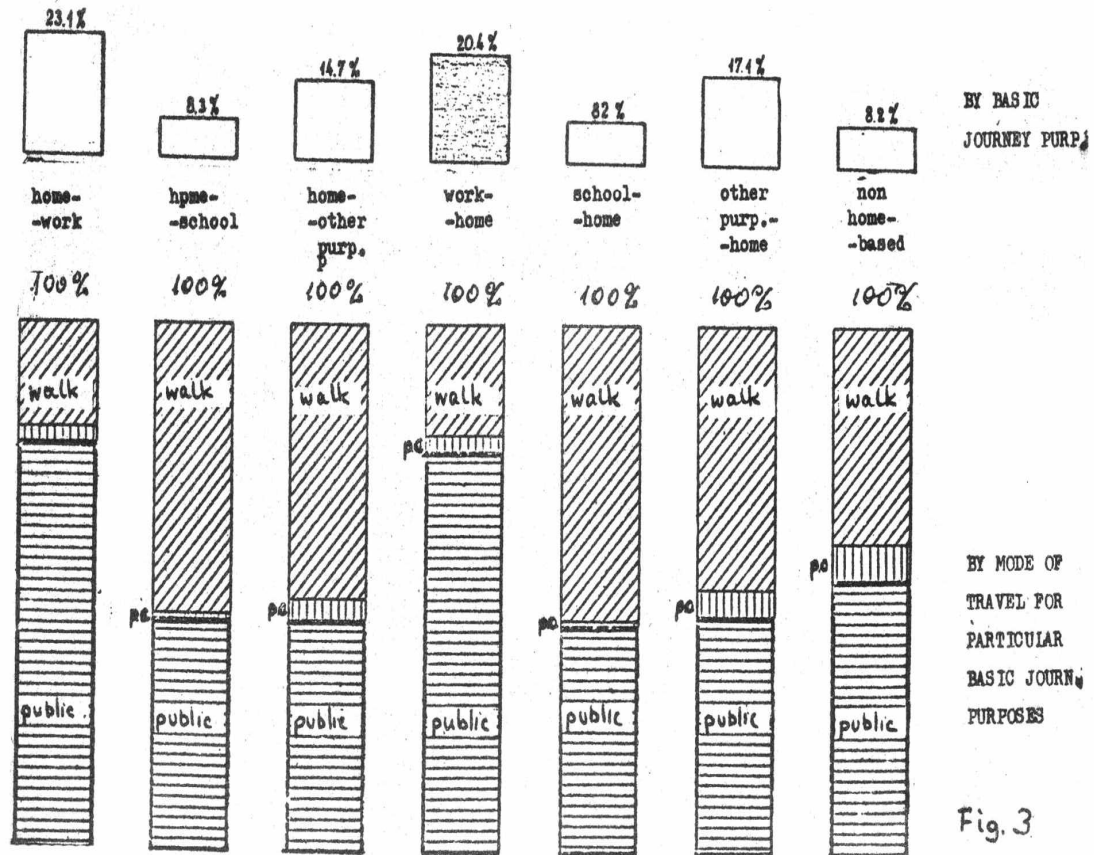
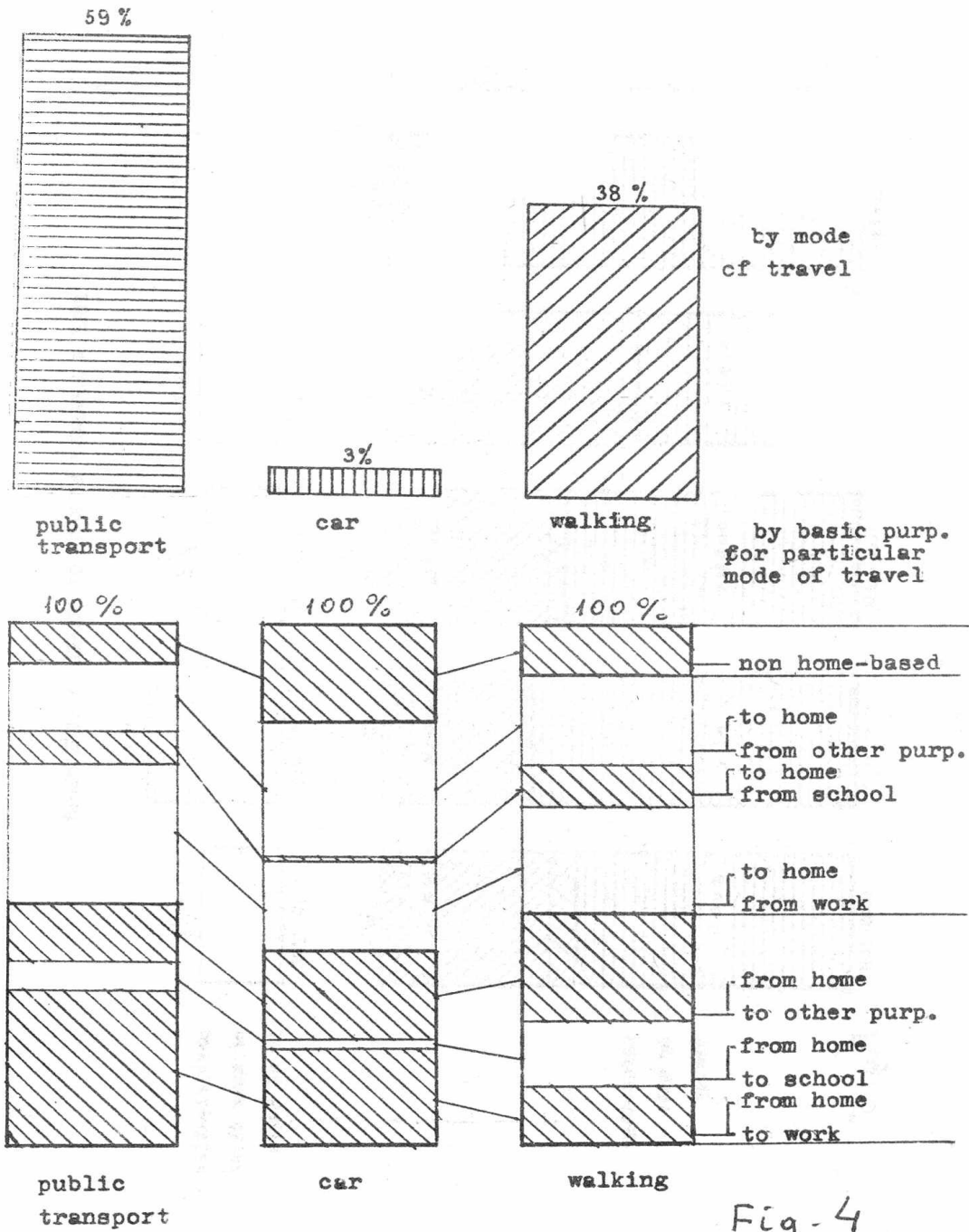


Fig. 2

INTERNAL PERSON JOURNEYS BY MODE OF TRAVEL AND BASIC JOURNEY PURPOSE



INTERNAL PERSON JOURNEYS BY MODE OF TRAVEL
AND BASIC JOURNEY PURPOSE



PERSON JOURNEYS BY MODE OF TRAVEL IN HOUR FLOWS

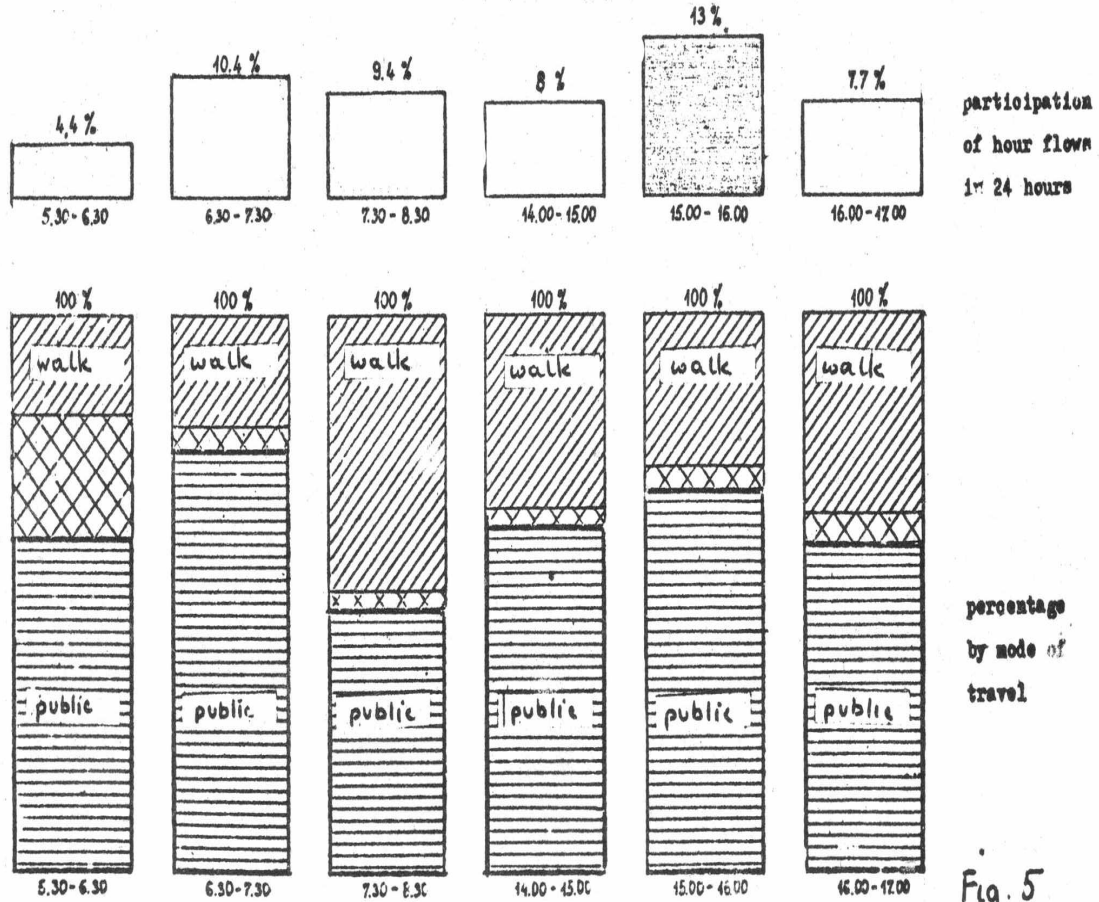


Fig. 5

**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Henryka Wałęcka

**LE ROLE DES AUTOROUTES
DANS LA FORMATION DE
L'ENVIRONNEMENT DE
L'HOMME ET L'AMENAGEMENT
D'ESPACE**

Section2: Environnement de l'homme.

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

Świętojerska 5/7
00-236 Warszawa

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Elle a terminée l'Ecole Polytechnique de Varsovie et les études de planification d'espace. Pendant 4 ans elle a travaillé comme architecte dans le Bureau de Construction de l'Urbanisme à Puławy et une année au Comité de Construction d'Urbanisme et d'Architecture à Varsovie, 9 ans dans le Département de Construction d'Urbanisme et d'Architecture-Mistère de Construction à Varsovie comme inspecteur supérieur pour les affaires de localisation et de décision, ensuite comme inspecteur supérieur pour la planification d'espace. De 1969 à 1972 elle a été représentante du Ministère de Construction dans la Comision d'Appel pour les affaires d'expropriation auprès du Ministre des Affaires Intérieures. A present elle est suis chef de la Section d'Urbanisme et de Protection de l'Environnement au Bureau d'Etudes des Autoroutes de l'Administration des Autoroutes à Varsovie.

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LE ROLE DES AUTOROUTES DANS LA
FORMATION DE L' ENVIRONNEMENT DE
L'HOMME ET L' AMENAGEMENT D'ESPACE

1. Les traditions de la planification d'espace et de la formation de l'environnement

L'urbanisme moderne naquit dans le monde au tournant des XIX et XX siècle.. Devant une rapide extension des processus d'urbanisme et a base du développement de l'industrie nationale, on s'est rendu compte de la nécessité de protéger des gens contre l'effet dangereux de l'industrie de cette époque - là.

Les cadres des urbanistes polonais faisaient alors leurs études dans des Ecoles Supérieures d'Europe. Par consequence la Pologne est devenue le point de croisement de nombreuses influences des écoles étrangères.

Des jeunes urbanistes instruits en dehors de leur pays ont réussi á profiter des expériences obtenus a l'étranger. Avec cela on voit se former une tendance á créer, sur cette

base, une école polonaise d'urbanistes. On a créé entre autre un plan de Grande Cracovie comprenant des communes voisines. On a attaché une importance particulière à la solution adéquate du système de communication, surtout aux artères périphériques. Les premiers travaux présentés au congrès médical et publiés dans le magazine "Santé" prouvent que leur but principal consistait à la protection de santé de l'homme.

Il faut noter que toute l'activité ayant le caractère national se passait dans le pays sous l'occupation étrangère. Après avoir obtenu l'indépendance en 1919 on s'est mis dans le pays à l'éducation des spécialistes.

En 1923 on a créé la Société d'Urbanistes Polonais qui réunissait des spécialistes. Ensemble ils ont commencé les études sur le problème de l'urbanisme, ils ont formé sa base scientifique et popularisé les idées liées avec l'amélioration des conditions de vie de l'homme. La Société d'Urbanistes a groupé des gens de différentes spécialisation: architectes, ingénieurs, médecins, sociologues et économistes.

Dans les projets élaborés, le bien de l'homme et les raisons fonctionnelles suggéraient la façon de planifier de nouveaux systèmes de communication, nouveaux quartiers, zones et arrangements de verdure.

Dans les années trente parurent les bureaux de planification régionale élaborant les plans de toutes les grandes

régions de pays. On a créé aussi le Bureau d'Etudes du Plan National. Le développement de la planification régionale cause le changement de la manière de traiter des problèmes d'espace.

La ville devient un élément lié organiquement avec la région, la région avec le pays.

Ces travaux ont été interrompus par la II-ème guerre mondiale. Après la chute de septembre en 1939 l'état de stupeur désespérée durait relativement court.

A Varsovie on a formé 3 centres clandestins d'urbanisme du caractère interdisciplinaire qui faisaient les études sur la reconstruction et modernisation de la capitale, et aussi sur les petites villes. Au fur et à mesure du développement des événements l'équipe des urbanistes devenait de plus en plus petite. Mais les travaux étaient continués jusqu'à la fin de la guerre même pendant l'insurrection à Varsovie.

En dehors du pays pendant la guerre, la plus grande concentration des urbanistes s'est formée en Angleterre. Là, on a créé la filiale de la Société d'Urbanistes Polonais et L'Ecole Supérieure Polonaise d'Architecture et d'Urbanisme à Liverpool. Les études et les travaux de planification menés pendant la guerre par les urbanistes anglais exerçaient une grande influence sur la direction des travaux du centre polonais d'urbanisme.

Après la II-ème guerre mondiale en 1945, parut le Bureau de Reconstruction de la Capitale à Varsovie complètement détruite. Dans les conditions après la guerre ce bureau

s'est mis à l'élaboration de l'Ensemble Urbain de Varasovie, prenant en considération démographie, problèmes sociaux économiques, physiographie, communication, rapports d'eau et d'entourage de l'homme avec la verdure, problèmes énergétiques. Ce premier atelier d'urbanisme en Pologne possédait les traits du model qui est actuel jusqu'à présent.

On a organisé les discussions publiques sur la nouvelle forme de la capitale.

En même temps s'établit l'Office Central de Planification d'Espace qui a pris la surveillance de tous les problèmes de planification d'espace /national, régional et local/. Dans toutes les voivodies on a convoqué les postes de planification régionale.

Ces premières années après la guerre étaient la période d'une abondante activité urbaniste.

L'enthousiasme et élan avec lesquels on a commencé cette activité n'avaient pas de précédents.

L'une des forces motrices de ce dynamisme était la conviction que la révolution sociale et économique a mis à notre disposition des moyens illimités pour réaliser les projets en perspective. En 1949 on a fait éditer la Loi de la protection de la nature. D'après celle-ci la protection de la nature signifie la conservation, la restitution et la disponibilité convenable des ressources de la nature aussi bien que des produits de nature vivente et non – vivante dont la protection constitue l'intérêt public en égard aux fonctions sanitaires, scientifiques, esthétiques, histo-

riques - commémoratives et sociales et aussi á cause des traits caractéristiques du paysage.

Dans la même année on a créé aussi le Comité d'Aménagement d'Espace du Pays á l'Académie Polonaise des Sciences. Avec le temps on a développé dans tout le pays le réseau des bureaux urbanistes dressant les plans des villes et des campagnes. En 1961 parût l'un des meilleurs actes juridiques en Pologne, la Loi sur la Planification d'Espace. Selon elle le but de la planification d'espace est en outre la formation des conditions pour satisfaire les besoins de la population sous tous ses aspects et la protection des sources et des valeurs naturelles.

La Loi est toujours actuelle et se basant sur celle-ci on est en train d'élaborer un projet national, projets régionaux et locaux.

En 1972 on a formé une nouvelle administration centrale, le Ministère de l'Aménagement du Territoire et de la Protection de l'Environnement, et ensuite l'Institut de Formation de l'Environnement.

2. Le système projeté des autoroutes en Pologne

Le développement général du pays et de nouveaux besoins dans le domaine de transport et de motorisation provoquent un rapide accroissement du chargement du réseau routier de notre pays et aussi la formation de grands flux du trafic. Cette circulation pourrait être réalisée uniquement sur les routes qui se caractérisent par une grande capacité de circu-

2. /Lwów/ - Rzeszów, Cracovie - Katowice - Wrocław - Trzbień - /Berlin/

- autoroutes sur la direction Nord - Sud:

1. /Ostrava/ - Katowice - Łódź - Toruń - Grudziądz - Gdańsk
2. /Praha/ - Wrocław - Poznań - Bydgoszcz - Grudziądz - Gdańsk

et les autoroutes auxiliaires:

Varsovie - Łódź - Wrocław

Varsovie - Toruń

Varsovie - Radom - Kielce - Cracovie

Des autoroutes polonaises conviendront aux standards et normes européens des routes internationales. Les principales conditions techniques sont suivantes: vitesse de base 120 km/h, largeur de voie 3,75 m.

Le système des autoroutes sera complété par les routes à grand débit. Elles vont relier le réseau routier avec de grandes agglomérations, et ces agglomérations entre elles. La longueur totale des routes à grand débit dans le système de direction est environ 2300 km.

En 1972 la Présidence du Gouvernement a pris une décision concernant les travaux préparatoires à la construction des autoroutes.

L'Administration des Autoroutes qui - avait été créée à la suite de cette décision, a élaboré "Le programme de réalisation de la I-ère étape de la construction des auto-

lation dans les conditions de sécurité convenables.

On a décidé donc de chercher la solution de ces problèmes dans le développement des autoroutes, des routes d'express, des voiries rapides sur les territoires de grandes agglomérations.

Dans les années soixante on s'est mis en Pologne aux premiers travaux sur le schéma perspectif et directeur des routes de circulation rapide. En profitant des matériaux du plan national qui concernent les perspectives du développement économique, démographique, urbaniste et de modernisation on a élaboré le système national des autoroutes.

Comme il s'ensuit des calculs les trajets les plus chargés sont:

Katowice-Cracovie, Katowice-Częstochowa - Piotrków,
Katowice - Wrocław, Kraków - Tarnów, Gdańsk - Włocławek,
Varsovie - Łódź.

La prognose de circulation a donné la base à une élaboration du système des autoroutes, avec la longueur totale du réseau de 3000 km. Ce système renferme les directions de la plus grande intensité existante et prévue de circulation et prend en considération les fonctions nationales et internationales, touristiques et économiques.

On a prévu dans ce système des séries fondamentales suivantes:

- autoroutes sur la direction Est - Ouest:

1. /Moskwa/ - Terespol - Varsovie - Poznań- Swiecko – Berlin

routes en Pologne". Ce programme a prévu les tâches les plus importantes concernant les travaux d'études, de projection, de réalisation, d'équipement, de matériel et aussi les problèmes liés à la formation des cadres qualifiés.

3. La technique nouvelle d'élaboration des études des autoroutes sur la base de la stratégie de la planification d'espace et de la protection de l'environnement.

On a cité plus haut les directions fondamentales des trajets des autoroutes. L'établissement plus précis du cours de trajets dans les directions particulières exige des études techniques et économiques plus poussées. La réalisation juste de ces études n'est possible que si l'on tient compte de la planification d'espace et de tous les problèmes du milieu naturel.

Dans ce but le Bureau d'Etudes des Autoroutes de l'Administration des Autoroutes a élaboré le système d'étu-technique et économique.

Dans ce système, outre les éléments techniques de planification de l'autoroute on traite par ex. des questions suivantes:

- aménagement d'espace des territoires et la protection de l'environnement
- classification du sol, utilisateurs et équipement
- géologie
- aménagement des voies de l'autoroute
- analyse économiques

Les problèmes d'aménagement de l'espace et de protection de l'environnement sont élaborés dans les études des autoroutes sur la base des plans obligatoires d'aménagement de l'espace du pays, des régions, des agglomérations et des localités particulières.

Comme je viens de mentionner, ces projets sont réalisés sur le territoire de tout le pays. C'est un grand avantage permettant de construire des autoroutes de qualité.

Au cours d'élaboration des études, on consulte des organes de la planification économique, de la planification d'espace, des organes de la protection de l'environnement, des organes ruraux, de l'économie forestière et toutes les institutions intéressées.

4. L'analyse des rapports entre l'aménagement de l'espace d'environnement de l'homme et les trajets des autoroutes.

Si l'on étudie les rapports entre l'environnement de l'homme, l'aménagement de l'espace et les trajets des autoroutes, il faut se rendre compte de ce qu'il faut, d'après nous, changer et comment, quels processus aident et développent et quels autres freinent et évitent.

La structure de l'aménagement de l'espace du pays est déterminée par des facteurs de base, comme par exemple:

- 1/ différenciation des conditions naturelles de l'environnement
- 2/ dislocation de la population,
- 3/ dislocation de l'industrie,

4/ systéme de communication.

ad 1/. Le premier facteur est considéré comme 1e plus stable et en même temps 1e plus menacé.

Tous les changements qui ont lieu dans l'environnement naturel sous l'influence de l'activité technique et économique ont un caractére stable et ils sont irréversibles ou difficilement réversibles.

L' environnement naturel se compose de nombreux elements, par exemple: eau, territoires ruraux, territoires humides, forêts et paysage.

L' eau. Une autoroute peut avoir un effet essentiel sur le bilan d' eau, si elle traverse la région de sources. Elle peut alors capter et infecter l' eau de source avec des huiles, de l' essence et des lubrifiants, ce qui provoque son inaptitude á la consommation.

Les impuretés de l' essence, des huiles et des lubrifiants sont dangereuses pour toutes les eaux courantes et stagnantes et causent la mort de flore et de faune aqueuse. Pour la protection des eaux les trajets doivent passer á coté des territoires de source. Dans les environs des rivières ayant des valeurs naturelles et du paysage, et aussi près des bassins d' eau du caractére surrégional et regional, les autoroutes doivent être situées á une distance d' un

km des eaux.

On ne doit pas faire évacuer les eaux de routes dans lacs. Si on fait les projets des installations à côté de l'autoroute, par exemple stations d'essence et de réparation, parkings et motels, il faut prendre en considération l'établissement des stations d'épuration et d'évacuation des ordures. Pour garder des réserves des eaux sous-terrains, il est nécessaire d'éviter les territoires avec une nappe d'eau élevée, ou du moins d'éviter les déblais qui baissent cette nappe; il est aussi obligatoire de tracer les routes parallèlement à la direction d'écoulement des eaux sous terrains.

Les terrains ruraux. Les terrains ruraux diminuent de plus en plus et la demande de nourriture augmente. Un grand nombre de terrains sera occupé par les autoroutes. La largeur de la voie des autoroutes à quatre voies, avec un remblai d'1 m de haut prend environ 50 m, c'est-à-dire 1 km de l'autoroute occupe 5 ha de terrain.

Les terrains ruraux sont préservés dans les projets d'espace et protégés par la Loi du Conseil des Ministres sur la protection des terrains ruraux.

Il faut donc tenir compte du fait que l'autoroute ne peut pas passer par les terrains ruraux d'une grande valeur. Elle ne doit pas non plus changer de conditions de terre et d'eau dans son entourage. Un moyen qui peut en partie récompenser les pertes dans l'agriculture causées par la

construction des autoroutes est la plantation d'arbres et de buissons le long d'une voie de l'autoroute. Les arbres protègent contre l'érosion d'altération du terrain et ils abritent des oiseaux qui exterminent des insectes et se nourrissent de la semence de mauvaises herbes.

Les terrains humides. Les terrains humides comprennent: prairies, marais, tourbières et eaux basses. On exploite assez intensément les prairies qui sont une des sources du fourrage. Les marais et les tourbières sont très souvent considérés comme terre improductive pendant qu'ils sont en réalité un énorme réservoir d'eau. On estime que nos tourbières peuvent emmagasiner au moins 5 milliards m³ d'eau, c'est-à-dire plusieurs fois davantage que 5 les plus grands réservoirs d'eau construits jusqu'à présent.

Les tourbières qui alimentent en eau les terrains voisins, conditionnent l'existence des bois, des forêts et des récoltes de foin. Certaines tourbières forment d'unique ensembles marécageux d'une très grande valeur biologique. On peut y trouver de rares ensembles de plantes et des espèces d'animaux et d'oiseaux protégés.

Pour prévenir l'extirpation de la flore et de la faune marécageuses spécifiques, on a voté en 1971 une convention internationale sur la protection des terrains humides. La tourbe possède aussi certaines valeurs pour le traitement médical pour l'exportation et elle sert de sous-sol à la culture jardinière.

L' autoroute traversant l' ensemble de marais trouble les conditions d' eau, la vegetation de planets et aussi l' existence des animaux. L' action de découvrir la tourbe provoque sa décomposition rapide et sa combustion sans flammes. En conséquence après quelques décennies la tourbe disparaît en laissant le terrain sablonneux. Les gaz de combustion exercent une mauvaise influence sur la qualité des herbes récoltées sur les prairies. A la suite du caractère dépressif des prairies, l' air vicié des autoroutes y tombe et y demeure.

Les herbes absorbent des substances toxiques et le foin qui se trouve de 100 - 200 m des deux côtés de l'autoroute devient inutile.

On doit éviter de construire des autoroutes sur les terrains des ensembles de mairais et de prairies. On ne devrait pas détruire les terrains marécageux. Il n'est pas désirable de faire de longs remblais ininterrompus qui dérangent le passage des eaux et de l' air. Il est profitable de planifier les autoroutes sur les estacades au moins en partie.

Les forêts. Elles constituent le plus grand producteur de l' oxygène sur le continent, et en même temps elles sont un filtre absorbant les gaz et les poussières. Elles garantissent aux hommes une récréation psychique et physique et prccurent le bois. Les forêts augmentent le degré d' humidité dans leur milieu et ceci est essentiel, car une grande par-

tie du territoire en Pologne risque de devenir une steppe. La forêt diminue la possibilité d'inondation et elle est une barrière contre les vents. Une forêt naturelle constitue un bien que l'on ne peut pas remettre à neuf.

Pour prévenir les destructions il faut construire des autoroutes à une distance de 1 - 4 km des parcs nationaux, parcs de paysage et réserves. On croit nécessaire de faire passer des autoroutes à côté de chaque ensemble forestier ou au moins par ses secteurs de moindre importance. S'il est indispensable qu'une autoroute traverse une partie de forêt, il ne faut pas qu'elle le fasse dans la ligne droite mais que son entrée et sa sortie soient placées sur un arc. En outre il est nécessaire de conserver les passages existants pour les animaux, en construisant des estacades.

Le paysage. On trouve les plus beaux paysages sur les terrains des forêts les plus précieuses, des prairies et des eaux de surface. Il y a quelques années le Conseil National de la Nature a initié la formation des parcs de paysage et des zones de paysage protégé.

Les parcs de paysage sont des territoires relativement petits qui présentent cependant une grande valeur naturelle, et qui offrent des conditions nécessaires pour le tourisme actif. Les zones de paysage protégé occupent des terrains plus vastes. Dans ces zones on ne prévoit pas de changement en ce qui concerne le développement de l'industrie et de l'urbanisme. Cependant on prévoit l'augmen-

tation du boisement et la construction des réservoirs d'eaux. Sur ces terrains on installe des centres de repos. Compte tenu des inconvénients provoqués par une route rapide il faudrait tendre à ce que tous les terrains cités ci-dessus soient libres d'autoroutes. Ce la est facile à réaliser dans les parcs nationaux de petite surface.

Mais les zones de paysage protégé sont plus grandes. Un moyen réel de la protection de ces zones est la construction des autoroutes dans les rétrécissements ou les secteurs éloignés des objets naturels et des centres de repos.

5. Les autoroutes - élément qui forme et arrange l'espace.

J'ai consacré beaucoup d'attention aux problèmes liés à la protection de l'environnement de l'homme parce qu'ils ne sont pas encore assez connus aux techniciens.

D'autres facteurs formant la structure de l'espace, par ex. la répartition de la population et de l'industrie changent avec le temps. Mais on sait bien que Varsovie, Łódź, Katowice, Cracovie, Poznań et aussi Gdańsk seront, des agglomérations principales en Pologne. On sait également que l'augmentation du niveau de vie sera inévitablement accompagnée d'un développement de l'industrie de consommation dans ces agglomérations, localisée à côté des routes à circulation rapide. Le système d'autoroutes sera donc un élément important pour la répartition de la population. La construction des autoroutes peut provoquer une grande activité de certaines régions et l'exclusion des autres de la vie économique et culturelle. Tous ces problèmes sont pris en considération au cours des études sur les autoroutes. La création d'un système national convenable des autoroutes va garantir un développement harmonieux de l'aménagement de l'espace en Pologne.

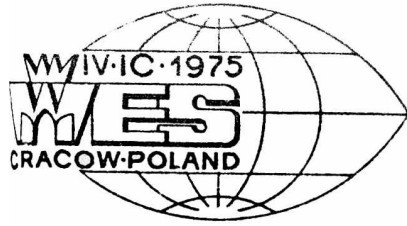
6. La participation de l'opinion sociale dans la planification des autoroutes.

L'opinion sociale en Pologne s'intéresse beaucoup aux trajets des autoroutes.

Les solutions des autoroutes sont discutées et critiquées en public par l'intermédiaire de la presse et dans les milieux des agglomérations particulières. Souvent sous la pression publique, dans les cas justifiés et compte tenu des raisons de l'urbanisme et de la protection de l'environnement, les plans du parcours des trajets des autoroutes sont changés.

7. Les conclusions et les postulats.

1. Les autoroutes construites à présent sont des réalisations durables et elles serviront au XXI siècle.
2. Le système des autoroutes doit accomplir d'une façon convenable toutes les fonctions liées à la circulation rapide au niveau international, régional et local.
3. On doit réaliser avant tout les autoroutes qui lient la Pologne avec le système des autoroutes européennes.
4. Les autoroutes en transformant l'image du pays et l'environnement de l'homme, constituent un élément important de l'aménagement du territoire.
5. En planifiant les autoroutes il faut tenir compte des résultats qui en découlent pour l'aménagement de l'espace et l'environnement de l'homme. Par conséquent il faut chercher à niveler l'agressivité de l'autoroute dans l'environnement de l'homme sur les terrains urbanisés ou soumis à l'urbanisme. Il faut respecter les conditions naturelles existantes de l'environnement de l'homme.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Zofia Chitulescu

TRAFFIC STUDY AS A SOURCE OF INFORMATION

Section 2: Spatial arrangement of human environment.

Printed according
to the author's original

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In 1974 she spent three months in Great Britain studying traffic problems there.

Zofia Chitulescu is responsible for traffic measuring methods, the interpretation and preparation of data, etc. She has taken part in the comprehensive studies on person movement in Warsaw and person and vehicle movement in Łódź.

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TRAFFIC STUDY AS A SOURCE OF INFORMATION

When making decisions and carrying out analyses of transportation problems at various administration levels there arises a need of having general and detail informations about traffic in the city. The studies and analyses of the existing traffic are a starting point in the transportation planning process. They provide valuable contribution to verifying the decisions made previously and also they form a basic for short term modernization planning.

We can say that the traffic studies have two purposes: - first, to get a picture of the existing traffic which is needed to assure proper traffic organization and control and to determine a hierarchy of needs for the modernization of the transportation network,

- second, to find out regularities in the traffic and estimate the trends in their variation in time and in space for for-casting and implementing investment policy.

The subject of this inventory and the analyses is person, vehicle and load movement. The present study covers the following problems:

- traffic volume survey to provide information on the volume in various periods of time,
- traffic conditions surveys /speed, loss of time/,
- comprehensive transportation study /trip generation, trip purposes, trip distribution in time and space/,
- parking surveys,
- accident analyzes,
- special surveys.

Following the example of countries with a high number of cars, in Poland there are being used similar methods and techniques of traffic surveys. At the same time, there are being developed new methods which take into account local conditions.

Comprehensive transportation studies seem to be most essential in this aspect. They have already been realized in several Polish cities. The first one was implemented in 1969 by the Warsaw Development Planning Office as a person movement survey.

Now, the most important one is a person and vehicle comprehensive study in Łódź and its suburban area. It started in 1973 and was prepared to provide direct data for traffic modeling and forecasting in Łódź.

This survey will be discussed in another paper. The scope, of this report, does not permit either the presentation of those surveys or full description of all the problems connected with traffic survey in Poland.

The aim of this report is more moderate. Two kinds of

simple studies were chosen because some new elements have been introduced into method used so far. They are:

- taxi survey,
- volume short-time survey in Warsaw.

In 1972 Warsaw Development Planning Office realized a special taxi survey, prepared by W.Chlebowicz.

That survey consisted in observing the time the passengers spent waiting for a taxi and the time the taxi drivers spent waiting for passengers. The method used and results made it possible to come to some conclusions concerning the use of taxis in town and, the means for improving the situation.

In this survey the difficulty of qualifying the taxi stand was overcome. The results of the study were generalized by using various level of passenger service. This was determined as the ratio of the average passenger waiting time to the average taxi driver waiting time:

- A level for the value γ under 1,5
- B level for the value $1,5 > \gamma \leq 3,5$
- C level for the value above 3,5.

The level of service of a particular taxi stand depends on the localization of this place in the city and the time of day. The best level of the passenger service was found in the Centre and the worst one at the railway stations, where the number of taxi passengers waiting for taxis largely exceeded the number of available taxis.

Now several words about second survey.
In many analyses in towns it is necessary to have infor-

mation on the traffic volumes at per hours in the basic street network. For example, in Warsaw the traffic volume surveys are made every two years and require a lot of manpower and much money. It should be emphasized, there is a contradiction between the need for maximum information about the existing movement and the necessity of keeping the costs of the survey as far as possible. The compromise is to use a representative, sample survey.

This year /1975/ Warsaw Development Planning Office has conducted two experiments to reduce the financial costs of the survey:

- the effect of using short-time surveys, based on previously performed series of normal surveys was analyzed,
- short-time surveys were used for estimating peak hour traffic volumes in the basic street network in Warsaw.

The method of short-time surveys has two varieties:

- the first one is based on measuring the time it takes for a determined number of vehicles to pass,
- the second one is based on counting the passing vehicles in a determined short period of time.

In both varieties the sampling survey results can be extrapolated to 100 per cent by using the following formula:

$$N = \frac{60}{t} \cdot n,$$

where:

- N is the estimated hourly traffic volume,
- n is the number of vehicle passing during the time "t",

t - is the time it takes “n” vehicles to pass/in minutes/.

This problem is connected with some risk of error when estimating the total value. However, the ranges of such errors can be determined statistically.

When preparing the survey what ought to be determined is the number of vehicles counted in method 1 or the time of survey in method 2, in connection with the acceptable error of the hourly estimated volume.

According to the English study wing a short-time survey the hourly traffic volume can be estimated with an error less than 20 per cent:

- in the first method even when measuring the time for 100 vehicles/i.e. for volumes of 1200 vehicles per hour/,
- in the second method when counting vehicles in 15 minutes but on condition that the traffic volume is estimated for above 300 vehicles per hour.

In the work of Warsaw Development Planning Office, English theoretical results were checked with the surveys realized at 16 intersections in Warsaw. It was confirmed that the empirical formula for estimating the error as:

could be used to the tax the value of error when estimating the hourly traffic volume, and then to chose the method of survey and the size of sampling under local conditions.

Enclosed with this report is a figure showing the

the correlation between the total traffic volume and the error of estimation for the both methods of survey.

As the result of the analysis a new method was put forward when a short-time survey is used. It was suggested that a number of vehicles passing a determined point during a 20 minute survey per hour should be counted. The survey would be done twice for 10 minutes with a pause of 20 minutes between the surveys.

For the total volumes above 250 vehicles per hour the error of estimation does not exceed 15 per cent and for volumes under 250 vehicles per hour it does not exceed 50 vehicles.

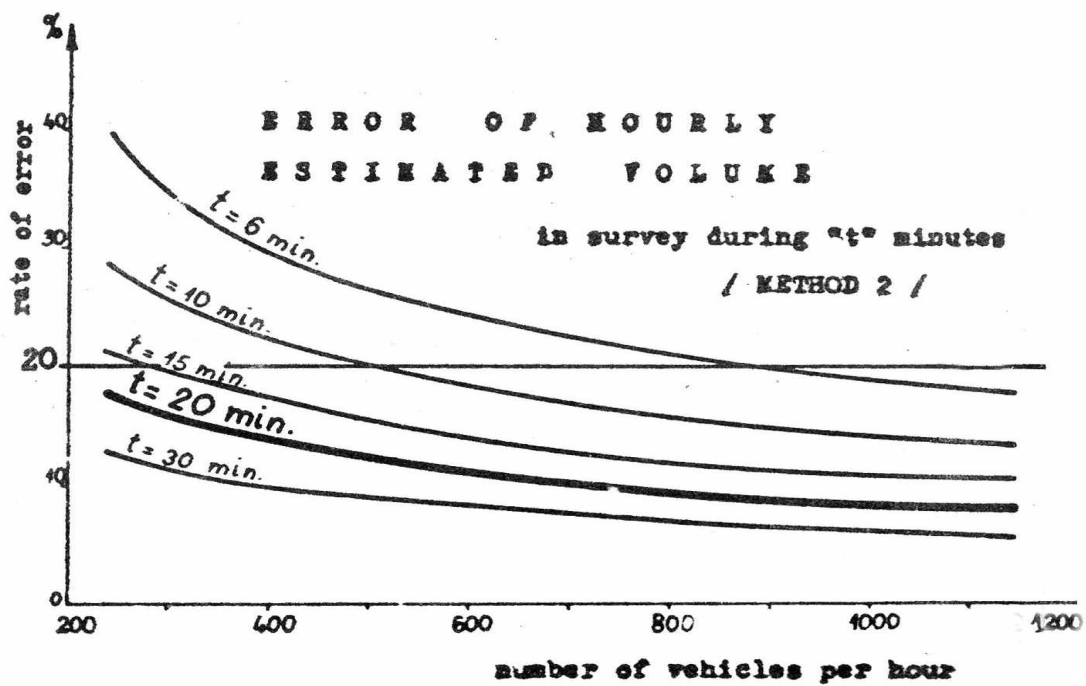
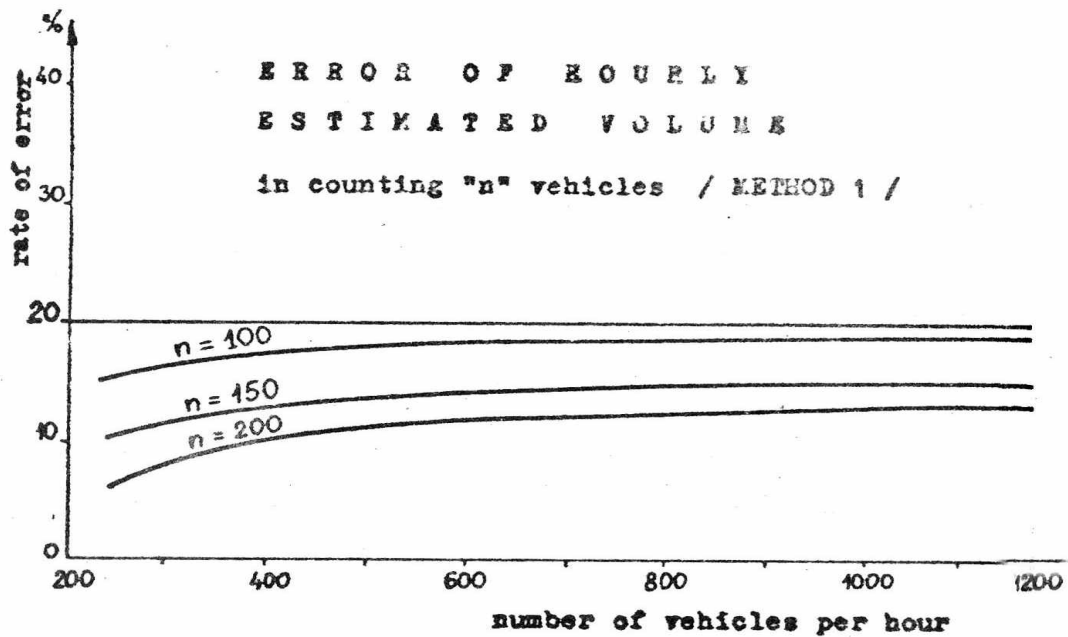
This method was accepted this year in Warsaw for the traffic volume survey at about 700 street points. It permits the reduction of manpower and survey time by about 50 per cent.

One observer during an hour was able count at two points, changing his position after every 10 minutes, and cycle of his work was as followed:

- 10 minutes - first counting at the first point,
- 5 minutes - passing over to the second point,
- 10 minutes - first counting at the second point,
- 5 minutes - passing over to the first point,
- 10 minutes - second counting at the first point,
- 5 minutes - passing over to the second point,
- 10 minutes - second counting at the second point.

The survey realized by this method made it possible to save manpower but at the same time it increased office work. In spite of this generally it brought about an essential reduction in the survey costs.

Finally; its should be stressed that in Poland the importance of traffic surveys becomes more and more appreciated. This is true for the simple direct observations as well as for some more sophisticated comprehensive studies.



**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Barbara Borodzik

**MODERN TECHNIQUE IN
ROAD DESIGNING**

**Section 2: Spatial arrangement of
Human environment**

Printed according
to the author's original

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Barbara BORODZIK Dipl.Eng. After graduation from the Warsaw Higher Polytechnical School /Department of Transports / I began to work /1954/ at the Central Office of Studies and Design of Roads and Bridges, and I have worked there till now.

I have gradually given the post from assistant designer up to the post of the manager of the superhighway laboratory and that of designer in chief. I have elaborated a number of designs which have been given a fairly high recognition being granted awards for the outstanding design achievements.

Among the others, I am the author of studies and of the design of extension and modernization of the Warsaw-Okęcie air port as well as the designer in chief of the superhighway of rapid traffic Warsaw-Katowice.

In my professional career, during technical visits abroad I have been acquainted with means and scope of design in the Soviet Union Czechoslovakia, Hungary and German Democratic Republic. Moreover I have studied in Italy the modern methods of superhighway design being there for a training period.

As an organiser and coordinator of work concerning the elaboration of know-how I wish to acquaint you with my experiences concerning the design and propagation of the up-to-date methods in this field.

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MODERN TECHNIQUE IN ROAD DESIGNING

The development of motorization, a fairly dynamical increase of the motor - transport tasks as well as the development pace of the Polish road construction and their maintenance assuming the necessity of a accelerated adaptation of roads to the changing traffic conditions were the factors instigating initiation of operations connected with modernization of the road network' in Poland.

The determined tasks as well as the need of preparing the desing know-how for the long itineraries of highways and superhighways have been at the basis of the initiation of work connected with modernization of design technique in the design laboratories of TRANSPORJECT, with the aim of acquiring, in a short time, the world level in this respect.

The works initiated in 1972 aiming at elaboration of methods and technological know-how for road design , on the basis of means available in the country-scale, made it possible to start, in 1974, the investment operations on the basis of a know-how worked out by means of the modern desing technique, including application of the computer-based system of data obtaining.

The "rapid traffic" - superhighway Warsaw - Katowice, now under construction, can serve-as an example in the respect.

The up-dating of route design comprises both geometrical and constructional elements.

The geometrical shaping of roads aims, first of all, at assuring a proper level of traffic freedom and of its security as well as at a fun coordination of the route as concerns its plan, longitudinal profile and lateral cross – section, in other words, design of the route within a given spatial structure.

The problem of environmental protection has become a new factor in road design, being expressed by the fact that a route lay out should be composed within the area in order that it harmonize with both topography and regional development and enhance its landscape valours. The area surrounding should be protected against the traffic impact of nuisance for the inhabitants, which goes especially to noise and pollution of air by combustion gases.

The existing forestal complexes have been covered by special protection.

Basic Elements of the Process of Up-to-Date Design

The design methods both elaborated and introduced ones abandon completely the former forms, and taking as basis the up-to date design method they take their stand on the following essential elements:

- a/ photogrametry which replaces the former traditional road measurement system and makes it possible to obtain the numerical model of the area by means of pictures taken from a plane;
- b/ mathematical calculations made by computers,
- c/ partial automation of drawings making it possible to obtain one part of printed annexes of the design with the help of a computer printing machine,

- d/ other modern design elements such as, for instance, analyses of traffic measurements, studies concerning the engineering aspect of road traffic, stereoscopic studies of the route, geological photo-interpretation and the like.

The Whole Process Of Up-To-Date Design

The example of the process of modern design, taken as a whole, and concerning the Warsaw Katowice route in its Piotrków- Częstochowa part has comprised the following works:

1. Studies concerning traffic, economy and substantiated reason of the choice of this route passage.
2. Detailed analysis of the raid corridor in view of establishing of technical possibilities for route construction on the following basis:
 - a) detailed investigation into the area, including measuring of the difficult fragments of the route,
 - b) geological opinion formed on the basis of geological maps, photo-interpretation of pictures made from the plane, and of penetrating checking probes,
 - c) classification of soil categories and its use on the basis of a cadastral maps.
3. Studies concerning the geometrical aspect of the structure of essential route on the situation-height grounds/the scale 1:5.000/.
4. Studies concerning reproduction of the structure of communication and mutual road connections on cadastral maps.
5. Insertion of the designed lay-out of the route into the State coordinates in order to procure the raid programme for photo making, tracing of the raid axis and tracing of the pattern of technical sites.

6. Coding of the area relief, types of soil in the cuts as well as both lateral and longitudinal cross section under a digital form, for the computer-based calculation of the following essential data:
 - a) recall line of designed route,
 - b) earth work, including mass division,
 - c) humus-formation surface, expriopriating, work planting and the like.
7. Preparation of the set of data for a technical design, such as, for instance:
 - a) Execution of pictures and tachometrical measurements of both covered places and characteristical points which is the initial material for making situation- height patterns in the scale 1:1.000 and for knots in the scale 1:1.500 as well as for numerical model of the area on a is-meter band;
 - b) execution of technical - sites line including its height levelling along the projected axis of the route / at a distance of some 50 metres form the route axis/ ;
 - c) geotechnical investigations along the route and drillings nedded for envisaged constructions;
 - d) elaboration of a geological-engineering know-how concerning local deposits, including the laboratory tests useful for construction.
8. Transformation of data on computers with the following aims:
 - a) Determination of the coordinates of pick trajectories and of the curve parameters on the basis of situation -height patters,
 - b) calculating of basic elements of the route such as streight lines and curves including the temporary curves as well as of coordinates of the route axis with a constant step and characteristic points including calculation of the

lateral cross-sections and longitudinal profile of the roadway as well as obtention of geometrical elements for the elevation of the route axis on the basis of area range envisaged, all calculations being made on a computer ODRA 1203 with help of the complex programme "STRADA".

The results obtained under the form of tablegramme and perforated paper bands make a set of data on the area and they are introduced into the programme "cut-embankment" of use for calculating the road project.

- c) Putting into motion of the programme "cut-embankment" on a computer JCL, series 1900 and ODRA, series 1300. This programme has 9 sub-programmes enabling it for getting data under the form of table-grammes, of ordinates of the recall line in a wanted point as well as of ordinates and cuts in characteristical points of the lateral cross-section, setting of the volume of earth work, taking or not into consideration the co-efficient of fluffing of work including local throwing over and the diagramme of mass division.

The results comprise, moreover, the data concerning the surface, humus removal, humus inclusion and expriopriation belt.

- d) Passage, within the design system, from the former lay-out /length, angle /to that of xyz, coordinates.

Such a procedure enables it for automation of the calculating system concerning all the basic elements of the plan on the basis of a "COGO" programme. This is the programme adapted to the IBM machines, series 1130-and 360 as well as to the machines ODRA 1304 and JCL, series 4, and also adjusted to the mini-computer WANG 2200.

Photogrametry in Road Designing

The situation-height patterns which are the basic material for working out the -itinerary of designed roads are elaborated both in the lateral and longitudinal lay-out with use of recent technical achievements in road design. After carrying out a series of studies and research investigation, a technological process has been elaborated, grouping within an uniform system the geodetic, photogrametric and information processes, indispensable for carrying out the designing work. According to the principles adopted, this technological process takes into consideration the numerical model of the area, considering it as the basis for computing both longitudinal and lateral profiles. Application of such a solution gives the possibility of making changes in the axis position of the designed road at the stage of project elaborating with no need of carrying out additional geodetical or cartographic work.

Particular technical operations which are included within the photogrametrical-information technology of the know-how elaborated for highways and superhighways design, that have been worked out on the example of the Piotrków-Częstochowa itinerary, are being implemented within three basic stages:

Stage No 1, comprising such operations as the following ones;

1. Elaboration of the project of both photogrametric flights and signaling system of the points of photogrametric contents.
2. The geodetic work comprising the measurements of the site-range and photogrametric blueprints as well as tachymetric measurements on the covered areas impossible for being elaborated by means of photogrametric methods.
3. Working out of the photogrametric system of signaling for the area.
4. Execution of photogrametric photos from the plane and their

laboratory treatment.

Stage No II, consisting in the following operations:

1. Autogrametrical elaborating of the situation-height maps in the scales: 1:1.000 and 1:5000,
2. Photogrametric measurements of the coordinates of points which provide the source data for numerical calculation of the area model.

Stage No III, consisting in calculating operations:

1. Computing of the lateral axis of the route,
2. setting up of a numerical situation-height model of the area on the basis of both photogrametrical and techametrical data,
3. computing of both lateral and longitudinal profiles on the basis of the numerical model of the area,
4. calculation of data as concerns elevation of the axis in the area.

Geodetical Blueprint of Designing Route

Linking of the axis of designed route to the points of area range point network, being the geodetical warp of designed route by means of coordinates is one of the new elements in road design tested during the design of the route Warsaw-katowice.

The geodetical data of the site range set up in the area at the vicinity of the road axis along its whole itinerary, elaborated for the design route gives the possibility of a rapid and fairly precise reproduction of the designed route in the area, even in the case of introduction of eventual changes in its itinerary at a further stage.

The assumed geodetical "wrap" gives the possibility of determining and stabilizing an arbitrary number of points facilitating reproduction not only of the route but of other characteristic points of the whole road trunk, as well.

The route itinerary designed in continuous circular curves with long rays, can be reproduced in the area, owing to the assumed geodetical pattern fairly quickly and precisely with help of coordinates, the characteristic points of its passage giving the possibility of being of an arbitrary density, depending on both needs and relief of the area.

As concerns the Piotrków-Częstochowa itinerary of the road, the executor was given, together with the design, the coordinates of the points located at the axis of the route at a distance of 40 metres the one from the other, as well as all the points characteristic for this road such as the beginning and the end of the curve, the beginning and the end of engineering object, the axes of cross roads, points characteristic for cross roads, roadway edges localization and the like.

The coordinates of points can be, according to executor's need, completed by data concerning the points arbitrarily condensed.

The technical-site points set up in the area at every 200-250 metres approximately, as well as the data achieved from programming and concerning the elevation of the axis of designed route in the area enable it for a geodetic service of the route under construction both efficient and fairly precised.

The technical site points are designed, in the same time, as height guiding marks for the route.

A project designed in this way assures a proper carrying out of work connected with the situation-height reproduction of designed route in the area.

Moreover it makes it possible, as well, to exercise a control of the carried out operations and of their correspondence with the know-how data quickly and, principally with no errors.

Automation of Calculations in Road Designing

Application of a computer for design calculations and the choice of technological process for data elaboration have been preceded by an analysis of conditions existing in this respect.

The analysis concerned the up-dated possibilities of using computers in the process of both highways and superhighways design, the libraries of computers IBM 360, JCL- series 1.000 and ODRA 1304 and 1204 being taken into consideration.

A detailed analysis of programmes concerning geodetic aspect, reproduction of the numerical model of area as well as of road-concerning problems, taken as a whole, gave the possibility of becoming interested in the set of programmes ICES ROADS and HIDES because of big possibilities for system automation of design calculations.

Intensive work has been initiated in order to popularize application of programmes CUT and FIIL which give the possibility of carrying out the design calculations concerning shaping of longitudinal profile variant call line and of lateral profiles together with calculations concerning the amount of earth work, surface, planting and humus inserting, as well as the COGO programme concerning the geometrical design of the route.

The above-mentioned programmes gave, moreover, the possibilities of conservation of the calculation sets enabling it for cyclical improvement of the project, i.e. for variant possibilities for road calculation owing of the changes introduced in the primary task, preserved on a magnetic band.

Of a certain meaning is, moreover the fact that the programmes under consideration could be implemented directly on Polish computers ODRA, series 1.300 - which are the most popular and most easily accessible.

The sets of the above-mentioned programmes have been used for design of the Warsaw-Katowice route.

7. Ending

The possibilities of road-project elaborating on the basis of photogrametrical patterns and with use of a numerical model of the area has a decisive impact on improvement of the quality of designed roads. Application of up-to-date techniques assures a much better recognition of the area which results in the fact that, owing to the application of the electronic computing technique it is possible to apply much more often, the variant solutions, concerning both the plan and the profile as compared with traditional methods.

One variant was, at most, executed in the envisaged time by means of traditional methods, with a fragmentary completion of alternatives. owing to the up-to-date technique, 3-5 variants have been executed on the average, giving the possibility of selecting the optimum solution.

Application of an up-to-date technique of the know-how, elaboration /taking an example of the Katowice road / gave the possibility of:

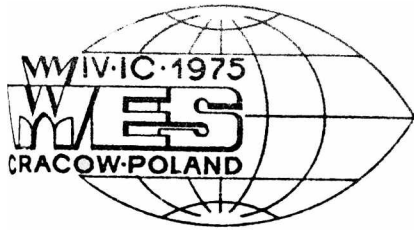
- shortening the cycle of the know-how elaboration, -by 45 per cent,
- drop in the, cost of the know-how elaboration - by 15 per cent,
- drop in investment cost by 12 per cent.

Summing up, the up-to-date methods of design, elaborated on the basis of example of the Warsaw-Katowice route have passed their exams in practice. They have given the possibility of obtaining big technical-economic effects resulting from the shorter time needed for the know-how preparation, increase in its scope and rate of precision as well as possibilities of obtaining optimal solutions both technical, and concerning traffic and exploitation of the designed road.

The following effects of the system under consideration should be considered as original scientific and technical achievements:

- elaboration of the method of transforming cartographic information into a digital form,
- elaboration of digital model of the area, giving the possibility of a full carrying out of the further complete operations in road design,
- abandoning of the former system of geometrical design in a linear-angle form and adopting of rectangular coordinates making it easier to reproduce the pattern of route design in the area and organisation of implementing work, connected with carrying out of particular operations.

Finally, a conclusion general in character should be added, namely that within the system man-machine a computer accepts perfectly the quantitative load being unable, however to exercise any conceptual operation. It is, thus, for this reason that carrying out of a design with help of a computer requires that the task be given to a designer of a high professional standing.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Halina Mortimer- Szymczak

FEMININE OCCUPATIONAL WORK IN A SOCIALIST STATE

Section 1: Contemporary sociological problems of women engineers and scientists

Printed according
to the author's original

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FEMININE OCCUPATIONAL WORK IN A SOCIALIST SITATE
/ Selected Problems/

The occupational work of women has become a general phenomenon in almost all the societies, thus, it has gained the approval. It is considered as a socio-economic integral factor in the role of women which means that there is no objection as concerns women's right to undertake an. occupational work. For years, the occupational work of women has been subject to investigations carried out by experts in various fields. The socialist economy provides conditions particularly favourable for research of this type. This is the reason for which it seems to me that nowadays, the above-mentioned research should embrace a scope unusually broad, being carried out in many directions and under various angles.

Linking of occupational work with maternal and family duties is connected with problems of economic, demographic, social, legal, medical and of other character. Feminine work as a massscale phenomenon and under the conditions of a new regime imposes the necessity of being well acquainted with the scope of this problem. Scientific research concerning the position, role and motives for which the occupational work is undertaken, as well as

other types of research concerning women - are undertaken on a broad scale in socialist states.

Let me draw your attention, in this paper, to some, aspects of the above-mentioned research. Our socialist countries - I take Poland as an example - dispose of large statistics concerning work of citizens, including- of course - feminine work.

In addition to the general statistical data / under the form of Statistical Yearly books published by the Main Statistical Office / There appear in Poland, from time to time, statistical data concerning the problem of interest to us, namely: yearly statistical data on work, which give a wide review of problems concerning employment, wages, professional skill, formation in crosscuts of sex, age, as well as on regional level. There are publications on family budgets, including indications on women's incomes and their share in the common family budget. Personally I consider as an achievement the statistical publication concerning exclusively women, under the title: "Woman in Poland in the period 1945-1965. Its new edition has recently appeared, comprising the next decade, i.e. the period up to 1975.

Its rich factography gives the possibility of grasp the occurring tendencies and of confirming the appropriateness of measures that have been undertaken by both political and State authorities, as well as of tracing the further directions of economic, and first of all, of social policy. Of particular importance is observation of emergence of the eventual disproportions, difficulties or consequences of wrong decisions aiming at their removal or diminishing as quickly as possible.

Science has a field particularly wide in this respect. The investigations undertaken in Poland on feminine work is fairly

universal. Let me talk only about some of them, the ones which are most closely connected with me, and in which I have directly participated, because of my occupational work, or because they are carried out by the group of my close co-workers. This is, then, not an enumeration or a review of problems but only a selection and an example illustrating the problem. The problem of feminine activeness from the occupational point of view is one of the problems subject to broad investigation. The level is fairly differentiated in this respect, being, as we observe, the highest in the Soviet Union, than in the German Democratic Republic and in Czechoslovakia. The high rate of activity in work is observed in Poland. It is - of course - differentiated as anywhere depending on age group, number of children in the family and also of civic status. There is a common tendency in this respect in the socialist States, namely: a continuous and systematic increase of women's occupational activity which is the result of both political and socio economic transformations. The detailed analyses make it possible to indicate further specific tendencies, However, I think that they also will find a confirmation in the socialist, States, namely:

1. -an increase in women's occupational activity occurs in all the age groups;
2. -Levelling of the occupational activities of women in the big- city and small-town agglomerations is parallel to economic growth;
3. -Implementation of both social and educational policy brings smoothing away of differences in women' s occupational activeness / *both* with children and having no children/,
4. -We observe a certain drop of the occupational activeness of women in families having many children, however, this refers

to young women only. In the older groups of age we observe the return of women to occupational work, once the children are brought up.

The analyses under consideration give the possibility of seeing that demographic transformations play a serious role in addition to both economic and social factors.

Speaking about the growth on women's occupational activeness, it should be borne in mind, that this growth is not unlimited and that women fulfill other duties equally important and needed, and resulting from their role in the family. The increase in women's activeness has its ceiling which should not be overpassed. Women's duties in the household can neither be infinitely increasing. These are the problems of concern from the part of politicians as well as of scientists, searching for proper pattern of feminine employment, for an appropriate model of education and teaching, for a new family model, based on partnership of wife and husband.

This is the research carried out in Poland on country's scale, however I take the liberty of mentioning special investigations into the position of women that are carried out in a big-city agglomeration unique from various points of view. This is the agglomeration typical of the light industry and textile industry, around the city of Łódź of 800 thousand inhabitants, the agglomeration itself, having 1.300 thousand inhabitants. This is the centre of the greatest concentration of feminine work. Analyses that are carried there can be of use for other industrial centres and, in my view, they can be a contribution to the research surpassing the boundaries of this State.

The agglomeration of Łódź represents the highest rate of women's activeness, The activeness indice concerning women wor-

king outside agriculture amounted in Poland, in 1970, to 49 per cent, amounting, in the agglomeration under investigation, to 57 percentage groups 15-59, 60 and more. The share of women in the population active professionally outside agriculture, amounted in Poland, in 1970, to 40 per cent, and in Łódź, alone, to 49 per cent, being the highest as compared to all the big cities in Poland. By way of example, in Wrocław it represented 48 per cent, in Cracow - 45 per cent, in Wrocław - 46 per cent etc.

The territorial differentiation in women's occupational work sometimes requires various solutions which should, first of all, go in the following directions:

1. - Proper distribution of productive forces in the country,
2. - differentiation according to sections and branches of economy,
3. - preventing, as much as possible, the creation of industrial mono-cultures, then, ipso facto, construction of industries assuring work to men and women,
4. - multilateral and uniform development of educational, cultural and social centres,
5. - proper structure of education, assuming the concordance between the demand declared by national economy and qualifications achieved through education.

Women's employment has been also subject to our analyses. These problems are, of course, included, in the whole of the economic policy of the State. A number of questions emerge, for which there is always lack of full solution. First of all: what are the reasons of the definite work division between women and men? What are the factors on which depend the share of women in particular branches of economy, industries and enterprises; whether there exist occupations and types of work typical of women and those

typical of men? what are the reasons of wage- gap between women and men;- what are the motives of undertaking the occupational work? what are the vocational skills of women? what are the possibilities of improving them?

The high rate of activeness is noted in big-city agglomerations, which is, often, the consequence of the feminization of such centres. By way of example: in Poland there are 105 women for each, 100 men, in the Łódź agglomeration this proportion is 115/100. The high indices of occupational activity are certainly positive. They reflect the engagement of the woman in social life of the country, being, moreover, positive from economic point of view, possibilities of finding work and increasing of the material well-being of the family. There are however, difficult aspects, as well. They often result from an improper economic structure of big urban conglomeration, or a structure which has been crystallized historically, for instance, domination of textile industry which employs women on the mass scale. It often happens, that work is undertaken in early youth, with no proper formation of occupational skill, and low qualifications. Such a situation brings, in consequence, low incomes for a definite group of women, making more difficult improving of qualifications in mature age which can be achieved without interruption of occupational work.

Textile industry which is dominant in the agglomeration under investigation, employs 65 per cent women, garment industry employing 80 per cent and knitting- stocking industry - 72 per cent. These industries, because of their importance in the investigated agglomeration, decide upon the general character of the living standard of the population. It is for this reason that there is the necessity of transforming, there the economic structure and

the projects as well as implementation of socio-economic plans go in this direction. As concerns the industries with a low rate of employed women, they belong to heavy industries: production of: both electric and heating energy, fuels, machinery and. construction, transportation means, and electrotechnical industry: The above-indicated structures are observed in the majority of Polish towns.

Then, we observe the phenomenon of concentration of women in economic divisions with lower wages / which is by no means unanimous with less exhaustive work and, as concerns industry, also in the branches with relatively lower wages, i.e. in the light industry in order to explain this phenomenon, it is necessary to determine the historical shaping of the role of women in the society, the history of her emancipation, struggle for work, for acquisition of professional skill and qualifications. It is certainly the problem requiring further scientific research from the part of economists and sociologists. The determination of woman's place in economic divisions and industrial branches is related to her general education and vocational formation. We observe a differentiation in this respect in various regions of the country, first of all, in big cities.

Among certain tendencies typical of employment are the following:

1. - In the period of several scores of years a more rapid increase in women's employment as compared to that of men could be observed in the groups with higher education as well as in these with general, vocational. Of course, the relative increases are at stake in this respect not the absolute figures. This is a result of women's access to schools, especially of young girls to higher schools as well as to the secondary vocational schools of various types. However, there is always a preponderance of men as con-

cerns education of these types.

2. - There has occurred the levelling of the employment rate of men and women who have the grammar- school level of education, while the share of women with unfinished grammar-school education has decreased /the latter case concerns, first of all, women in the older age groups/.

3. - We note the ever greater approachment of the proper proportions between the choice of occupation and specialization and learning, on the one hand, and the need of national economy as concerns particular specializations, on the other hand. Thus personal aspirations and socio economic need are satisfied.

It happens the traditional opinions play the role in decision-making concerning the profession. Some of occupations are considered as typically feminine, for instance a nurse, kindergarten nurse, teacher. It would be even difficult to find in Polish a corresponding word for kindergarten nurse for man. We can use the word however this is an occupation which has almost disappeared as concerns men. Why?

The division into boys and girls within the framework of acquiring general secondary or vocational education begin to spread over higher education. The humanistic studies or the so called proper sciences at universities that lead to teaching profession are undertaken, first of all, by women, polytechnical studies being mainly men' s choice. The consequences are the same as in the case of secondary schooling: a division into women' s occupations with less pay and better paid men' s occupations. The higher school graduation diploma does not completely smooth away, so far, - the differences in wages which are so strongly connected

with the sex represented..

As concerns qualifications, attention should be drawn not only on the efforts on educational authorities but on the atmosphere and conditions in the enterprises of work. It still happens; that there is a lack of good will or of willingness to employ women at posts suitable for them.

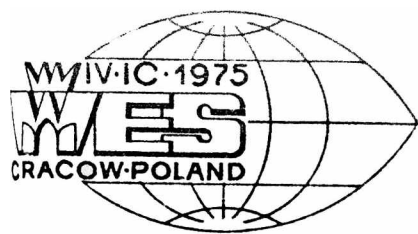
The occupational work of women has become in Poland an irreversible fact. The problem is, then, not whether women should work or not, but how to organise the occupational work of women in order that the constitutional postulates on equal rights be implemented in everyday life. It is for this reason that a particular importance is attached by us to the new family model based on partnership, common work both in and outside home, common upbringing of children, common house-keeping and common responsibility for family's fate.

We arrest our attention on the problem to what extent the function of children upbringing can be taken over by the State through the development of the network of schools-dispensaries. Proper solution of these aspects is possible in a socialist society highly developed and on the high level of economic development, and a high level of culture, living and social culture. Many times, at conferences and in publications, I have been putting forward the postulate of increasing means for development of scientific-research centres in the socialist States, dealing with problems of working women. I think that they can be very well the independent research institutes, being of help in tracing the guidelines of social policy.

Combining of efforts, in this respect, of feminine organizations in various countries would give the possibility of exchan-

ging mutual experiences and look, from under a new angle, at the achievements and difficulties that still exist.

I also support the postulate of including research concerning women's work into the work of the CMEA / Council of Mutual Economic Assistance/. We should take into consideration the possibility of setting up the division or at least a small working group within the C.M.E.A. which would deal exclusively with research concerning the socio occupational situation of woman in various countries.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Roshan J. Begum
Kamala Balaraman

CONTEMPORARY SOCIOLOGI- CAL PROBLEMS OF WOMEN ENGINEERS AND SCIENTISTS IN INDIA

**Section 1: Contemporary sociological
problems of women engineers
and scientists.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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CONTEMPORARY SOCIOLOGICAL PROBLEMS OF WOMEN ENGINEERS AND SCIENTISTS IN INDIA

The tremendous progress made by women in Free India in all walks of life including Science and Technology can best be appreciated by taking a peep into the history of this vast country where different religions and cultures have intermingled freely. The earliest vedic age was a glorious period for the Indian women. They were free, enlightened and enjoyed more or less equal rights with men. Famous women-philosophers like Gargi and Maitreyi competed with men and even did better than them. But soon, Manu, the priest, created Unequal rights for men and women. He put women under the legal tutelage of father before marriage and husband thereafter. In the 8th Century frequent wars and invasions created an atmosphere of unrest and the status of women began, to deteriorate still further. Child marriage became a well established practice and women were removed further and further from knowledge and learning. Gradually Indian women came to occupy a position of subjugation and were denied even the basic human rights and privileges.

Female education was almost non-existent till the early 19th Century. In a few aristocratic houses girls were instructed by private tutors. The first school for native girls were opened by Rev, May in 1819 which was followed by a handful of others, but the efforts of the misstarries did not prove successful because of prejudices which had pervaded the society all over the country. It was only toward the end of 19th century that a new spirit was infused in our static, tradition bound society by a band of fearless social reformers. The first of them was Raja Ram Mohan Roy of Bengal who was the initiator of the Indian Renaissance. He was a product of Hindu-Muslim culture and was deeply aware of the gifts that the West had to offer. Because of his agitation the sati system-the immolation of women on the funeral pyre of their husbands-was prohibited by the Government in 1830. Justice Mahadev Govinda Ranade in Bombay and Swami Daranand Saraswati in the Punjab started similar agitations and all of them tried very hard to reform the society and purge it from evils like child marriage and enforced widowhood. Later on, the emancipation of women became an important factor in the programme of many social reformers like Keshab Chandra Sen, Iswar Chandra Vidyasagar, Gopal Krishna Gokhale, Dadabhai Naoroji, Lokmanya Tilak, Lala Lajpatrai, Mahari, shi Karve, Sivaswamy Ayyar, etc. Pandita Ramabai, herself a widow, dedicated her to the cause of the uplift of the Indian widow and the women's education.

It is important to note that the above facts relate only to Hinduism and the variations in its fold. Islam came to India around 8th Century and Christianity became widespread much later. Paradoxically, the lot of Muslim girls was no better than that of their Hindu sisters though their religion accords them equality with men in all respects. In fact the restriction on women was more than in Hindu Society. The equality is more a myth than a reality. However, Sir Syed Ahmad Khan, ancient social reformer set up Aligarh College for Muslim girls. But his influence was confined to only certain sections of the upper classes and did not even touch the urban masses, leave alone the rural population. Haji Mohamed Mohsin and Mumtas Ali succeeded better in this respect.

As a matter of fact, the most significant and greatest impetus to women's education came from the National Freedom Movement. Thousands of women came out of seclusion on hearing the clarion call of the Father of the Nation, Mahatma Gandhi. The new system of education introduced by the British also helped and even encouraged ladies to go abroad. Mrs. Annie Besant's campaigns also had a powerful influence to arouse Indian Womanhood. Once awakened, the Indian women have not fallen back into apathy. They are still on the march. There is hardly any field that has escaped their attention. They are now occupying high positions and discharging their responsibilities with dignity and efficiency.

It was only in 1877 that the University of Calcutta opened the Matriculation examination to girls. In 1883, the University of Bombay also threw open its examinations to women candidates. Post-graduate classes were opened to women by Calcutta University in 1919. Even after that women were unable to get admission in certain types of colleges like Agriculture and Engineering only because of their sex. But now there is no vocation that is debarred for a woman who wishes to enter it provided she has the requisite qualifications and merit. . The constitution of the country grants equal rights and, privileges and opportunities to its men and -women.

During the last two decades India is engaged in a gigantic task of transforming an ancient tradition-bound people into a modern nation. Science and technology have important roles in our plans and India has made considerable investment in stimulating their growth. We have today some 30 national research laboratories, about 15 agricultural and medical research centres, nearly 70 Universities and a highly sophisticated atomic energy programme. There are a number of women's Polytechnics and Industrial Training Institute which offer courses in medical laboratory technology architectural assistantship electronic and radio engineering civil electrical and electronic engineering.

etc. In these large and complex scientific and technological efforts of today, Indian women are participating actively. They have made significant contribution in the research field and helped advancement of science.

It is most unfortunate that inspite of our progressive constitution, in practice women today do not enjoy equality of status with men. Also full use is not made of the opportunities because of the prevailing socio-economic conditions. Even parents differentiate between their sons and daughters. Sons are considered more important as they are the future props of the family, whereas the daughters become members of another family after marriage. Our conservative society has not yet adjusted itself to the idea of equality which has almost been thrust upon it by our leaders. Besides, no amount of legislation can improve the status of women unless they themselves grow conscious of it. Doing no work is still considered by many ladies as a symbol of status. Only 11.9% of women in India work. Rural areas have about 28 million women workers as against 3.3 million in urban areas. In fact women working in fields in villages enjoy much more freedom and equality with men than their sisters in the towns.

In this context, it is worth comparing the rural and the urban women of India. Education, even of a primary stage, is still far beyond the reach of a village girl, whereas most girls in urban areas have greater access to schools. This is so, because of the age-old traditions and fear instilled into the Indian woman that she is inferior to the man and that it is a sin to try and equal or better him in any field. Also, social security is very poor in a village and women-folk prefer not to go out alone. This leads to the high rate of illiteracy among the village women and the consequent ignorance of their basic rights. No wonder that they are kept in the dark even now by their men-folk, because it gives them the upper hand. But as far as employment is concerned, it must be said that a village woman gets as much remuneration as her male counter part does and she is also free to work with men unlike their sisters in cities who normally do not get equal pay as men for the same job. They also have to face a lot of criticism from the society for having to work amidst men. The only common thing about women everywhere is that they have still not attained the status of equality with men in many ways.

As a part of the programme to celebrate the International Women's year, the Indian Women Scientists' Association has undertaken a survey to assess the working conditions of the women scientists and engineers in India. A preliminary study of 182 cases is presented here, The laboratories and industries covered are given in Table I, Table II

gives the break up of the cases according to their academic qualifications. Since Bhabha Atomic Research Centre constitutes the major centre that has been studied more extensively than others, the figures concerning this organisation are shown separately. There are 150 women scientists and engineers working in this Centre, but only 70 have filled in the survey questionnaire forms so far. Hence the results as well as the conclusions drawn should be considered in that light. Besides, about ninety percent of the cases are from Bombay city and thus represent only the conditions prevalent in this city and not on all India basis. Due to non-availability of funds and other unexpected reasons, the all-India survey could not be completed. However, the same is in progress and the results will be published as a report at a later date.

57% of the cases studied are married which clearly shows that these women did not study science simply to use it as a stepping stone to marriage. The family background shows that 85% were encouraged by their parents to take up a scientific career. 81% of the married ladies were encouraged by their husbands. Table III gives the motivation that was responsible for their scientific career. Though the number of women taking to science is steadily increasing yet it is only a negligible fraction of the total number of women working. For example, in the Bhabha Atomic Research Centre which employs the largest number of women scientists and has almost all the disciplines of science, only 150 are scientists out of a total of about 1000 women employees. The percentage is very much less in other institutes and industries. An appreciable number, i.e., a little more than 50%, has taken up the job because of economic necessity. But the more interesting feature is that 80% of the women have taken to science because of their keen interest in the subject and career ambition. However, the survey also showed that little help or encouragement is provided by the employers to combine a demanding career with a satisfactory family life. Table IV gives the figures concerning working mothers. The main difficulty is the care of children during the mother's absence. The cost of a resident domestic help is often prohibitive. The alternative is to send the child of pre-school age to a creche or nursery school, which are either lacking or totally inadequate. Perhaps we need to revive the joint family system where elderly relatives could look after children or it should be like the U. S. S. R. where the state provides numerous facilities to allow women to work and bring up a family.

The figures in Table V, however, are the most important and significant ones since they classify the responses regarding Job satisfaction, promotion prospects and opportunities available as compared to their male counterparts. Job satisfaction and equality with men go on decreasing with increasing years. When they are young, the girls are likely to have a status comparable to that of boys of their own age.

and qualification, but as they grow older the discrepancies increase dramatically. The social expectation - conscious or unconscious - is that women should remain in a relatively subordinate status and women in general, are not yet aggressive or ambitious enough to register their protests. Perhaps co-education from the very beginning may help to put women on an equal footing with men and uproot the theory of mental and social inferiority complex in women. Promotion prospects are extremely discouraging at all stages. Even in the junior-most group only 4 answered in affirmative though most were non-committal. It is noteworthy that not a single woman in the senior-most group gave "yes" as answer to promotion prospects. Indeed it is very difficult for any woman scientist or engineer to reach a senior position. In 1973, for the first time, Indian Science Congress elected a lady, Dr. Ashima Chatterjee as its president. She has also been honoured recently by one of our highest national awards. But such cases are extremely rare. In general it is found that many women scientists feel inhibited because their talents are not being utilised in the best manner, or, rather wasted in routine jobs.

The overall pattern still remains almost unchanged - even after 25 years of independence. Women have to work hard to dispel the myth that women cannot be expected to undertake really demanding professional position. By their manner of working and their scientific integrity, women should be able to convince everyone that they can be as capable as men in the pursuit of research in pure sciences or even better. They have to fight for their rights without forgetting their duties and responsibilities. Women in India have been given a position of status, but they still await recognition in the intellectual, scientific and other academic achievements.

ACKNOWLEDGEMENTS

The authors wish to thank Dr. V. A. Kamath of the Bhabha Atomic research Centre, for his kind help and Miss Jayashree Dighe for having typed the paper.

TABLE I: Number of Cases Studied
Institute of Industry

	<u>Number</u>
Bhabha Atomic Research Centre	70
Tata Institute of Fundamental Research	16
Pfizer Ltd.	9
Cancer Research Institute	8
Institute of Hotel Management, Catering Technology and Applied Nutrition	8
University Department of Chemical Technology	7
Ciba – Geigy of India Ltd.	7
The Bombay College of Pharmacy	6
P.G. Institute of Medical Sciences	5
Raptakos, Brett and Co.	5
Bombay University	5
Institute for Research in Reproduction	2
Hindustan Lever Research Centre	9

Total	182

TABLE II. Number vs. Qualification

<u>Qualification</u>	<u>General</u>	<u>B.A.P.C.</u>	<u>Total</u>
B.Sc.	53	19	72
M.Sc.	37	34	71
Ph.D.	15	11	26
M.D.	2	1	3
Engineers	-	3	3
Others	5	2	7

TABLE III. Motivation Behind Career

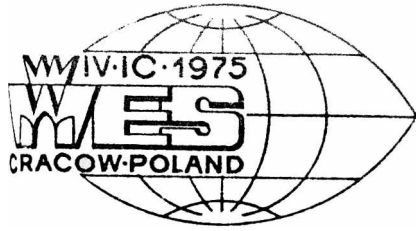
	Financial Need			Career Ambition			Keen Interne		
	Yes	No	Neutral	Yes	No	Neutral	Yes	No	Neutral
B.A.R.C.	43	13	14	52	4	14	53	7	10
General	57	20	35	83	7	17	81	8	23

TABLE IV. Working Mothers

	Total No. of cases	Married	Married with children	Problems with children		
				Yes	No	Neutral
B.A.R.C. General	70	49	37	18	7	12
	112	56	34	12	8	14

TABLE V. Job Conditions

Experience Group	Job Satisfaction			Promotion Prospect			Equality with men		
	Yes	No	Neutral	Yes	No	Neutral	Yes	No	Neutral
0-5 years									
B.A.R.C.	16	5	2	3	8	11	17	5	1
General	34	11	13	1	13	42	40	10	7
6-10 years									
B.A.R.C.	16	2	-	5	4	9	15	3	-
General	11	6	2	1	13	5	15	2	2
11-15 years									
B.A.R.C.	5	4	1	-	7	3	3	6	1
General	8	6	1	5	8	2	8	4	3
Above 15 years									
B.A.R.C.	5	3	1	-	5	4	4	4	1
General	9	4	1	-	9	4	7	8	-



**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Evelyn M. E. Murrey- Lenthall

**THE EFFECT OF LEGISLATION
ON THE STATUS OF WOMEN IN
THE WORK FORCE**

**Section 1: Contemporary sociological
problems of women engineers
and scientists.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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She is a member of the Society of Women Engineers (U. S.), the Women's Engineering Society (U. K.), and Associate Member of the Institute of Physics (U. K.) and member of the American Society for Personnel Administration (U.S.). She is now Section Representative for the Boston Section of SWE, having been Chairman for two years, and is a Vice-Chairman of the Massachusetts Engineers Council. She is listed in The World's Who's Who for Women.

THE EFFECT OF LEGISLATION ON THE STATUS OF WOMEN IN THE WORK FORCE

INTRODUCTION

"While there has been some progress toward the goal of equal rights and responsibilities for men and women in recent years, there is overwhelming evidence that persistent patterns of sex discrimination permeate our social, cultural and economic life." (Senate Report, 92-689.)

These patterns of discrimination are illustrated in Table I, which shows the breakdown by occupation for women workers with the median salaries of these occupations as compared with those for men. It illustrates that the median salary for women is only 59% of men (that is, \$6335 compared with \$11,186 per year in 1973).

We can compare the commonly held beliefs or myths with the real reasons that women work. Some of these are that nine out of ten of all females will work at some point in their lives, and that for the majority, economic need is the driving influence putting very many of them into the labor force - the same reason as for men - yet most women workers are concentrated in the low-paying, dead-end jobs. The analysis of the 1970 census data shows that one out of eight families is headed by a woman, 17% of female workers are widowed, divorced, or separated, 23% are single, 8% have husbands with incomes less than \$3000 per year, and 22% have husbands with incomes between \$3000 and \$7000 per year. Thus, one may well ask what would happen if more women were in higher paid positions; wouldn't the economy be better off? The Government receives income through the payment of taxes by employed persons, but often is supporting a family (or at least contributing to its support) when the adults in the family earn less than a minimum amount. (The Government considers that poverty cutoff for a family of four is \$4500 a year. It is worth noting that if all women with husbands dropped out of the work force, it would be necessary for 20% of all families in the U. S. to go onto Welfare.

A working woman who receives a viable wage tends to spend more on services, clothes, convenience foods, etc. Thus, to discriminate against paid women workers does not in the long run serve the economic needs of employers. It is advantageous to pay female employees higher wages and thus feed the economy, rather than discriminate to the extent that in many areas the end result runs counter to the goals of the economy.

During the past several decades, as the numbers of women in the work force have increased, their median wage has decreased, and fewer women in the fifties and sixties earned masters and doctorate degrees than did in the thirties and forties. It is interesting to note that frequently a fully employed woman with a high school diploma is earning less than a fully employed man who has not completed elementary school.

Legislation that goes well beyond the Equal Pay Act has become the principal path to opening up opportunities for competent women to move into the higher paid positions and to train for the more highly skilled jobs.

LAWS ON SEX DISCRIMINATION IN EMPLOYMENT

The principal legislation presently applicable to the area of sex discrimination in employment are the Federal Civil Rights Act, Title VII; the State Laws on Fair Employment Practices; and the Equal Pay Act. In addition, there are Executive Orders relating to equal employment opportunity by Federal Contractors and the Federal Government.

The first of these, and the landmark legislation, is Title VII of the Federal Civil Rights Act (signed 1964, and amended in 1912 and 1973) which prohibits discrimination in private employment based on sex, race, color, religion, and national origin. It is administered by a five member bipartisan Equal Employment Opportunity Commission, appointed by the President. The coverage of private employers means all those with 15 or more employees, unions with 15 or more members, and employment agencies dealing with 15 or more persons. The 1972 amendment covers all employees of educational institutions, State, and Local governments. It deals with the hiring, discharging, wages, benefits, and other privileges of employment and includes the advertising for workers as well as in any training or apprenticeship programs. The EEOC has the authority to bring suit in an appropriate Federal district court if conciliation efforts are not successful, and the Civil Service Commission has been given additional power to enforce EEO for Federal employees.

Thirty-seven states, the District of Columbia, and Puerto Rico have mandatory fair employment practices laws; twenty-one of these and the District of Columbia prohibit discrimination based on sex. Usually, the employment practices prohibited are the same as those prohibited by Federal law. These State laws conflict in many cases with existing State protective laws, which although originally designed to protect women workers can deny them certain employment opportunities. Several states now have rulings on this, in many cases upholding these protection laws - but for all workers instead of restricting the protection to women. 1, 2

Executive Order 11246, as amended by Executive Order 11375, prohibits discrimination on the basis of sex by Federal contractors and subcontractors and on Federally assisted construction projects. Under these orders, all Federal contractors and subcontractor must institute an Affirmative Action Plan which outlines their goals and methods for increasing the numbers of women and minorities in the different job categories, based on the available known pools. It also covers the many aspects of a person's employment, such as hiring, promotion, transfer, layoff, rates of pay, training, etc. The Office of Federal Contract Compliance enforces these Orders (HEW is the compliance agency for Educational Institutions), and Guidelines have been issued outlining the responsibilities of the contractor.

The Federal Equal Pay ACT enacted in 1963, is an amendment to the Fair Labor Standards Act. It prohibits discrimination on the basis of sex in the payment of wages for equal work. It was extended in 1972

and now covers all workers except those in small retail and service establishments and certain Public employees. The U. S. Department of Labor, through the Wages and Hour Division, administers the Act, bringing suit in Federal District Court on behalf of employee's.

There has been a steady growth of court decisions to support these laws and orders. For example, a Federal Appellate Court held that women performing work which is "substantially" equal to that of men should receive equal pay³. This decision was upheld by the Supreme Court who denied review, thus making this a landmark decision for suits over pay discrimination.

The Equal Rights Amendment passed in 1972 by Congress is struggling through the Ratification process. Two-thirds of the 50 States must ratify within seven years of initial passage before it may become an Amendment to the U. S. Constitution. The ERA states that "Equality of rights under the law shall not be denied or abridged by the United States or by any State on account of sex"⁴. Its intention is to have the law treat women and men equally, but would not interfere with the family structure, life, styles, and social relationships. Its main effect would be in areas of employment and education, and married women would be able to engage in business as freely as men.

CHANGES IN THE STATUS OF WOMEN SINCE 1964

1. The Equal Employment Opportunity Commission (EEOC)

The EEOC has been in existence for over ten years, during which time its budget has grown from \$2. 25M in FY 1965 to over \$50M in FY 1975. Job discrimination charges have risen from 8854 in 1966 to about 58,000 in 1974. Substantial progress has been made against discriminatory practices in the work place, and it cannot be argued that the complaints are trivial - of the 175,000 complaints investigated, reasonable cause was found in 63%.

The EEOC issued guidelines in 1960, and these are presently being updated. They give guidance in such matters as bona fide occupation qualifications, the treatment of marital status, advertising of positions open, benefits, pregnancy, etc. The Commission investigates complaints and attempts conciliation; if the complaints are justified and conciliation fails, the Commission files a lawsuit on behalf of the individuals bringing the complaint. In addition, the EEOC will assist any employer in the preparation of its Affirmative Action Plan.

2. Affirmative Action Plans

The EEOC has published a Handbook⁵ for employers that outlines the basic steps toward developing an AAP. It includes such items as the appointment of a management person as the EO officer who will be responsible for implementation of the Plan. Suggestions are given about publicizing the commitment to the plan by Management, and how to survey women and minorities by department and job classifications, together with methods for developing goals and a timetable toward improving areas of underutilization. In addition, suggestions are made for implementing programs to achieve these goals, both through hiring and by career advancement or job mobility within the company.

The greatest confusion lies with the "pools and goals." It means looking at the available pool of men and women in a particular job category and the structure of the work force within the area. As the available pool increases, then the company must increase its goals by a similar amount.

One particularly good aspect of the AAP is the requirement to survey the job classifications and search out cases of under-utilization of employees. This has resulted in some rapid promotions for women, with the consequent higher pay and status. It is also necessary to review categories with large numbers of female employees and to set goals for hiring men into these same areas. Both benefits and salaries must be the same for all workers doing substantially similar work, and consideration must be given to hiring the "qualifiable as well as the qualified," that is, being prepared to train on the job. Job descriptions should ask only for the qualifications necessary for the position, and no more. The EEOC suggests that employers train their supervisors and managers so that they are aware of the implications of Affirmative Action. EEOC Commissioner Telles in a speech to members of the American Society for Personnel Administration pointed out that guidelines alone won't solve the problem, and all the affirmative action plans and pledges will be so many "empty words" unless it is made clear to employees at all levels that equal opportunity is backed up by top management's personal conviction and commitment.

3. Case Studies

There have been many pay awards within the last 3 to 5 years, including the well publicized one awarding back pay and pay increases for employees of the Bell Telephone Company. A fairly new ruling affecting job advancement is very far reaching and is presently under appeal⁷. The judge ruled that American Brands of Richmond, Virginia, had discriminated against women and blacks in its cigarette and pipe tobacco plants. In order to rectify the situation, the company is barred from hiring anyone but women and blacks into supervisory positions until the percentages equal those of the Richmond area work force, and a "bumping" system is to be instituted. This idea was requested by the employees, bringing the suit. It means that women and minorities may replace any production-line worker with less seniority, providing that after a reasonable time they show that they can do the job.

4. Changes in the State Labor Laws for Women

The repeal of many of the State Protection Laws has resulted in a broadening of many of these to include both men and women. The EEOC Guidelines stated that these laws were discriminatory as they did not take into account individual preferences and abilities. Instead of just repealing the maximum hours laws, seven states have passed laws that limit working hours for all employees. Thus, the standards for working conditions are being improved for all workers as a result of Title VII. Overlong hours of work are being limited by requiring premium overtime rates to be paid for all workers, and this is now the case in 19 states. Both men and women are pressing for voluntary, instead of mandatory, overtime in union contracts, and for more flexible working hours. In Massachusetts, for example, meal periods used to be required only for women workers; now all employees working more than

six hours a day must be given a 30-minute break⁸.

5. Growth of Women into the Professions

Overall, there has been a steady increase in the numbers of women entering the so-called nontraditional professions, especially within the past five years. In this time period, the percentage of women in engineering has doubled - from 1 to 2 percent. What is more promising is that the number of women now studying in Engineering Schools equals the number actively working as engineers. At M.I.T. the number of women graduate students in 1971 was 260; in 1974 it was 405 – the largest percentage increases being in the, Chemical Engineering School (12 students, an increase of 300%), and in the Sloan School of Management (increasing from 14 to 44 women students). It is worth bearing in mind, however, that the total enrollment, at the Graduate level was 3250 in 1972 and 3468 in 1974. In other words there have been increases, but they are still small, and it will be many years before the available pool of highly qualified women is truly significant.

Employment conditions for most women in Science and Engineering have improved in many areas. Women in engineering disciplines often receive twice as many offers upon graduation compared with men, and these offers usually are for a few dollars a month more. In the Federal Government, there has been a 10% decline in the number of women in the lower-grade levels (GS 5 to 11), compared with a drop of 6.7% in the number of men. Alternatively, there are 7.2% more women in grades GS 12 and 13, whereas there are 3.3% more men. In the highest grades (14, 15, and above), there have been very small increases in the number of women. Salaries are still lower, however; the 500 women scientists and engineers average \$17,700 or 82% of the \$21,600 average earned by the 83,800 men in Federal Government employment.

6. Maternity Leave

One of the reasons given in the past against hiring a woman or promoting her is that she will only leave to have a baby. The EEOC has issued guidelines that suggest treating pregnancy as a temporary disability⁹. This is a much debated issue, and the outcome of several court cases will hopefully clarify the situation. It had been the customary practice to require that a woman would be terminated at some well defined point in her pregnancy. Some professional women managed to avoid this and continue working, but it was usually impossible to avoid termination in the non-exempt levels. Now the trend is to grant up to 8 to 10 weeks leave of absence without pay, but with no loss in seniority, and with the person either returning to the same job or to one at a similar level¹⁰. A few employers will pay sick leave during the LOA if any has been accrued by the employee. The arguments against treating pregnancy as a temporary disability are first that a woman doesn't have to get pregnant, and second that it would cost a company far too much to pay disability compensation while the woman is out on leave. An interesting aside is that more and more men are requesting paternal leave of absence to help at home when their wives are having a baby.

The optimistic outcome of all the discussions will be that women can be free to choose according to necessity and personal feelings whether to continue working or to stay with their young children. Thus,

both career-oriented women and women who must work through economic need will not be faced with the discriminations associated with being the bearers of children.

7. Layoff and the Seniority System

The present recession has posed a difficult problem for those firms forced to reduce numbers of employees and at the same time keep their Affirmative Action goals in mind. The system for layoff has been one of seniority, that is, the last hired was the first fired but in many cases the most recent employees have been women and minorities.

In a recent survey by the American Society for Personnel Administration, 53 percent of the 154 companies responding said that they had been forced to implement some method of employment reduction in early 1975¹¹. Most of these companies are in manufacturing thus resulting in production and maintenance workers being the largest group laid off. Many companies stated that they had used the value and abilities of individuals as the criteria for layoff in non-union jobs. Some effort seemed to have been made to keep the Affirmative Action goals in mind, one company explaining that the percentage of minorities laid off concurs with the percentage of minorities and women in the company rather than by seniority. Nine firms had complaints, grievances or suits filed or threatened as a result of their layoff procedures.

The EEOC is presently considering the adoption of guidelines that would require employees to reduce their working hours, eliminate overtime, provide for work sharing or rotation, before instituting layoff procedures. This, they hope, would alleviate the impact of laying off the recently hired minority and women employees.

Two Federal Courts of Appeals have so far ruled in favor of the seniority system, providing that the custom does not discriminate against any particular group of people¹². The rulings are based on the argument that Congress did not intend to interfere with plant-wide bona fide seniority systems, particularly where this would involve the collective bargaining agreements with the unions. Furthermore, Title VII was not intended to have impact on established seniority rights, and to create fictional employment time for newly hired minorities and women would result in preferential treatment of these individuals. Only in cases where discriminatory practices excluded these people from particular job levels would exceptions be made. A case of this nature is *Watkins vs. United Steel*¹³ where it was ruled that employment preferences based on seniority are not to apply, as certain positions had been closed to minority employees before being forced to hire under Title VII action.

Women are definitely still being affected by these cutbacks, and are receiving more than their share of layoffs. In 1972, although women represented 37% of the workforce, they comprised nearly 46% of the unemployed. In addition, it is suspected that many unemployed women have given up looking for work and so these numbers do not appear in the monthly unemployment statistics.

LEGISLATION AND THE STATUS OF WOMEN WITHIN THE EUROPEAN COMMON MARKET COUNTRIES

The European Common Market Organization as well as some of the individual Governments within the Community have been considering new legislation to change the present status of women in the work force. Without going into detail, these range from the Sex Discrimination Bill in the United Kingdom to changes in pension schemes in Germany.

As the Sex Discrimination Bill has passed the Report Stage, it will become law on 29 December 1975. It establishes an Equal Opportunity Commission whose Chairman is to be Ms. Betty Lockwood, and the coverage appears to be fairly similar to that of Title VII. Its effectiveness will depend on resultant legal decisions and it does not change the present differences existing between men and women with respect to taxes and social security. The draft directive issued in February 1975 by the European Commission would compel Common Market countries to remove all barriers which discriminate against working women being designed to reinforce the Equal Pay clause in Article 119 of the Treaty of Rome. Dr. Patrick Hillery, the Commissioner for Social Affairs, on introducing the directive said that there was a "massive inertia in society over the role of women. He feels that the present education and opportunities available to women within the Community still reflect the traditional role for women. He stresses the importance of making it possible for women to have two careers - having a family and holding down a job.

The rights of the insured woman worker to equal social security benefits for herself and her dependents is being examined in these countries very carefully¹⁴. It is an area which provides difficulties for the legislator, partly as it directly conflicts with the traditional role of the husband being the sole provider for wife and children. So it appears that employed women will continue to receive less social security benefits for some time to come in Europe, and in addition will have her job description carefully structured so that her pay packet will remain less than that of a man with similar qualifications.

CONCLUSION

Certainly it appears that in the professional areas there have been noticeable improvements during the past ten years. This is indicated by the larger numbers of women in enrollment in schools of Engineering, Sciences and Medicine. The increased budget of the EEOC shows that the Administration is determined to make equal opportunity come to pass. The Department of Labor is allotting some \$3. 9M to administer the Equal Pay Act in 1975, as it estimates that \$9. 1M in illegally withheld wages will be recovered by this effort. Thus, 44,000 employees, primarily women, will receive this money; in addition, another \$13. 7M of their annual future income will be assured.

Employers with Federal contracts are very aware of the Department of Labor's Office of Federal Contract Compliance. This Office monitors 250,000 contractors, and so far has penalized nine for non compliance. Not only does it penalize, however, it can reward. Part of the Rockwell International Corporation's success in winning the \$2.6 billion space shuttle contract is believed to be due to fulfilling its

Affirmative Action goals. As highly qualified women are hard to find, companies are funding college programs and are awarding scholarships to young women to help them study engineering or management. Howard Lockwood, the head of Personnel at Lockheed, says that Affirmative Action has done its job: "Without Government surveillance, we certainly wouldn't have gone this much out of our way." Managers, are being sent to training sessions to learn about Affirmative Action, and to be sensitized to the overt forms of discrimination. The bureaucratic nature of Government surveillance is a negative aspect of the process, such as the paper work required by the different compliance agencies, and many more records must be kept by the employers.

As women have moved into better paying and more interesting jobs, it has been found that their average quitting rate, absences and days out sick have dropped. It now seems that the figures for both men and women in similar jobs and age ranges do not differ appreciably¹⁵.

Much of the recent court actions brought by or on behalf of women employees have put both the employer and the union on the same side of the fence. Many unions do not yet have senior women executives and seem unaware of the changes going on around them. There are some signs of change, however; one of the largest unions, the United Automobile Workers, now has a women's department, and there recently has been several State AFL-CIO women's conferences¹⁶. Women union members are beginning to show a desire to gain access to top leadership positions within the unions.

In conclusion, I would add that it takes time for legislation to be effective; changes must still be made by both men and women in attitudes and behavior patterns. The working world is a tough place, and few rise to the top. Those that do, whether men or women, must be better qualified and work harder than the rest, and for many years to come a woman in management must be more dedicated than her male colleague. The aim of the legislation is to make the work place a fairer and more equitable place for all workers, and in the main it is being quite successful.

TABLE I

**COMPARISON OF MEDIAN EARNINGS OF FULL-TIME WORKERS
BY NON-FARM OCCUPATION AND SEX**

Major Occupational Group	Percent Women	Percent Men	Median Wages/Salary (\$U.S.)	
			Women	Men
Clerical Workers	34	7	6,458	10,619
Service Workers Outside the Home	17	8	4,745	8,112
Professional and Technical Workers (nurses, teachers, etc.)	15	14	9,095	13,945
Operatives (including transport)	14	19	5,420	9,481
Sales Workers	7	6	4,674	12,031
Managers and Administrators	5	14	7,998	14,737
Private Household Workers	4	<0.2	2,243	-
Craft Workers	} <4	21	6,315	11 ,308
Non-farm laborers		8	5,286	8,037

Note:

Data compiled from U.S. Department of Labor, Women's Bureau Tables. Data published by the Bureau of the Census, U.S. Department of Commerce.

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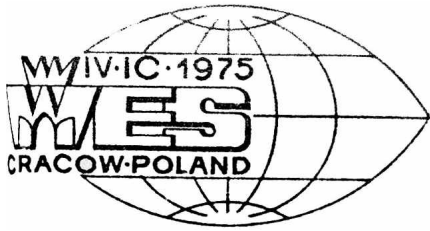
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**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Wilma Smith

**THE NECESSITY OF THE
COMBINED EFFORTS OF
THE ENGINEER AND
OTHER PROFESSIONAL
INDIVIDUALS IN SOLVING
THE MAJOR PROBLEMS
THAT EXIST IN THE
PRESENT - DAY WORLD**

**Section 1: Contemporary sociological
problems of women engineers
and scientists.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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THE NECESSITY OF THE COMBINED EFFORTS OF THE ENGINEER AND OTHER PROFESSIONAL INDIVIDUALS IN SOLVING THE MAJOR PROBLEMS THAT EXIT IN THE PRESENT-DAY WORLD

Today's engineer must be willing to leave his or her desk, complete, laboratory at times to meet and cooperate with other professional individual, as well as to seek out their cooperation, if the major problems facing the world today are to be solved. These problems include overcrowded cities, possible worldwide food shortages, health care, energy shortage, pollution problems, and action against natural disasters.

Survival as individuals and as members of society means having enough understanding to find some solutions to the tremendous problems facing the world. We must try to find a balance between personal interests, privacy or liberty and the welfare of the people. The efforts of men and women from all areas -- including technologists, engineers, scientists, physicians, computer experts, agriculturists, sociologists, ecologists, and so on for countless others -- will be needed. Planning must be done with a total overview in mind -- not just for the narrow view of one's own professional interests.

Pollution

Much of our pollution comes from cars, incinerators, and industrial stacks. One solution would be to ban these, but we would very probably be sentencing hund of individuals to unbelievable hardships in finding transportation to the locatic of their jobs, absence of food and medicine because of no way to get the items to the consumers, and lack of heat in winter and/or air conditioning in the summer.

We surely are entitled to certain rights as far as our environment is cancer unpolluted air to breathe, a sufficient supply of water, land areas reasonably from trash and pockmarks, and hopefully freedom from irritating or even deafening noise. A certain amount of transportation is a necessity, not a luxury.

Picture a typical city apartment house. The four or five-room apartment contains a kitchen where frozen foods are stored and prepared; a living room with television; bedrooms with air condition or heat when needed; baths with fresh water; and sufficient light for whatever tasks we undertake. Over a wide range of income, we are provided with a span of conveniences unknown even to the very wealthy a few, decades ago. Yet in this same apartment house, incinerators burn rubbish and garbage from its 1000 or so inhabitants. If these are average people, 5000 pounds of rubbish appear each day. The smoke and soot from the incinerator add to the pall of smog rest over a city. The rubbish not burned is hauled away to be dumped into the nearby offshore waters, where it gradually may change marine life. Sewage from the building joins that from neighboring houses and flows through underground pipes to the ocean or nearby lake.

The air conditioners could demand so much electricity that the local electric company continues to use more and more fuel. The results could be air pollution and occasional, localized, electrical blackouts. The man-made world surrounds us -- the comforts and the pleasures, the complexity and the pollution.

Sometimes referred to as the "third pollution," solid wastes are rapidly becoming one of mankind's most critical problems. The problem is a costly one. In the U.S. There are ever increasing volumes of solid wastes resulting from increased scrap iron and steel of which about 1/3 consists of tons of derelict autos. The per capital production of household refuse grew from 2 $\frac{3}{4}$ pounds per day in 1920 to over 4 $\frac{1}{2}$ in 1965. Much can be recycled but there is still a certain amount that just keeps building up.

On the brighter side, people are becoming more and more pollution conscious and many steps have been made to combat, the problem.

Most of us take the purity of our drinking water for granted. Years ago, however, diseases, typhoid fever, cholera, and dysentery were expected from polluted water. These tragedies led to the development of water-treatment methods which can effectively control most disease producing bacteria. Our need for more and more water is making the reuse of water more common. The likelihood of one

community's water supply intake being located only a short distance downstream from another community's waste treatment plant outfall is greater than ever before. In some places where water is scarce, there is serious talk of closed systems with the waste effluent being converted directly to the drinking water supply.

As the interdependence of a used for water supply pure enough to drink, air good enough to breathe, and decrease in piled up rubbish, we must be concerned not only for safety and health for ourselves but for our neighbors as well. This means cooperation from almost all professionals -- engineers, scientists, biologists, environmentalists, ecologists and almost everyone interested in these items.

Population

Somewhere, between 1/5 and 1/2 of all the people who have ever been born since the world began are alive today. Actually, the estimates cover such a wide range because there is no way to ascertain the exact count. Only recently (comparatively) have we had actual head counts in periodic census data. It is surely true that the comparison of the world population of today with the total individuals who have lived is staggering. It is also true that many of the cities of the world are seriously overcrowded, but the solutions needed are ways to make the lives of the in the city healthier (from a physical and sociological standpoint), and happier. Very few city dwellers want to move to the country.

Actually, if every person decided at one time to "go back to nature" there be tremendous problems. One could envision disputes over certain choice spots, tremendous unhappiness over the lack of sanitary facilities, and much unhealthy conditions.

Certainly the world population grows and thinking people; in all professions should try to consider the problem. In ancient days a natural check would appear in the form of a plague, a drought, a flood, storms, etc., that would thin out overpopulated areas. We certainly do not want this type of control and so solution should be sought.

Most cities just grew. Footpaths became streets, Shops sprang up

footpaths crossed. Politics determined where the public conducted its business. Such haphazard growth spawned many of today's urban troubles -- slums, congestion, lack of parks, helter skelter placement of public buildings.

Cities should be planned/ and properly staffed. It will take many, many different types of professionals to help solve such a problem -- engineers, scientists, city managers, traffic personnel, law enforcement officers, computer analysts, transportation experts, and one could go on and on naming those who are necessary in finding solutions so that city dwellers would have adequate housing, transportation, food, heat, uncrowded/ non-depressing conditions, and other necessities of a comfortable life.

Health Care

Health care used to be entirely the domain of the physician, nurse, and at times the hospital staff. In our present-day hospital, clinic, and possibly even the doctor's office, use is made of highly sophisticated equipment -- invented and developed by the combined efforts of the engineer, the physician, chemist, mathematician, scientist, computer analyst and others. X-rays, radiation treatment, prosthetics, heart pacers, electrocardiograms, mammography, catheterization, and countless other tests and treatment are now necessary for complete health care. Often the physician needs the cooperation of the psychologist, the sociologist, or psychiatrist in order to cure the patient. Equipment such as the artificial kidney machine and the heart pacemaker have saved many lives. The computer plays a tremendous role in gathering and sorting, as well as storing, data used in test results. These items, as well as others, could never have been invented and developed without the engineer but on the other hand, the engineer could not have done it alone. In laboratories, hospitals, and engineering colleges, physicians, engineers, and other professional individuals are working together to find new ways to help care for the people who are alive today.

Safety from Natural or Man-Made Disasters

It is not by chance al- that, in the event of a devastating hurricane, tornado, or earthquake, one building withstands the force of blows from such an event while one right next to it is completely demolished. It is entirely due to good planning, design, and construction that a building is able to endure with safety a high velocity wind or earthquake. The engineer, architect, building contractor, and of course the person or organization financing the building must work together with a command goal in mind of seeing that a building is as safe as possible. Many items -- as well as design and construction -- should also be checked. For instance, a better location could be found than close proximity to a coastline that has a high probability of occurrence of some type of disaster. The proper orientation of the building against strong winds and avoidance of large areas of glass in, say, a hurricane belt should be considered. In the United States, the Defense Civil Preparedness Agency has started a program to develop a bank of knowledge for such protection. This is a new type of disaster protection planning, but thousands of persons in a great many buildings will be far safer because of such efforts. Professional individuals from many, many areas will supply bits of knowledge to keep increasing this bank of information.

Food

As the population of the world continues to grow, the food production is increasing, but at a slower rate. By 2074, the expected population of the world could be in the neighborhood of 36 billion -- about 9 times as many people as there are today. In past years, even while famine struck same places and millions went hungry or perished, there was an overall world food reserve, improperly distributed, however, and unavailable to some in greatest need, and in many of these areas, population has grown the rapidly.

One of the reasons there has not been a greater increase is that the use of pesticides has been curtailed more and more. It has been stated that without the use of DDT, the world could soon reach starvation level.

It does not take a great deal of money to buy the food necessary for survival. A person could exist on about 30 cents a day and be reasonably healthy if he or she were willing to eat wheat flour, cabbage, and hog liver day after day.

Agriculturist experts have recently begun to believe that if there should be a severe curtailment of crops because of a large-scale extended drought, a huge influx of devastating uncontrollable pests, or some other disaster that would be huge losses of crops, there may not be sufficient food for the majority of the people. What is needed is an invention that would equal the big historic breakthroughs, such as the wheel or the tractor. Such an invention and its development would need the combined efforts of the agriculturist, the scientist, the engineer, the chemist possibly, and others. Wouldn't it be a wonderful achievement of some of the women attending this convention could envision and work toward the development of such a breakthrough?

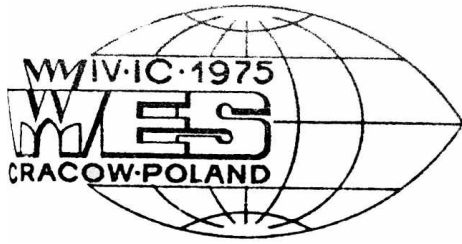
Energy

We are interested in the energy used to drive machinery in production, heat and air condition, and to transport people and materials. We are concerned with the form of energy which one extracts from natural resources -- coal, natural gas, petroleum, or nature's sources -- waterfalls, tides, winds, and sunlight, and which can then be converted to do work for us. We have curtailment on the one hand and demand on the other. Since a half dozen years are required to plan, build, and bring into operation a new plant, the energy shortage promises to be critical for some time in the future regardless of any new construction authorized now.

Many new sources of energy are being sought but so far nothing has been found that is practical and economical enough to substitute for our present sources. Most scientists feel confident that there will be some practical form of substitution by 2000 or possibly even 1985. Nuclear and solar energy seem to be the front runners at present.

Other possibilities - and many of these are actually in use -- are geo-thermal, tidal, windmills, and burning of refuse. Solutions must be planned -- not haphazard emergency measures only, and such planning is going to need the talent and efforts of ecologists, engineers, environmentalists, scientists, oceanographer, politicians, computer experts, and many, many more.

Surely some good compromise can be effected and a safe, practical, and economical substitute for present energy source can be found.



**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Lois Graham

**EDUCATION AND
EXPERIENCE IN
ENGINEERING AS
AN UNDERGRADUATE
PROGRAM FOR WOMEN**

Section 1: Contemporary sociological
problems of women engineers
and scientists.

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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Dr. Lois Graham was the first woman graduate of the oldest engineering school in U.S.A. Rensselaer Polytechnic Institute. Following a period of employment at Carrier Corporation, she came to Illinois Institute of Technology at a time when few graduate engineering schools would accept women and became the first woman in the U.S.A. to earn a Ph.D. in Mechanical Engineering. Prof. Graham is co-founder, of the Chicago Section of the Society of Women Engineers and has served as national president of the SWE. The major activity of the society is to make known through lectures, articles, and scholarships the possible role of women in engineering.

Prof. Graham's major professional activity is as a teacher and advisor. In this role, she has helped prepare thousands of students for careers in engineering. She has been active in curriculum planning with special interest in the role of the liberal arts in engineering curricula.

Dr. Graham was Assistant Chairman of the Department of Mechanical and Aerospace Engineering Department at I.I.T. from 1950 to 1970. She has served as Chairman of the Faculty Senate and is presently the I.I.T. Faculty Representative to the Faculty Advisory Board to the Illinois Board of Higher Education. She is Chairman of the I.I.T. chapter of Sigma xi.

Dr. Graham was recently appointed Associate Director for Engineering and Science of the E³ Program Center. The E³ (Education and Experience in Engineering) Program offers a project oriented self-paced education emphasizing the interaction of science and technology with social and political realities.

Prof. Graham has authored numerous papers and articles including the section on "Heat" for the fully revised 1974 edition of the, Encyclopedia Britannica.

Lois GRAHAM

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**EDUCATION AND EXPERIENCE IN ENGINEERING
AS AN UNDERGRADUATE PROGRAM FOR WOMEN**

I have always felt that the education of women as engineers should not be different from that of men and I continue to hold this view. However, I have recently become associated with a new and unique Bachelor of Science in Engineering program which I believe is particularly suited to the interests and concerns of women and which should appeal to women who never thought of engineering as a career.

The program is designed to train engineers who look at a problem in the broadest possible way and who then define problems so that they include the sociological implications as well as the economic and technical aspects.

For example, in the designing of a house to minimize energy consumption not only would one consider fenestration and insulation but one must consider also the needs of the family, their attitudes and their willingness to accept innovation.

One such instance in which the planners failed to take the people into account occurred in Africa. The troglodytes of Matmata have lived for 2000 or more years in cave dwellings scooped out from the ground. Each dwelling-unit is built around the bottom walls of a well-like excavation which is flat at the bottom and open at the top. The flat bottom serves as a courtyard with recesses in the walls for various rooms making up the dwelling. Below the courtyard a small cavern stores the little rain water that falls in the area. This water helps to increase the humidity of the relatively cool air. See figure 1.

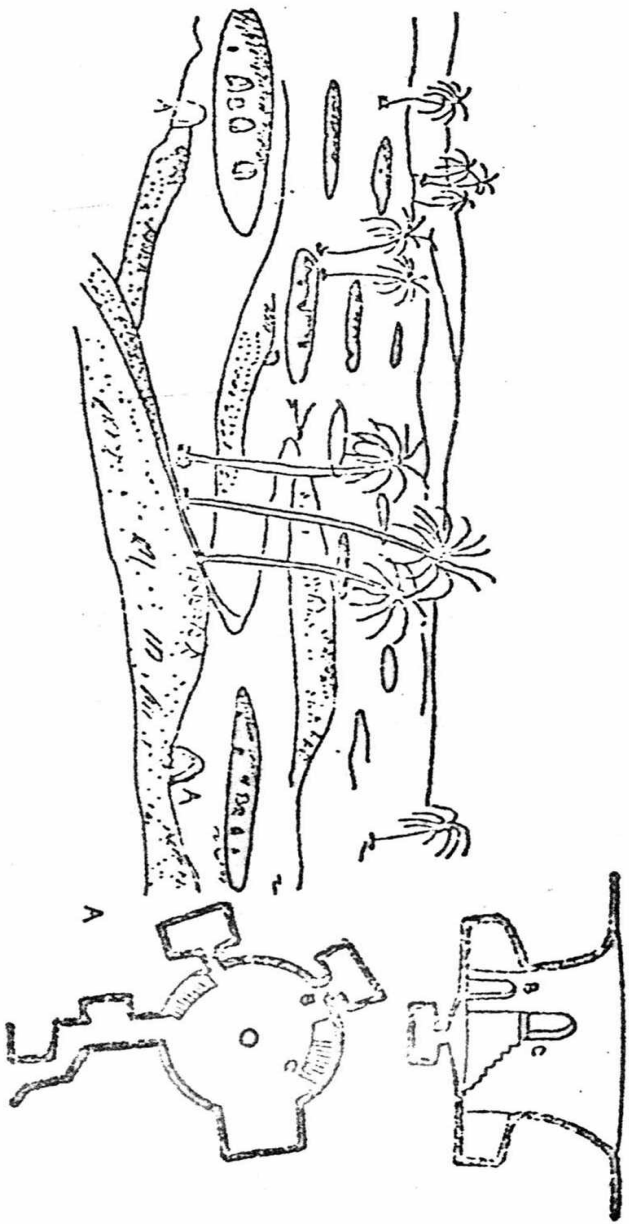


FIGURE 2 TROGLODYTE CAVE DWELLINGS VILLAGE

The Matmatas of southern Tunisia and a part of Lybia find these dwellings so well insulated against the searing desert heat and chilling desert night that they refuse to live in modern high rise housing developments which have been built for them.

In this time of increasing concern over energy consumption, we might find here a more widely applicable solution to the problems of keeping a building both warm in winter and cool in summer. What about underground or partially underground dwellings? Would the public accept them?

In Chicago a modern expressway has been proposed through the west side of the city. There has been no difficulty with the technological problems, be the road built above or below ground. The real problems are political and sociological. The people being displaced are violently opposed to this "cross-town" expressway while the remainder of the population is either neutral or in favor.

It is hardly necessary to mention the whole realm of pollution as typifying the kind of problem area in which the interactions of many disciplines are needed. Engineers Council for Professional Development defines engineering as "the profession in which knowledge of the mathematical and natural sciences gained by study, experience and practice is applied with judgement to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind." (2) The traditional attitude of the engineer is to view his job as a purely technical one; a job which admits to a responsibility to maximizing the profit of his employer but ignores the responsibility to the public unless some external restraint has been imposed.

Questions as to whether a product should be manufactured at all, say disposable cigarette lighters, are seldom considered even though the manufacture of these items use precious energy and the item itself adds to our stockpile of garbage.

In a recent discussion with engineering students in traditional programs I found that the students felt -little concern for the question of pollution as an engineering constraint except as it might be legally required. They agreed they would address themselves to such problems, however, if they were paid specifically to do so.

In the USA, it is only through government action that a greatly increased emphasis has been placed on considerations of safety and noise reduction (OSHA). Even engineering faculty fail to see the need for integration of the social sciences in engineering and feel that the need for the humanities in engineering is fulfilled by the students learning to write a technical report.

So how can we train engineers who will recognize the input of the social sciences and humanities to engineering problem definition and solution? It seems to me that women have some awareness of these concerns to start with, and, hence, are just the people we need in engineering today. It also seems possible to design an engineering program with this objective in mind.

The Bachelor of Science in Engineering program of which I spoke earlier addresses itself to the education of engineers to meet today's needs by providing a unique environment for the learning experience. The program is called E³, education and experience in engineering. During the entire four year curriculum, there are no formal classes but there is self-study

and problem identification and solution. The entire program is project oriented. Teams of four to six students representing all four years of academic achievement and two faculty members, one from science and engineering and one from the humanities and social sciences, 1. identify a problem area chosen from broad themes such as mass transportation, energy consumption, communications. Each year a new theme is chosen and a series of seminars presented in which as many different aspects of the theme area as possible are explored. The viewpoints of both outside resource people as well as university faculty from both engineering and social sciences are included. For instance, in the energy consumption theme seminar series the outside resource people included a representative of the local power company, an exponent of zero population growth, a representative of the research branch of the gas industry, a consultant in the area of nuclear power plant siting and a lawyer. Topics covered by the faculty included "Energy Flow in the sun-Earth System", "Energy Relationships in the Biosphere", "Values, Value Conflict, and Policy", "Energy and Ecology as Public Policy Issues" and "Alternative Technology, Appropriate Technology" to name a representative few.

The students and faculty formed groups similar in composition to project teams and discussed each seminar in depth. Each group member was expected to do further reading and library research. Out of this type of experience come suggestions for projects to be studied in depth.

To qualify as an E³ project, the project must have a real setting, have a definable time span, provide for scholarly activities at a variety of levels and provide the opportunity for the students to develop technical

and humanistic breadth. The suggestions for projects which have grown out of the theme seminar are now further refined. Teams of students and faculty are formed on a voluntary basis. The students acting as a team with faculty as consultants write a proposal which includes the problem identification, the proposed method of solution, an appropriate budget, and the individual study plans of the students. Through the project experience students are motivated to learn through a variety of methods; self-paced individual study "modules", seminars, faculty suggested reading. Students learn to draw on all possible resources to aid in the project solution.

Each semester the student is participating in a theme seminar one result of which is a proposal and at the same time, is also completing a previously defined project.

To carry out the project each student must acquire new knowledge. As mentioned this is done through a variety of ways. The common core material of the IIT regular engineering curriculum referred to as MSES (Mathematics, Science and Engineering Science), has been put in module format. Each module is a self-study guide covering material for which the prerequisites have been minimized and repetition eliminated.

Mastery is achieved by passing an examination on the material. Passing requires that there be no conceptual errors. Most of the original modules, and most of them have been revised, were based on texts which were then in use in the IIT common core courses. Some of the newer modules are self-contained and do not rely on texts. There are advantages for both. Frequently texts go out of print (Baltino & Wood "Thermodynamics An Introduction", for example) and yet the text based module encourages the student to build his own library. I personally

like to use several references in the modules I write. This gives the student a variety of views and approaches and helps develop his evaluative capabilities.

The student is expected to have 52 credits (40% of his or her program) in MSES. It has been found that the students have to be encouraged to start Mathematics, Physics and Chemistry Modules as soon as possible otherwise they fall seriously behind. Other methods of learning are also used such as seminars, reading courses, laboratory experimentation, and so forth.

The faculty, in particular, have difficulty adapting to the non-lecture mode of teaching used in E^3 . Unless, carefully supervised, Seminars frequently become courses. This is OK if they don't duplicate regular courses. The intent in E^3 is that guided study will become independent study, study which will continue all the student's life. The E^3 student learns by teaching others not only in the project group but by catering in module work.

The individual student's progress is monitored by the project advisor on a short term basis and by the Program Design Committee on a long term basis.

The Program Design Committee consists of four E^3 faculty and the director. It makes recommendations to ensure maximum development of the student's potential within a balanced program. Recently, the PDC advised certain students, who were not progressing at a reasonable rate, to take appropriate regular IIT courses. The final report of the project is presented by the group in written and oral form. E^3 plans to publish an E^3 Journal

on a yearly basis. This journal will include selected final reports. The ASHE paper guide is being used as the format for the journal and all final reports in the future. Project work and advanced independent study forms another 40% of the student's program. Humanities and Social Sciences complete the program (20%). As an important adjunct to all these activities, the IIT Counseling Center, conducts a group dynamics seminar for faculty and students in which team participation and management skills are emphasized. Members of the Counseling Center participate in all project teams as facilitators until it is apparent that the team is functioning effectively.

Other support activities include the E³ Graphics workshop. The accompanying slides are the product of the workshop. Students are encouraged to develop skills in the visual presentation of material in order to communicate effectively. Recently, this slide was shown at the theme seminar and the audience was given three minutes to count the triangles. I won't let you look at it that long but take a minute. You're right it's a trick. Look where the line intersects in the right hand corner. The poster - we see things differently - is the work of Gary Fadota of I.D. and was produced in the E³ workshop.

There is both internal and external evaluation in E³. The students evaluate themselves, each other and the faculty. The faculty evaluate the students and their fellow faculty members. The Review Board uses these evaluations in granting credit. The Faculty Evaluation Committee summarizes the faculty's evaluations and forwards them to the appropriate department chairman and dean.

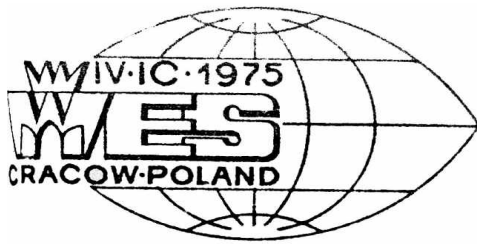
The IIT curriculum committee through its E³ Review Committee has in the

past and is not studying the program's effectiveness.

Students collaborate with the faculty in operating the program itself, from day to day functions to evaluation, planning and recruitment. This collaboration is seen as a central element of the educational process in E³.

Eight now we have two women students in the program. Both have brought a Strong sense of social awareness to their projects activities. One has already decided to spend a year as a legislative intern after graduation. It is too early to predict the impact of this educational Program and without more women students it is impossible to compare it with other more traditional engineering curricula. We are making a concerted effort to attract women to this program and I hope in another five year time I can give a more comprehensive report about the success or failure of E³ as a engineering curricula for women. (3)

- (1) Optimum Subsurface and underground Shell Structures for Better Housing in Hot-Arid Lands. Sudhir Kumar and Cheng-Chuan-Shih, April. 1970.
U.S. Army Research Office - Durham, Box CM, Duke Station, Durham, N.C.
- (2) Goals of Engineering Education, ASEE Journal 1966.
- (3) NSF Grant No. GY-93000 Experimental Approach in Undergraduate Engineering Education.



**FOURTH INTERNATIONAL CONFERENCE
OF WOMEN ENGINEERS AND SCIENTISTS**

Elizabeth Laverick

**THE EDUCATION AND
TRAINING OF PROFESSIONAL
ENGINEERS IN THE UNITED
KINGDOM AND ITS INFLEUNCE
ON WOMEN ENGINEERS**

**Section 1: Contemporary sociological
problems of women engineers
and scientists.**

Printed according
to the author's original

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Elizabeth LAVERICK – dr, read Honours Physics at the University of Durham, after spending a year at the Radio Research Station working on ionospheric propagation. She stayed on at University doing research on dielectric measurements, and obtained her PhD before moving into industry with G.E.C. Her industrial career was based on microwave engineering, and when she joined Elliott Brothers in 1953, with microwave instrumentation. She moved into the Radar field, ran a Research Laboratory for some years before moving into management as Technical Director. Three years ago she left industry to become Deputy Secretary of the Institution of Electrical Engineers.

In her spare time she is very active in the education field. She is a Governor of Hatfield Polytechnic, and she does a lot of careers advice work advising young people about careers in engineering - she has appeared in a Central Office of Information film especially made to encourage more girls to take up engineering as a career.

She is a Fellow and past Council member of the Institute of Physics, a Fellow and past Council Member of the Institution of Electrical Engineers, and was elected a Fellow of the American Institution of Electrical Electronic Engineers for her contributions in the field of millimetric measurement, and for leadership of development facilities. She is also a member of the Advisory Committee on Women's Employment which acts in an advisory capacity to the Minister of Employment and Productivity.

Elizabeth LA VERIC K
The Institution of Electrical
Engineers
England

THE EDUCATION AND TRAINING OF PROFESSIONAL ENGINEERS IN THE UNITED KINGDOM AND ITS INFLUENCE ON WOMEN ENGINEERS

1. INTRODUCTION

In this paper a description is given of the education and training of professional engineers in the United Kingdom with particular reference to the contribution of the professional engineering institutions. Because the authors personal experience is associated with the electrical engineering profession and the Institution of Electrical Engineers in particular, the facts quoted relate to this particular engineering discipline, but in general the picture is the same for other engineering disciplines.

2. THE PROFESSIONAL ENGINEER

According to the EUSEC definition a professional engineer is competent by virtue of his fundamental education and training to apply the scientific method and outlook to the analysis and solution of engineering problems. He is able to assume personal responsibility for the development and application of engineering science and know ledge, notably in research, designing, construction, manufacturing, superintending, managing and in the education of the engineer. His work is predominantly intellectual and varied, and not of a routine mental or physical character. It requires the exercise of original thought and judgment and the ability to supervise the technical and administrative work of others.

His education will have been such as to make him capable of closely and continuously following progress in his branch of engineering science by consulting newly published work on a worldwide basis, assimilating such information and applying it independently. He is thus placed in a position to make contributions to the development of engineering science or its applications.

His education and training will have been such that he will have acquired a broad and general appreciation of the engineering sciences as well as a thorough insight into the special features of his own branch. In due time he will be able to give authoritative technical advice, and to assume responsibility for the direction of important tasks in his branch.

There is no statutory register of professional engineers in the United Kingdom, but a large proportion of the profession join their professional institutions and are registered by the Council of Engineering Institutions, (C.E.I.), as Chartered Engineers.

To become a chartered engineer the normal route is to take an approved degree in electrical or electronic engineering followed by a two-year period of training and a further two years of responsible experience in an electrics environment. There are alternative routes.

For example, a physics degree with an approved content in electronics and electricity or the CEI examination (which is in fact defined as the 'standard') is acceptable as an educational qualification. Pre-university training and sandwich course experience (i.e. courses which provide alternate periods in university and in industry) as well as post graduate work leading to a higher degree can also count towards the training requirement. A person holding a responsible position as an electrical engineer but with a degree in another engineering or scientific discipline can also qualify as a chartered electrical engineer. Engineers aged 40 or over, working in a responsible position within the electrical engineering field but without the necessary educational qualifications can become chartered by submitting a thesis of the appropriate academic standard to their professional Institution and CEI. Of the 188,000 chartered engineers in this country only 180 are women.

3. THE WORKING WOMEN IN THE UNITED KINGDOM

The total number of women working in this country was estimated to be 8½ million in 1971, this was about 38% of the total labour force. One third of these are classified as part-time workers that is to say that they work less than 30 hours a week. From the 1966 census it emerged that 59% of all qualified women were in employment, and of these 56% of the women were in employment connected with their subject group. More up to date and more detailed figures are not available unfortunately at this time.

It is clear that in a country where it is accepted that a large proportion of women work, including a growing proportion of married women, and where by far the greater proportion of graduate women are employed as professional and technical workers, the proportion of professional women engineers is extremely low. It would seem that of those qualified in technology the proportion employed in their subject is comparable with the situation in other more popular subject groups. A survey carried out by the Women's Engineering Society in conjunction with the Government Department of Employment confirms that the majority of industrial firms are willing to employ professional women engineers. It must be concluded therefore that either the education and training policies mitigate against women engineers or alternatively prejudice from an earlier age prevents girls from entering the engineering profession.

4. SCHOOL

It is usually accepted that mathematics and physics are the important school subjects for the would be engineer. Statistics show that in the examinations taken at the age of 16 or 17, known as O levels, the number of girls taking physics is comparable with the number of boys and their success rate is slightly higher than for boys. However, two years later, when the A level examinations are taken (these are the examinations required for entry to university) the number of girls taking physics is far less than the number of boys and of these a large proportion go on to study science subjects at university rather than engineering. For example, in 1973 only 24 British women students entered the first degree course in electrical engineering, at university compared with 1,770 men.

Clearly there is a great need to encourage more girls to study engineering at university. Indeed, the problem is greater than this, in that there are too few students of either sex entering engineering courses in the United Kingdom and of these the standard, as measured by their A level examination results, is dropping.

The professional engineering institutions are aware of the need to encourage the best possible quality of school children to enter the profession. Within the Institution of Electrical Engineers for example, careers literature, display stands, and voluntary speakers, usually members of the profession, are provided on request for careers conventions, talks etc. Advice is given to school teachers, career officers and youth employment officers as well as to parents and their children on the methods of training, the courses available, and the type of work involved in a career in electrical or electronic engineering. Future plans include closer cooperation with the Institution of Mechanical Engineers in the field of careers, and the possible production of tape/slide lectures to supplement careers talks by engineers. Of particular interest is the proposal to produce a tape/slide lecture aimed specifically to attract more girls into engineering.

Each year the Institution arranges a Christmas lecture for fifth and sixth formers on a topical electrical engineering subject. These lectures usually included extensive demonstrations and exhibits and are very well supported by the schools. The lectures have a dual purpose in support of the Institution's views that all children should be given an insight into what electrical engineering is about and what it can do for mankind, and that interested children with suitable capabilities should be encouraged to enter the profession. Another major annual lecture, the Faraday Lecture, travels around the country each year. This is a lecture on an electrical engineering subject aimed at the public as well as school children and students.

5. UNIVERSITY

Degree courses in the United Kingdom vary widely in scope, from the highly specialised to the modular. Modular courses enable a student to choose from a wide variety of subjects, including non-technical subjects and students should be made aware of the fact that they can obtain a degree whose engineering content is too small to qualify him or her for corporate membership of any of the professional engineering institutions. Some degree courses on the other hand start with the first year covering general engineering subjects, and allowing the student to specialise in say electrical, or mechanical engineering in the second year. The latter type of degree course has advantages particularly for the engineering student who very often is not sure initially which engineering discipline would interest her most. Sandwich degree courses, that is to say courses which gives the student alternate periods in university and industry are also available. These too can be advantageous to women engineering students who, through background, upbringing and schooling, often lag behind in practical engineering subjects.

On leaving university the pattern of employment of women electrical engineers is not significantly different from that of men. Judging by the figures published by the University Grants Committee for 1972/73 the majority of students appear to enter the engineering and allied industries rather than, for example, teaching or research.

The institutions have always endeavoured to maintain and indeed enhance the standard of education of the professional engineer. One function the institutions carry out therefore, is to satisfy themselves of the adequacy of the content and standard of the various degree courses available. This function is increasingly important with the growing availability of modular courses.

Students accepted by the engineering faculty at a university or college are eligible to become student members of the Institution thereby identifying themselves with their professional body. They may then join one of the Graduate and Student Sections which are located throughout the United Kingdom. Members of the Graduate and Student Sections of the professional engineering institutions are encouraged to present their own technical papers at Section meetings, and to organise activities such as lecture programmes, technical visits and social events, all useful training aids for the young member. However, it is appreciated that generally speaking, university students have many demands on their time, and the Institution's contribution to their education and training during this phase of their career is of necessity limited.

6. POST UNIVERSITY TRAINING

Following the award of a first degree the young engineer usually moves on to obtain his first employment and in this he is often assisted by the University Appointments Board.

From the point of view of the Institution and of the young engineer himself it is important that a period of practical training is next completed to complement his academic education. The training requirements for corporate membership of the Institution of Electrical Engineers (which also fulfills the training requirements, or becoming a chartered engineer) are detailed in a book published by i.e Institution and entitled 'The Training of professional Electrical Engineers in Power, Electronics or Control Engineering'. A list of training officers in the larger industrial organisations is maintained and they are kept informed of the Institution's training requirements. Indeed, many industrial companies submit their training programmes to the Institution for acceptance. Most are willing to offer training to women as well as men.

The Institution is anxious to encourage young graduate members to qualify as chartered engineers at the earliest possible point in their career. With this in view the Accelerated Transfer Scheme had been introduced recently, whereby a graduate first entering the industrial environment undertakes a four year period involving both training and a two year initial period of advanced appointment, under the direct guidance of an approved corporate member. Detailed reports are submitted to the Institution at periodic intervals by the tutor, and visits, are made to the particular organisation to assess the extent of the training, and the suitability of the staff appointment from the point of view of giving the new graduate responsible experience. At the end of the four years, it is expected that the graduate will qualify for corporate membership of the Institution and hence for registration as a chartered engineer.

During the first few years after graduation, the engineer can still participate in the local Graduate and Student Section activities. He may well decide to increase his knowledge in certain specialized technical fields by undertaking a course of higher education. To encourage him in the acquisition of specialised knowledge, the Institution had recently set up a Bureau of Higher Educational Courses, in conjunction with the Institute of Physics and the Institution of Electronic and Radio Engineers. The function of the Bureau is to provide information and advise on post graduate courses in electrical and electronic engineering available at universities etc. In due course, it is hoped to extend this service to cover relevant courses available from other sources, as well as to include a list of firms and other organisations who sponsor such courses.

7. CAREER DEVELOPMENT

Once an engineer is qualified and trained he or she has to hold a position of responsibility for two years before becoming accepted as a Chartered Engineer. As such he is bound by the Code of Ethics laid down by the Council of Engineering Institutions and, in more detail, by his professional institution. This includes the requirement that he shall at all times take care to ensure that his work and products of his work constitute no avoidable danger of death or injury or ill health to any person, also that he should take all reasonable steps to maintain and develop his professional competence by attention to new developments in science and engineering relevant to his field of professional activity and shall encourage persons working under his supervision to do so. With this in mind the Institution organises for its members and others publication of papers and provision of lectures, colloquia, conferences, vacation schools and specialist seminars or "workshops".

Some year or so ago the Council of the Institution of Electrical Engineers agreed a policy that more should be provided in the way of educational aids for the more mature engineer. One outcome of this is the provision of correspondence course for post graduates on certain specialised topics such as Pulse Code Modulation, Digital Instrumentation, Modern Control Theory and more recently, Colour Television. These courses are quite widely used both in the United Kingdom and overseas. Other subjects such as Industrial Heating and Mini-Computers are under consideration at present. In conjunction with the Design Council*, a series of tape/slide lectures on design are being planned, for example 'Design for Reliability', 'Design for Production', 'Design for Maintainability'. These lectures will be backed up by case histories and speakers briefs. They will be aimed at the young engineer and will be circulated through the Local Centres of the Institution as well as to industry and to university and college engineering departments.

Recently there has been an increasing feeling that the Institution should give more positive help in terms of publishing a 'Guide to Career Development' and possibly the provision of a careers counselling service.

Women engineers of course very often have a specially difficult problem in that, if they wished to have a family, they are likely to suffer a break of some years in their career. Not only do they need a means of updating themselves and of retraining in order to return to their careers, but also the opportunity and encouragement to do so. At present their numbers are relatively small and their specialisations are very varied. This, combined with the fact that family commitments restrict them geographically and timewise, tends to rule against provision of specialised retraining courses at suitable education centres. This is an area where the professional engineering institutions may have a special part to play. Correspondence courses provide one

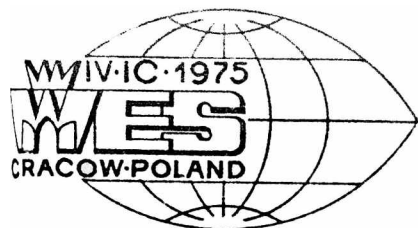
possible answer, but these do not provide the practical experience which is often necessary. The 'Open University', (i.e. courses broadcast by the British Broadcasting Corporation of graduate and post graduate standard) can also help. But in the end the greatest need, I feel, is for a sympathetic and farseeing employer who will ease the way by providing on-the-job retraining to supplement such cases. Legislation currently under discussion may well affect this issue in that employers may in future be expected to hold a post open for a period of some months for a woman undergoing child birth.

The transition from engineering into management, administration and other related jobs is another factor which has to be considered. A survey carried out by the Institution of Electrical Engineers last year showed that approximately one third of the membership were employed in management and administration. However it is clear from the statistics provided by the Department of Employment that the proportion of qualified women moving into management is only 25% of that of men. This is partly an outcome of the differing career pattern resulting from family commitments, but is also due to lack of opportunity in many cases and even worse, lack of ambition on the part of the women.

* The Design Council is a government sponsored body set up on 1944 as the Council of Industrial Design to promote the improvement - of design in British products. The name was changed in 1972 to the Design Council to emphasise governments' request that they should encompass engineering design as well as industrial design.

8. CONCLUSIONS

To summarise, the system of educating and training professional engineers in the U.K. is such as to encourage girls to take up the profession, and indeed is sufficiently flexible as to be adaptable to their special problems. The low ratio of women to men in the profession stems largely from the lack of interest by girls at the school stage and not from any lack of capability or even opportunity. This lack of interest is exacerbated by the attitudes of parents, teachers and even careers advisers. Whilst so few girls enter the profession it is difficult to break the tradition that engineering is a man's world - a tradition with which present day women engineers in the U.K. have to learn to live, at least for the present.



IV^{ème} CONFERENCE INTERNATIONALE DES FEMMES INGENIEURS ET SCIENTIFIQUES

Giséle Hugues

**SITUATION DE LA FEMME
INGENIEUR EN FRANCE EN
1975 SON ROLE DANS LA
FORMATION PROFESSIO-
NNELLE.**

**Section 1: Problemes sociologiques
actuels des femmes in-
génieurs et scientifiques.**

Imprimè d' après l' original
de l' auteur

Organisateur de la Confèrence
et editeur:

Ośrodek Postępu Technicznego NOT
ul. Świętojerska 5/7
00-236 Warszawa

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Giséle HUGUES, mariée 4 filles est licenciée es sciences et Ingénieur Diplômée de l' Ecole Supérieure d' Optique.

- En 1946, Ingénieur ó l' ONERA: Recherche sur la Spectrographie.
- En 1948, abandon de la vie professionnelle pour raisons familiales, mais continue á effectuer des travaux de recherches dans le domaine de l' éclairage et de la signalisation, ainsi que dans le calcul optique.
- En 1968, reprend une vie active professionnelle á la Société CERCO dont elle devient Administrateur.
- En 1973, nommée Présidente du Cercle des Femmes Ingénieurs de l' Association des Femmes Françaises Diplômées de l' Université.
- En 1974, nommée Conseiller de l' Enseignement Technologique pour l' Optique et la Mécanique de Précision, par le Ministère de l' Education Nationale.

Gisèle HUGUES
France

SITUATION DE LA FEMME INGENIEUR EN FRANCE EN 1975 SON ROLE DANS LA FORMATION PROFESSIONNELLE

Il est assez difficile actuellement de définir très exactement la situation de la femme ingénieur en France, car l'étude remarquable faite par G. de PESLOUAN en 1969, sur le " rôle et les conditions de travail des femmes-ingénieurs en France" n'a pas encore été vraiment remise à jour.

En effet, le Cercle des Ingénieurs toujours soucieux d'information a mis sur pied un questionnaire afin de réactualiser cette étude, mais cette nouvelle enquête est en cours de dépouillement.

En 1974, une enquête a été faite par la FASFID (Fédération des et Associations et Société Française d' Ingénieurs Diplômés) auprès des 64 écoles membres de sa Fédération.

A cette enquête 738 femmes ont répondu dont 387 anciennes de l' Ecole Polytechnique Féminine. Or, la FASFID n'a pas encore effectué de dépouillement particulier pour les femmes Ingénieurs.

Cependant, en analysant les premiers résultats donnés par notre propre enquête, en consultant certains chiffres de l'enquête FASFID, ainsi que les dépouillements faits par l'Ecole Polytechnique Féminine, en interrogeant les membres du Cercle issues de Centrale, de l'Institut National de l' Ecole Supérieure de Physique et Chimie. Industrielle, en réunissant les anciennes de l'Ecole Supérieure d'Optique, en relisant l'étude de G. de PESLOUAN, et les communiqués du Comité du Travail Féminin, Le Cercle des Ingénieurs peut, avec quelques réserves, donner un état de la situation de la femme ingénieur en 1975.

D'abord on peut déterminer que le nombre de femmes ingénieurs diplômées en France est actuellement d'environ 7.000.

En 1968, d'après le recensement national 190 500 personnes diplômées ou non exerçaient des fonctions d'ingénieurs dont 6500 femmes, soit 3,4 % de l'ensemble. On dénombrait environ 4500 femmes diplômées. Ce pourcentage ne semble pas évoluer beaucoup, car, nous le verrons ultérieurement dans les

écoles il y a environ très régulièrement 4 % d'élèves sortantes.

D'après l'enquête FASFIO de 1974, on peut approximativement considérer actuellement que le nombre d'ingénieurs diplômés est de 204.000, soit en gardant le pourcentage de 3,4 % 6.936 femmes ingénieurs, dont 3.000 anciennes élèves de l'Ecole Polytechnique.

Actuellement, en pratique, toutes les écoles d'ingénieurs sont ouvertes aux femmes, à part, à notre connaissance quelques écoles militaires:

- Saint-Cyr Navale, Ecole Nationale Supérieure des Etudes Techniques d'Armement de Brest, Ecole de l'Air de Salon, et quelques écoles très spécialisées comme les Mines à Alès, Le Béton Armé de Marseille, l'Ecole Supérieure de Soudure Autogène et l'Institut National de Promotion Supérieure Agricole de Dijon.

Cependant, peu de filles se dirigent vers des disciplines scientifiques 20% environ, et sur ces 20 % très peu osent aborder les classes de préparation aux Ecoles d'ingénieurs.

D'après les chiffres communiqués par la FASFID, et Le Comité du Travail Féminin en 1972, il y avait 503 femmes diplômées sortantes sur 10 107, soit une proportion de 4,9%

- En 1971, 380 filles sur 8 857, soit 4,3%

- en 1965, 308 filles sur 7 204, soit 4,2%

Il semble donc que ce rapport augmente avec les années, mais très légèrement; en effet, des Ecoles comme Centrales ont affiché 22 Elèves cette année, et l'Agro une vingtaine en 73 > mois ce mouvement n'est pas généralisé.

Cependant, une remarque est à faire: on note en effet depuis 2 ou 3 ans, entr'autre à Centrale, une forte proportion d'élèves venant de province, ce qui montre d'une part une évolution des mentalités féminines dans la province, et d'autre part, le niveau élève des classes préparatoires de province.

De quelles écoles se répartissent-elles?

Environ 25 % se dirigent vers la chimie

30 % dans des écoles sans spécialité dominante

20 % vers des écoles agricoles et alimentaires.

7 % dans des écoles à dominante électronique.

Aucune femme ingénieur dans le textile alors que ce secteur emploie en majorité un personnel ouvrier féminin.

D'après nos investigations personnelles, ces jeunes femmes trouvent dans l'ensemble, grâce à leur association d'anciens élèves, du travail sans plus de difficultés que leurs collègues masculins à la sortie de l'école. Cependant la situation se complique, si par suite de compression de personnel ou par convenance personnelle (changement de résidence par suite de mariage, enfants) elles quittent leur place.

En effet, étant donné la conjoncture économique actuelle, il leur est très difficile de se reclasser.

Certaines réussissent, surtout, lorsqu'elles sont appréciées dans leur entreprise, à avoir un horaire plus souple au même endroit à travailler à mi-temps, si elles ont des problèmes familiaux dus à la présence de jeunes enfants, mais ces cas sont exceptionnels.

Il faut reconnaître qu'actuellement les jeunes femmes ingénieurs entre 25 et 35 ans abandonnent rarement leur métier pour des raisons familiales, alors que cet abandon se produisait souvent dans les générations plus anciennes.

La, encore, d'une part, il y a certainement une évolution des mentalités, d'autre part, la contraception est très pratiquée dans ces milieux de niveaux intellectuels élevés: elle permet d'espacer les naissances; de plus, il est plus aisé actuellement de trouver un logement près de son travail. Il reste évidemment le problème de la garde des enfants. Toutes les jeunes interrogées nous ont dit avoir pris une garde à domicile qui leur prend une bonne part de leur salaire, mais toutes nous ont dit préférer cette solution.

D'ailleurs on note chez les jeunes une ambition plus marquée que chez les générations précédentes.

Deux points importants n'ont pas évolué depuis l'enquête de G. de PESLOUAN D'abord les types d'emplois occupés par les femmes sont toujours les mêmes:

- La Recherche
- Le Laboratoire
- La documentation
- l'Enseignement.

60 % des femmes environ occupent des postes dans le secteur public.

Quant aux salaires, la situation n'a guère évolué. Si les jeunes sont embauchées á salaires égaux de leurs collègues masculins, tous les dépouillements faits montrent que les femmes sont, au milieu de leur carrière nettement moins payées que les hommes. Une enquête récente faite chez les Dr. es Sciences a montré, la même disparité.

Quelles sont les causes de cette disparité?

Tout d'abord les femmes sont en majorite dans le secteur public; elles occupent rarement des postes de haute responsabilité: enfin, pour beaucoup l'intérêt du métier l'emporte sur les considérations de salaires.

On notait en 1969, dans l'enquête de G; de PESLOUAN que presque toutes celles qui avaient maintenu Leur activité se préoccupaient de perfectionnement, et déploraient que leurs désirs de formation ou de recyclage soient irréalisables, soit par manque de temps, soit par refus de l'entreprise.

Or, il est interessant de voir que, actuellement en conséquence probablement de la loi de 1971 sur la formation continue, le problème ne se pose plus.

En effet, les résultats d'une enquête sur ce sujet, lancée par le Cercle l'année dernière démontraient que le problème ne se posait pratiquement plus. Toutes les femmes ingénieurs actives ayant demandé des stages de formation au de recyclage l'avaient obtenu. Certaines se sont même reconverties en devenant animateur dans la formation continue. Cette loi de 1971 semble donc être appliquée sons discrimination en ce qui concerne les femmes ingénieurs.

Les femmes ingénieurs, bien que peu nombreuses ne doivent pas oublier qu'elles sont, malgré leurs difficultés, des privilégiées et qu'elles ont un role essentiel á jouer pour les autres femmes.

En effet, elles ont le devoir de penser á leurs soeurs moins privilégiées qu'elles, et elles peuvent les aider á leur faire acquérir la formation professionnelle dont elles sont pour la plupart dépourvues.

A ce sujet une voie intéressante et peu connue, commence á s'ouvrir en France.

En effet, lors d'une circulaire datée du 4 Octobre 1972 concernant l'application du décret relatif aux attributions des Conseillers de l'Enseignement Technologique, Le Ministère de l'Education Nationale souhaitait que " la participation des femmes employeurs ou salariées soit élargie notamment dans les secteurs d'activité qui s'ouvrent ou sont susceptibles de s'ouvrir à la main d'oeuvre féminine".

C'est ainsi que m'étant occupée activement d'information professionnelle dans les lycées, et de développement de la formation professionnelle technologique, on m'a demandé de poser ma candidature auprès du Ministère de l'Education Nationale pour être Conseiller de l'Enseignement Technologique.

Et ma candidature ayant été acceptée, je me suis retrouvée, seule femme-Ingénieur au milieu d'une assemblée comprenant 90 messieurs et une autre femme représentant la couture.

Et là, en tant que Présidente des Femmes Ingénieurs, en tant que femme aini, l'ai tout de suite découvert tout ce que je pouvais apporter en essayant d'intégrer d'autres femmes dans le corps des Conseillers de l'Enseignement Technologique.

En effet, Quel est le rôle d'un Conseiller de l'Enseignement Technologique?

Les Conseillers assurent une mission générale de liaison et d'information entre les branches d'activité professionnelle de leur compétence et l'Education Nationale et les Etablissements qui dispensent cet enseignement.

Ils peuvent être chargés d'enquêtes portant sur la création d'établissements publics ou privés, sur leur suppression en fonction des besoins de l'économie, sur leur fonctionnement, sur l'application relative aux taxes d'apprentissage et de formation professionnelle continue.

Ils participent aux jurys des examens professionnels.

Le mandat dure 6 ans renouvelable.

Depuis que j'ai été nommée j'ai réussi parfois à faire prévaloir une opinion féminine sur les problèmes de formation professionnelle dans l'industrie de façon à en faciliter l'accès aux femmes.

Actuellement, j'ai présenté deux membres de mon association, l'un en technique audiovisuelle, l'autre en mécanique de précision, et consciente de ce que nous pouvons apporter, j'espère, l'année prochaine, présenter d'autres candidatures.

Il est très important pour nous femmes ingénieurs d'être présentes dans toutes les instances officielles, car la femme s'intègre de plus en plus dans l'industrie et dans la vie professionnelle. Les pionnières que nous sommes ont le devoir de leur faciliter le chemin.

Les femmes ingénieurs, qui contribuent à l'essor économique de leur pays ne doivent pas oublier qu'elles ont aussi un rôle à jouer dans l'évolution de la Société, non seulement dans leur métier, mais aussi par des actions concertées, permettant d'ouvrir plus largement aux femmes des formations professionnelles méconnues ou inconnues d'elles, permettant également un équilibre meilleur entre la vie professionnelle et la vie familiale.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Irene C. Peden

WOMEN ENGINEERS IN AMERICAN UNIVERSITIES

**Section 1: Contemporary sociological
problems of women engineers
and scientists.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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Dr. Peden, who holds a B.S. degree in electrical engineering from the University of Colorado, and the M.S. and Ph.D. degrees from Stanford University, all in electrical engineering, has been a consultant to the United Nations Educational, Scientific and Cultural Organization (UNESCO), and has served as a consultant to the Commissioner for Science of the U.S. Food and Drug Administration (FDA). She is a member of the Committee on Space Physics of the Space Sciences Board, National Academy of Sciences, and a member of the Advisory Council of the Stanford University School of Engineering." She is the 1975 Vice Chairman of the IEEE Educational Activities Board and a member of the Engineering Education and Accreditation Committee on the Engineer's Council for Professional Development (ECPO).

The first American woman engineer/scientist to conduct field work in the interior of the Antarctic continent, Dr. Peden has produced many major publications including a number dealing with radio propagation and the polar ionosphere as well as others on the dielectric and loss properties of the Antarctic ice sheet at very low frequencies. She has written and spoken extensively on the subject of women in engineering careers, as well. She and her husband, attorney Leo J. Peden, live in Seattle, Washington.

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WOMEN ENGINEERS IN AMERICAN UNIVERSITIES

A substantial escalation in the enrollment of women students in engineering curricula is underway in the United States of America. Engineering colleges have seen their enrollment figures for women triple over the last two years. This phenomenon is believed to reflect at least three trends in the American society. 'Reversing a previous anti-science/technology attitude among young people, engineering is now viewed as a positive problem-solving approach to areas of acute societal concern such as energy, environmental quality, urban transportation and world food supply. This image of the profession attracts renewed numbers of students of both sexes to the study of engineering. A second significant factor is the availability of engineering positions; the particularly attractive offers now being made by prospective employers to women and ethnic minority engineers provide added incentives for these groups. The latter situation is without historical precedent in the U.S.A.; it is an outcome of the affirmative action programs that have proliferated since the release of executive orders requiring them of those, institutions and industries that are the recipients of Federal contract funds.¹ In the third place, there is a new perception on the part of American women, particularly those of high school and college age, regarding themselves and the goals they can achieve. New lifestyles have evolved that facilitate the balancing of fully professional careers, with all the commitment of time and energy this implies with satisfying personal lives. These new attitudes and perceptions are related to civil rights movements of the recent past and to changing patterns in the society. They hold the promise that American women are preparing to assume full partnership in the mainstream of the technology of their very technically oriented society, a mainstream from which they have been virtually absent too long.

Some descriptive information about American women engineering students is appropriate to an international meeting such as ICWES IV, Sociologist Dr, Sandra Davis has recently reported on a study conducted at the Institute of Technology (IT) of the University of Minnesota.² Using matched samples of 234 female and 234 male engineering students admitted to IT over the ten-year span 1961-1970, the study utilized entrance data for each individual based on standard tests (Strong Vocational Interest Blank, Minnesota Counseling Inventory, American College Test, and Minnesota Scholastic Aptitude Test), as well as an extensive questionnaire mailed to each. The latter solicited information about family and high school background, reasons for enrolling in IT, experiences in school, and activities following graduation or academic withdrawal. Each respondent also wrote an autobiography describing the development of his or her personal interest in technical fields, and experiences in college. The completed questionnaire was returned by 70.4% of the

men and 72% of the women. A brief summary of the results of this lengthy study includes the following:

The women's mean high school record and verbal ability test scores are slightly higher than those of the men in the study; mean scores on the American College Test (ACT) are nearly identical in both groups.

Women students' interests are similar to those of women employed in technical, medical, military and scientific occupations, whereas they are dissimilar to those of women in music and social service fields. Women's interest in mathematics and science developed simultaneously with interests in literature, art, music, crafts, history, and politics. Men related only the development of their technical interests.

Women more often than men expressed a childhood fascination with mathematical logic and scientific phenomena, and reported making their career decisions early (often during the junior year).

Forty percent of the fathers of both groups were professionals and 40% were skilled or semi-skilled workers. More than 90% of the fathers dealt in their work with things rather than people.

The women's mothers were better educated than the men's; only 30% of the mothers in both groups were employed outside the home.

Male students believed themselves to relate well to fellow IT students; and to be positively viewed in return. Most women believed that male classmates were less than enthusiastic, even, openly unfriendly in some cases. This perception makes persistence in a technical major more difficult for women students than is the case for men. It also discourages many from choosing a technical major in the first place, and influences the decisions of some to withdraw from engineering studies.

Thirty percent of the women who entered engineering at IT actually persisted, whereas the figure was 40% for men in the matched sample. The women who remained in engineering had a higher level of scientific interest than those who withdrew either voluntarily or because of academic difficulty. The former group expressed a higher level of interest in people-contact activities than those who remained in IT.*

Father's occupation or family socio-economic status had a bearing on academic persistence only in the case of male students. The educational level of the mother was the only family item related to persistence of the women students.

*A more recent, independent study performed at Cornell University indicates that academic failure is not as significant a factor for women as for men and that most women who leave engineering do so because of a change in career objectives. (Private Communication).

Dr. Davis concluded that women entering technical majors typically possess and pursue broader range of interests than is the case for men. If they perceive few outlets in the university environment for these interests they are likely to withdraw. Many who remain in technical majors have found other outlets for their outside interests, either via the elective portions of the curriculum or through extracurricular activities. The study contradicted popular American stereotypes of women in science and engineering. Women engineering students are not masculine, narrow in outlook, inclined to avoid social relationships, to reject marriage and parenthood, or to drop out of technical schools in favor of marriage. They do have a broad range of interests, and plan to combine marriage, family and career responsibilities. They value social relationships to the same degree as other college women, are fascinated by science and mathematics, and are motivated to succeed in a challenging environment.

Pressures have been created on the universities by prospective employers of engineers to recruit, retain, and ultimately to graduate more women than are presently even enrolled in engineering curricula in the U.S.A. The presence and increasing numbers of women students in engineering colleges further suggest additional pressures on faculty and administrators to respond to their needs in several important ways. *One* such requirement is for the active procurement of funds specifically designated for women engineering students. When such financial assistance is available, some talented young women who might not otherwise have been able to complete the necessary academic training find it possible to do so. Further, when student scholarships and grants are offered, the sponsoring institutions, industries, foundations, etc., make unique and visible commitments to seeing women succeed in engineering careers. A second need relates to the publication and dissemination of informational materials about engineering careers and about women in them for distribution to high school and junior high school students, their teachers, counselors and parents. Although consistent change is taking place vis a vis women and professional goals, there is still a lack of understanding on the part of many key individuals in the pre-college educational system that engineering is truly open to women and that it is in fact an excellent career objective for those who possess the necessary combination of aptitude, interest pattern and motivation. Other needs of American women engineering students include the availability of role models, successful practicing women engineers and older students including graduate students, who can provide encouragement and occasionally even inspiration for their younger colleagues.

A key figure in all the above contexts is the faculty woman when a university is fortunate enough to have her on its staff. Two recent surveys have identified a 1974 total of 62 women in regular professorial positions in American engineering colleges, a number that might be considered representative of the size of the faculty in a single large academic department, or possibly two of very modest size.³ When we consider that this figure and all the data presented in the attached summary table were obtained via questionnaire from 192 of the 204 accredited colleges of engineering in the country, it is clear that women comprise a minute fraction of engineering educators in American universities. This scarcity in turn is related to the very low production of Ph.D. level women who are qualified for and are interested in university teaching and research in engineering. According

to the Engineering Manpower Commission, the number of women doctoral graduates in all engineering fields increased from a total of 16 in 1969-70 to 39 in 1972-73; only a fraction of these have chosen the academic life.

The last four columns of the figure comprise an unambiguous display of the numbers of faculty women who clearly held regular or "ladder" positions (Assistant, Associate and full Professor) in well-defined engineering departments in two recent years. Direct comparisons between 1972 and 1974 are difficult, since some of the queried universities responded in only one year. Still, it is possible to conclude that although there are few women faculty at this time, the number being hired has increased somewhat in recent years. At least, women are presently being appointed to engineering faculty positions at all academic levels. Sixty-one of the 62 women faculty in question are known to be currently active; of these, 42% are presumably tenured (Associate plus full Professor), with 24% in the Associate rank and 18% full Professors. It is not unusual in an American university engineering department for close to 50% of the male faculty to hold the rank of full Professor and for over 70% of the departmental faculty to be tenured. The disparity in the figures for men and women can be related to the very low production of women candidates with advanced degrees in engineering, although the supply of engineering faculty is not exclusively limited to this group. Only 65% of all people with doctorates working as engineers have those degrees in engineering. Presumably, about the same percentage of engineering faculty with doctorates have their degrees in engineering; others obtained them in mathematics or one of the pure sciences.

At this time, it may safely be said that any qualified woman wishing to try engineering teaching in the United States can obtain a position. This market did not exist to the same degree before the appearance in 1972 of a document containing executive orders and affirmative action guidelines for all educational institutions having federal contracts and was virtually non-existent before the 1970's. The scarcity of women doctoral candidates in the field is related to the fact that until recently few women have even chosen either engineering careers at any degree level or graduate studies in *any* academic discipline. American universities wishing to increase the numbers of young women who elect to prepare themselves for academic engineering careers must give all possible support to the recent increase in undergraduate enrollments and then follow through with encouragement and financial assistance for women who undertake graduate studies in the field. There is reason to believe that such steps are being taken in growing numbers of educational institutions.

Entry level salaries are not presently a problem to women, but it is not yet clear that the young faculty woman will be kept in step with, male colleagues after she is hired. Competition, plus salary equity review mechanisms now being established at many universities suggest that she will. Salary discrimination is seldom so clearcut as to be identifiable in terms of wide disparities between men and women within the same rank, although this can still occur. Rather, it tends to show up in the disproportionately longer time in rank so often experienced by faculty women.

The fact that entry level positions have become available to the professionally qualified does not guarantee smooth or rapid progression to the senior ranks even now. Whether one examines the percentages or the actual numbers of tenured academic women in engineering, it must be concluded that these faculty colleagues are still struggling for recognition and advancement. The best that can be noted at this time is the presence of a positive gradient in the system.

This paper suggests that the presence in American universities of growing numbers of women engineering students and faculty is not a transient effect. Dynamic societal change and (at least in the short run) governmental requirements regarding nondiscrimination and affirmative action will act to secure the place of these women in their profession.

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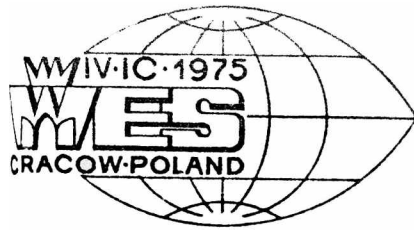
FACULTY WOMEN IN ECPD*-ACCREDITED ENGINEERING COLLEGES:
A COMPARISON OF TWO RECENT YEARS³

Year	Number of Schools Responding	Number of Faculty Women Listed by School in Regular / Ladder Positions	Number of Regular	Faculty Clearly	Identified with	
			Engineering	Departments and	Currently Active	
			Professor	Associate Professor	Assistant Professor	Total
1972	170	44	5	16	23	44
1974	192	96	11	15	36	62 ⁺

The last four columns represent faculty women clearly holding regular academic positions in well-defined engineering departments, as reported by universities responding to a questionnaire or as determined by Peden and Sloan from personal knowledge. Women in departments of materials science and computer science are included; women in other science departments and in mathematics are excluded.

*Engineer's Council for Professional Development, an organization containing representation from the major engineering societies in the U.S.A. which has as one of its official functions the accreditation of Colleges of Engineering.

+One woman who was engaged in full-time teaching in 1974 is known to have retired at the end of that year to Emerita status.



FOURTH INTERNATIONAL CONFERENCE OF WOMEN ENGINEERS AND SCIENTISTS

Danuta Mischke

WOMEN AT THE HIGHER TECHNICAL SCHOOLS OF CRACOW IN THE THIRTY-YEAR PERIOD OF PEOPLES POLAND

**Section 1: Contemporary sociological
problems of women engineers
and scientists.**

Printed according
to the author's original

Organizer and Editor:
The Center for Progress
in Technology

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INTRODUCTION WOMEN AT THE HIGHER TECHNICAL SCHOOLS OF CRACOW IN THE THIRTY - YEAR PERIOD OF PEOPLES POLAND

Introduction

Cracow is the city which at the moment of the end of war was one of major Polish towns spared by war destruction having, because of it, the conditions favourable for undertaking teaching activities at the old as well as new technical schools, meeting the requirements of that period. This was helped by the fact of the existence of the Cracow Mining Academy and Agricultural Chair at the Jagiellonian University in the pre-war period, as well as a large group of scientific workers employed, before the war, at the Cracow, Lwów and Warsaw schools together with many-year lasting endeavours of realization of the setting up of a broadly conceived technical university in Cracow. At present Cracow is proud of having three independent higher technical schools: Mining-Metallurgical Academy, Agricultural Academy and Higher Polytechnical School, as well as Technical Divisions at the Higher Pedagogical School, Training teachers of technical occupations giving no title of engineer.

As early as at the end of the 17th century the idea was

launched of setting up a technical school in Cracow and it resulted in the endeavours which led to the setting up of Polytechnical Institute not earlier then, in 1824. The institute was a school intermediary between the vocational school and a higher school.

Unfortunately the political situation, characterizing the region of Cracow in that period, was not favourable for the development of the Institute. It transformed, in 1854, in the Technical Academy, leading in consequence to its closure in 1875.

However, the Academy, having the chairs of: Architecture and Engineering, Mining and Metallurgy and Agriculture and Forestry can be considered as the progenitor of the Cracow higher technical schools.

2. The Historical Sketch of the Cracow Higher Technical Schools.

2.1. The Mining – Metallurgical Academy

Closing of the Technical Academy in 1875 was followed by -unfortunately- ineffective endeavours for the setting up of a higher mining school in Cracow.

The situation was better in the town of Kielce where, owing to Stanislaw Staszic's endeavours, a -Mining Academy was inaugurated in 1816. It was the sixth higher school of this type in the world and the unique one in Poland. Unfortunately, the Kielce Academy could not exist long, because the invader's authorities closed it already in 1826. - Nevertheless, the awareness of the need of such a higher mining school in Poland was a permanent concern of the Cracow community. After coping with- a number of obstacles the inauguration of the school in

question was planned for September 10th, 1914. However, the outbreak of the first World War put the end to the success of those many-year lasting endeavours.

It was not earlier than shortly after regaining independence in 1918 that measures were undertaken in order to organise the Academy of Mining the inauguration of which took place the 20th of September, 1919; at the beginning it had only the Mining Division /Chair/ the Metallurgical Division being set up in 1921. The Academy was functioning under this form till September, 1939, i.e. till the outbreak of World War As concerns the period of Nazi Occupation, there existed in Cracow a Higher Technical Mining-Metallurgical - Surveying School where lectures were given by professors of the Mining Academy and where - in addition to official teaching - clandestine education was organised, as well.

Directly after Cracow liberation in January, 1945, the Academy workers from the pre-war period began to organize it again, and as early as in March, 1945 the Mining and Metallurgical Divisions started their work. The Electromechanical Division and the Division of Geology and Surveying were set up in 1946. In 1949 the Mining Academy has been transformed into the Mining - Metallurgical Academy, with 10 Divisions functioning after this reorganisation Mining, Drilling-Oil, Geological- Research, Mining-Geodesy, Metallurgy, Non- Ferrous Metals, Foundry, Ceramics, Mining and Metallurgical Electrotechnics, Mining and Metallurgical Machinery.

As early as at the outset of the 17th century, the problem

of organizing education concerning agriculture was subject to deliberations, however, lack of professors properly qualified was an obstacle in this respect. It was not earlier than at the beginnings to the 19th century that the Chair of Rural Economy was set up at the Philosophical Division and of Veterinary at the Medical Division of the Jagiellonian University. Duly appreciating the importance of high qualifications for national economy, the Cracow Economic - Agricultural Association did not spare efforts in order that Agricultural Studies be organised at the Philosophical Division of the Jagiellonian University. The endeavours in this respect were ended successfully in 1890.

In the time of regained independence the Agriculture Studies at the Jagiellonian University were the only agricultural school on the university level in Poland. For this reason the enrollment was high, in turn-owing to the achievement through education of the won scientific personnel - had created the possibilities of setting up, in 1923, of a separate Agricultural Division at the Jagiellonian University. This Division, educating youth in the field of agriculture, horticulture, fishing and experimentation survived till the outbreak of World War II, resuming its activities, together with other University Divisions after the liberation of the city. In a short time, i.e., in 1946, the Agricultural Division enlarged its scope-covering by its work also the problems connected with forestry – to such an extent that it was given the name of Agricultural- Forestry Division, representing, a highrank scientific centre.

Continuous development of specialization within the framework of agricultural sciences, increase of the scope of

research and the necessity of broadenning the didactic activities led to the inauguration /September 1st, 1953/ of an independent Agricultural School, comprising 3 Divisions: Agriculture, Zootechnics and Forestry. Then, the necessity of organising properly water economy and appropriate use of aquatic resources as well as of territorial development concerning the areas being the base of the above-mentioned school, led to setting, up in 1955, of the Division of Water Improvement. The setting up of Horticultural Division as well as of the Division of Economical Production and Agricultural Turnover with the seat in Rzeszów reflects, the further development of the school under consideration. In 1972, the Higher Agricultural School has become the Agricultural Academy.

2.3. The Cracow Higher Polytechnical School

The Higher Polytechnical School in Cracow was organised in 1945, owing to the enthusiasm and energy of prof.,dr., eng. I. Stella- Sawicki and a handful of professors, docents and engineers, mostly the graduates from the Higher Polytechnical School in Lwów, who survived the war pogrom. April 1st, 1945, three polytechnical, Divisions have been set up at the Mining Academy: Land Construction, Water Construction and Transport. The Division of Architecture has been created Shortly after it. The newly-organized School was not subject to the Mining Academy and it became the Cracow Higher Polytechnical School in 1945, having the following divisions: Architecture, Land Construction, Water Construction, Mechanics and Chemistry, the latter one being set up in 1966.

3. Women at the Cracow Higher-Education Schools

3.1. Teaching group

During many years of the existence of higher- education schools, generally, and of higher technical schools, in particular, the teaching personnnel comprised no woman. It is understandable because of the fact that in the pre-war period the number of studying women was not a high one. However, directly after World War II, women with proper education have started teaching the technical youth. At the beginning the curricula comprised general subjects such as mathematics, physics or chemistry, then, with the passage of time, when an ever higher number of women graduated from universities, the ever higher number of them was becoming educational workers.

In the case of the Mining-Metallurgical Academy, the first woman became the docent in 1950, the next one - in 1954. The first women was granted professor's title in 1953, being followed by the next ones in 1957 and 1960. In the same time four women have been charged with devolved lectures since 1952 of mathematics and technical analysis of fuels/.

Table 3.1.1. The present structure of the Teaching Personnel of the Mining-Metallurgical Academy.

/In each column the first figure refers to men the second one to women/.

Division	Professors			Docents			Adjuncts			Assistants		
	M	+	W	M	+	W	M	+	W	M	+	W
1	2		3	4		5	6		7	8		9
Mining	15	+	1	20		-	41	+	7	79	+	35
Drilling-Oil	4		-	8		-	5	+	1	32		-
Mining Geodesy	7		-	9		-	26	+	4	46	+	20
Exploration-Geodesy	6		-	13		-	24	+	14	78	+	32
Material and Ceramics Engineering	8		-	11	+	4	20	+	18	55	+	43
Metallurgy Non- Ferrous	14		-	24	+	1	32	+	13	111	+	27
Metals	7	+	1	7		-	19	+	12	31	+	14
Foundry	7		-	9		-	22	+	1	30	+	10
Electrotechnics	10		-	16		-	45	+	5	154	+	45
Mining-Metallurgical Machines	12		-	22		-	35	+	4	117	+	24
Inter-Divisional												
Inst. of Physics	-		-	-		-	36	+	16	70	+	36
Nuclear and Chemistry and Mathematic												
Total	90	+	2	119	+	5	305	+	95	803	+	286

c.d. of the tabley – Table 3.1.1.

Ratio of the
number of women
in the total of
teachers

2.2%

4.1%

23.7%

26.2%

On the total women constitute 22.8 per cent of teaching personnel, having no, however, official position in the management of school. The highest number of women is employed at the Ceramics Division, namely 27 per cent of docents, 47 per cent of adjuncts and 44 per cent of assistants. At this Division women are at head of to laboratories.

As concerns the Agricultural Study, three women came, in 1945, as didactic workers, all of them having a doctor's degree of the Jagiellonian University. One of them became a docent in that year and shortly after it, the professor of the Division. The development of the School was accompanied by an increase in number of scientific workers, including women, as well.

Table 3.1.2. The Structur of teaching Staff at the Academy of Agriculture in 1974.

Division	Prof.			Doc.			Adjuncts			Assistants		
	M	+	W	M	+	W	M	+	W	M	+	W
1	2		3	4		5	6		7	8		9
Agriculture	9	+	2	15	+	5	28	+	20	53	+	54
Zootechnics	5	+	2	13	+	2	13	+	13	18	+	43
Water Improvement	7		-	9	+	2	28	+	7	42	+	18
Forestry	8		-	12		-	19	+	3	31	+	23
Horticulture	3	+	1	7	+	1	15	+	3	13	+	39
Economy of Production and agricultural turnover	-		-	2		-	6		-	10	+	12
Total	34	+	5	56	+	10	109	+	46	167	+	188

Ratio of the
number of women
in the total of
teachers

12.8%

15.2%

29.6%

53.0%

Generally women amount to 40 per cent of the teaching staff at the Agricultural Academy. They actively participate in school's authorities, namely: 1 woman is the 1st rector assistant: for every six Divisions one woman is dean and one dean's assistant. For the total of 26 institutes women are directors of four and vice-directors in three. Moreover, women are members of rector's commissions as well as their chairmen.

The Higher Polytechnical School in Cracow, being the youngest school and no teaching staff of its own and based itself, on workers to other schools as well as on Outstanding practitioners in engineering fields, represented at the Polytechnical Divisions Women were among them, as well: one woman worked in 1945, six - in 1946 and in 1947, their share in the Polytechnic staff amounted already to 13 women dealing with practical lessons of mathematics, physics, tracing geometry and artistical drawing. Since 1948, the ever growing number of women - scientific workers have been employed by the Polytechnic particular Chairs to the Polytechnical School under consideration, who not only have been dealing with practical lessons but with lectures on occupational subjects, as well. The first woman was granted professor's title in 1952, the next one - in 1957.

Table 3.1.3. The Structure of Teaching Staff of the Higher Polytechnical School of Cracow, in 1974

Division	Prof.			Docents			Adjuncts			Assistants		
	M	+	W	M	+	W	M	+	W	M	+	W
1	2		3	4		5	6		7	8		9
Agriculture	12	+	1	13	+	1	15	+	10	56	+	22
Land Construct.	12		-	25	+	2	27	+	6	55	+	18
Water Construct.	8		-	13	+	2	15	+	8	35	+	15
Mechanics	9		-	31	+	1	28	+	7	164	+	29
Chemistry	5		-	9		-	8	+	7	34	+	24
Interdivisional Laboratories	2	+	1	11	+	2	12	+	6	19	+	26
Total	48	+	2	102	+	8	105	+	44	363	+	134

Ratio of women's number in the total of teachers	4.2%	7.3%	29.5%	27.0%

/higher schools/

On the total women amount to 23.3 per cent of teaching staff of the Cracow Polytechnical School. Because of a small number of women working independently, their share in the Polytechnical management is not high.

The both women-professors were head of Laboratory, one of docents is dean of the Division of Studies for Working People.

On the other hand women actively participate in the work of presidential Commissions and other units with a broader scope

of activity.

3.2. Students

Immediately after the liberation of the city in 1945, the official activities have been resumed by the technical schools existing before the war and the registration of people willing to start polytechnical studies began. Among them were young people who graduated from the secondary school acting in clandestine, there were also the people who finished the secondary school in 1939 as well as students from Higher schools who had interrupted their studies at the Cracow universities or Lwów or Warsaw Higher Poly technical School, finally those who were students of clandestine higher schools. The studies were organised in a way enabling it for the first graduates to get their graduation as early as in 1945. Not many women were among them, because it was fairly seldom before the war that a women worked in technical school. It was not earlier than after the war that the Polish technics has been faced with enormous tasks, at first connected with country's reconstructions and, later on, with the economic development. These tasks require high number of qualified workers. That is why the number of students, including that of studying women has been increasing.

As concerns the Mining Academy, the first women began her studies in 1921, as an extra-mural student. Later on, because of the enactment of the Ministry aiming at "prevention of feminine competition", the so called numerus clausus was introduced limiting the number of female students to 8 at the first year of studies, the enrollment of men amounting, in the same period from 80 to 100. After World War II, at the be

ginning the number of women graduating from the Mining - Metallurgical Academy was small, amounting, in 1946, to less than 1 per cent. However, from the moment when the students enrolled in 1945 were approaching their diploma, the percentage of graduating women began to increase.

In the period 1972-1974, out of 2001 diplomas given, on the average by the Mining and Metallurgical Academy, 19 per cent were obtained by women, this figure oscillating between 6 per cent at the Mining and Metallurgical Machinery and 62 per cent at the Division of Material Engineering and Ceramics. The first doctor's thesis defended by women occurred in 1949. Women achieved 85 out of the total of doctor's degree, which amounted to 8.5 per cent, and in the last year, women were given 13 for the total of 145, which amounted to 9 per cent. The degree of habilitated doctor was obtained by women in 7 cases for the total of 60, however as concerns the last year of the period under consideration /1974/, 5 women were given it for the total of 13, i. e. 38.5 per cent.

Agricultural studies were accomplished by the first woman in 1907, which was 2.7 per cent of the total. This number was increasing later on, achieving, in 1939, 24 per cent. In the first post-war years women were accepted at agricultural studies with no restrictions, as it was just the case at the other universities. As a result, in 1952, out of the total of 221 diplomas, 62 were granted to women /28.5 per cent/, however, in the case of forestry, a lack of women's interest was observed, as the percentage of graduated women amounted to as little as 3.7 per cent.

In 1973/74 women represented 42 per cent of the total of 421 diploma-receivers. The first woman was given doctor's degree of Agriculture, in 1912. Up to 1939, six women got doctor's degree. At the higher Agricultural School, the first doctor's degree granted to a woman was given in 1948. Till now, the total number of doctor's degree granted in connection with agricultural problems has amounted to 352, that given to women being 74, i.e. 21 per cent. As concerns the last year, analogically 44/16, i.e. 36 per cent. The first habilitation informal examination of a woman at the Higher Agricultural School took place in 1954. The number of habilitation examinations /informal examination/ passed by women amounted to 9, the total amounting to 91/10 per cent, approx./, and in the last year 6/2, i.e. 33 per cent.

The interest of women in studying at the Higher Polytechnical School of Cracow has been high from the very beginning of its existence and it increases from year to year, In the first post-war years, the percentage of women graduated amounted to 2 per cent at the Division of Land engineering and Water Engineering, to 3 per cent - at Architecture, and to 1.5 per cent at Mechanical Division, In 1974 these figures increased considerably: out of the total on 1355 diplomas, women were given 24 per cent, their number at the Mechanical Division representing only 9 per cent while at the Chemical Division - as much as 56 per cent.

The first doctor's degree defended by a woman at the Higher Polytechnical School of Cracow took place in 1956, the number of doctor's degrees given to increasing continuously since 1961:

out of the total of 386, women obtained 39, which is 10 per cent\ In the total of 103 habilitated doctors, there were 5 women, i. e. 5 per cent.

4. Conclusion

The above-given compilation of data shows that the share of women dealing with technical fields of science has considerably increased in the recent years. Its pattern is not uniform for all the technical branches. Women reveal tendency of liking first of all, chemistry, and branches connected with it, for instance ceramics, or non-ferrous metals. The second field attractive for women are problems based on botany and zoology, construction following them. Branches of science connected with mechanics are of least interest to women.

However women have achieved results in all the fields, which is revealed by numerous scientific papers, participation in conferences, doctor's papers and habilitation thesis defended at the Division of minor interest to women.

The women-graduates from technical schools are given recognition, due to them, in Cracow. Some of them have been charged with managerial position which is the case even of big enterprises. Many women work in Administration in the Cracow technical Schools, being given such posts as those in dean's offices, libraries, publishing divisions, information and the like, where they show much initiative and interest in the units under their respective management.

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