

JPRS 71458

13 July 1978

TRANSLATIONS ON EASTERN EUROPE
SCIENTIFIC AFFAIRS
No. 592

EAST

EUROPE

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BIBLIOGRAPHIC DATA SHEET	1. Report No.	JPRS 71458	2.	3. Recipient's Accession No.
	4. Title and Subtitle			5. Report Date
TRANSLATIONS ON EASTERN EUROPE - SCIENTIFIC AFFAIRS, No. 592			13 July 1978	
7. Author(s)			6.	
9. Performing Organization Name and Address			8. Performing Organization Rept. No.	
Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No.	
12. Sponsoring Organization Name and Address			11. Contract/Grant No.	
As above			13. Type of Report & Period Covered	
15. Supplementary Notes			14.	
16. Abstracts				
The serial report contains articles concerning the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences.				
17. Key Words and Document Analysis. 17a. Descriptors				
<input type="checkbox"/> International Affairs <input type="checkbox"/> Albania <input type="checkbox"/> Bulgaria <input type="checkbox"/> Czechoslovakia <input type="checkbox"/> East Germany <input checked="" type="checkbox"/> Hungary <input checked="" type="checkbox"/> Poland <input checked="" type="checkbox"/> Romania <input type="checkbox"/> Yugoslavia		Scientific Societies Research Management Organizations Research		
17b. Identifiers/Open-Ended Terms				
17c. COSATI Field/Group 5B				
18. Availability Statement			19. Security Class (This Report)	21. No. of Pages
Unlimited Availability Sold by NTIS Springfield, Virginia 22151			UNCLASSIFIED	29
			20. Security Class (This Page)	22. Price
			UNCLASSIFIED	PC A03

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HUNGARY

INSTITUTE HEAD DISCUSSES AUTOMATION, ROBOT RESEARCH

Paris ZERO UN INFORMATIQUE in French 22 May 78 pp 8-9

[Interview with Tibor Vamos and George Cogar, by Ivan Berenyi, "Thoughts on Robotics in the East and West"]

[Text] Robotics throughout the world is looking more and more like a race in which a lot of capital and brains are being invested. For some of the nations or societies involved in this competition, the effort is encouraged by the hope for the enormous profits that can be reasonably expected by those who are the first to put on the market a general-interest, programmable, easily maintained robot that can show its profitability in performing a number of relatively simple but time-consuming jobs in the area of manual labor.

In Eastern Europe, besides the USSR and Bulgaria, Hungary has an international reputation for being in the forefront of work in robotics, which is conducted in this country mainly by the Computer Technology & Automation Research Institute of the Hungarian Academy of Sciences (SZTAKI), under the personal direction of Tibor Vamos, who is a world authority in this field.

In an exclusive interview organized by OI INFORMATIQUE, George Cogar, one of the pioneers in the computer industry, questioned Tibor Vamos on robotics research and the differences between the East and West.

[Cogar] Can you tell us where the Institute of Computer Technology and Automation is in its robotics research?

[Vamos] The Institute is heavily involved in robotics. For the last few years we have been working on pneumatic robots. We are presently working on industrial robots intended for assembly-line operations, about 1985, and we have set strict cost limitations. The material necessary for an "arm" now costs about \$30,000, but we think that sufficient mass production will bring this price down to about \$10,000, which would make it about \$25,000 for the whole system. It would then be not unrealistic to foresee wide use of such systems in manufacturing industries.

[Cogar] Are these "general-purpose" robots capable of performing a whole series of different tasks that are not necessarily defined when the machine is ordered?

[Vamos] Precisely. One of the goals of our research has been to try to define the limits of "manual dexterity" that could be given to a robot piloted by a 12-16 kilo computer. The minicomputer that we are using is the Videoton R-10, manufactured under licence CII. It now seems to us that we can set as a goal the recognition of 30 objects as well as the resulting decisions on manipulating them. That is about as much information as a minicomputer can process with a central memory and a disc. We asked ourselves the following question: how does a qualified foreman do a less qualified job? We made sure that the necessary level of intelligence would not be exceeded. Indeed, when the determined level of intelligence is exceeded, the necessary machine capacity increases exponentially.

A Shortage of Labor

[Cogar] What are the economic forces behind the effort Eastern Europe is making in applied robotics?

[Vamos] Hungary has a manpower shortage that is liable to become critical in the next decade. However, unlike the countries of Western Europe, we cannot solve this problem by importing foreign labor, even if we wanted to. Thus, robots will be necessary in 7 or 8 years to carry out repetitive tasks, or else we won't be able to have those jobs done at all. Also, our approach, which is very practical, to the problem of artificial intelligence puts us in the position of being able to export our robots on a large scale once they are being mass produced.

[Cogar] Your Institute seems to emphasize applied research almost exclusively, much more than your Western counterparts, although pure research is being more and more criticized in the West as a waste of the taxpayers' money, which is already limited. In Hungary, who decides how research funds are to be used?

[Vamos] At the Institute, we are certainly doing more applied than pure research. There are two reasons for that. The first is due to the very nature of computer science, which lends itself readily to applied research. Then there is also the fact that Hungary is not a rich country, and we have to be practical in choosing projects to finance. We cannot get involved in work when the foreseeable results are light-years away. However, we enjoy here, as perhaps in other European countries, a very high degree of independence as concerns the kinds of projects that the various institutes may undertake. My American friends always seem to me to have, on the one hand, a greater freedom of choice in their activities and, on the other, restrictions due to short-term financing and the constant necessity of "selling" the usefulness of their work to organizations like the National Science Foundation.

[Cogar] In the United States there is indeed a growing problem in this area. The grants awarded by the National Science Foundation are subject to the hazards of change at the top in politics. When Nixon was elected, he brought about a complete reversal of course between basic and applied research. The trouble is that this system produces people who are not researchers so much as expert grant-getters. Some organizations have developed remarkable adaptability in this way; MIT [Massachusetts Institute of Technology], for example, is capable of changing its orientation overnight.

[Vamos] As we see it, American research institutes nevertheless have a great advantage over all the others: instant access to the latest technological developments. When you have in your hands the latest results of the research being done in the semiconductor industry, you are necessarily way ahead of the game.

[Cogar] I agree with you on experimental tools in semiconductor research, but the publications are surely available to you in English, and the publications are right in the forefront of semiconductor technology in the United States. Everything that is discovered is published, because publication is the very lifeblood of science.

[Vamos] I don't agree. Scientific publications are marvelous, and they reflect what is really going on in the industry, but they don't get to the heart of the problems, partly because they don't want to and partly because they can't. That isn't just due to security considerations but basically to the complexity of the problems at the frontiers of computer science today. That is as true of the hardware as of the software, data bank managing systems or usage systems, for example. To know everything about a problem, you have to get into very precise details, otherwise everything is just general description.

A Parallel Treatment

[Cogar] Is semiconductor research so important for what you are doing in robotics? You said that the generation of robots you are working on is based on minicomputers.

[Vamos] Till now we have been relying on minicomputers out of necessity, and we have 8-10 of these machines permanently installed in the Institute (Videotons produced here), but microprocessors are making a place for themselves in robotics as they are everywhere else. They are inexpensive and convenient components, which means they can have many uses. They are contributing something new: in robotics, every degree of freedom can be computed at any moment by a specialized microprocessor. Before, with the minicomputers, it was impossible because of the cost and inconvenience. With a micro [as published], the problems had to be solved in series; with microprocessors, they can be solved in parallel. The parallel treatment of images is now a hot topic that has come in for a lot of discussion. Till now, most of the treatments in parallel consisted only of "parallelization" of treatments

in series. Now truly parallel processing is being sought, and it has proved to be a very exciting job of programming. Microprocessors have opened up virtually limitless possibilities. To process 8 x 8 images you have to use only 64 microprocessors. Why sacrifice? They cost less than \$1,000.

[Cogar] And even as little as \$100 in about ten years.

[Vamos] That's right, and it opens up exciting possibilities for us, once we've solved the software problem. That's another challenge we have to meet.

[Cogar] I have never been directly concerned with artificial intelligence, only as a sideline, as with intelligent terminals and such, but I think we lack in computer science the architecture that would enable us to create a true machine intelligence, that is, an intelligence capable of working in a variable environment. I don't think there is at present any hope of a solution, and for that reason I think the present progress in artificial intelligence has built-in limits. In a variable environment, data become obsolete very quickly indeed. Unless the new data can be received and processed at such a speed that the obsolescence becomes insignificant, the rate of error will be so high that results obtained will be all wrong.

[Vamos] I think you're right. The next stage in our work will be the recognition of objects in motion, not just stationary objects as now. In theory, a computer should process this type of problem better than the human eye because the machine's memory is fast and because it can process instantaneous events with no difficulty. If this operation is possible soon the outlook will be good, and everything should go well, but the researchers have seen nothing promising so far.

The Bionic Man

Another example of what we are working on is the use of artificial intelligence in the application of processing controls to deal with situations where there is a sudden breakdown or a panic where the machine, without a human being's emotional reactions, should be able to cope better than a person. Recognition of shapes could be used in situations like the New York blackout, for example, to check as closely as possible on what is happening at every moment to help people choose the best solution. Under circumstances of this sort, human operators tend to panic, and they are liable not to react fast enough, anyway.

[Cogar] In the West, some men have had a lobotomy, and their brains have been equipped with electrical controls. This is the theme of the book "The Terminal Man." There is said to be the meeting point of artificial intelligence and what is now called bionics. Does this meeting point exist in the East?

[Vamos] Yes. Obviously, we are still far from what you can see on television with Steve Austin, "the three billion dollar man" [as published]. However, important work is under way. The field is quite vast and involves medicine, computer science, etc. I have a doctor friend in Budapest who is doing research in neurophysiology and whose specialty is the correction of birth defects by variable-frequency treatment. Children who would have been handicapped thus become practically normal.

[Cogar] For 10 years, Case Western Reserve, in the United States, has been working on flexible plastic implants. They are based on transducers that capture muscular responses and transform them into movement. There are today artificial limbs based on this principle.

[Vamos] That's so, but they are still rather awkward. As far as I know, only in Sweden, in a Gothenburg hospital, has there been perfected an arm capable of six different movements initiated by myo-electric signals coming from the brain. It costs a little over \$8,000, and I understand it has been adapted successfully to five people so far. They say it is very sensitive, capable of holding a baby's hand without hurting it and of lifting a 15-kilo weight. Now that's beginning to look a lot like bionics. In this country, the present president of the Academy of Sciences of Hungary, Dr Janos Szen-tagothay, a renowned biologist who is, among others, a foreign member of the National Academy of the United States, is working on making models of the brain. We have talked about the possible coordination of our research, but while that interests me, I am a little skeptical, not about the biological aspects but about our capacity to represent on today's computers without oversimplification the extremely complex functions of the human brain.

[Cogar] I agree completely. It is impossible to use primitive tools to analyze structures several times more complex than these tools. I also think that what we know about computer technology is still very primitive. We tend to think we are very advanced, but I believe that will seem very naive a hundred years from now.

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POLISH ACADEMY OF SCIENCE ACTIVITIES, PERSONNEL

Warsaw NAUKA POLSKA in Polish No 3-4, Mar-Apr 78 pp 216-241

[Article: "News"]

[Excerpts] Research Achievements

Anti-Acoustic Screens

In the Laboratory of Environmental Acoustics of the Department of Aeroacoustics, Institute for Basic Technical Problems, Polish Academy of Sciences, a group under the direction of Prof Stefan Czarnecki made a theoretical analysis and completed model research and construction designs for anti-acoustic screens. Principles were also developed for using these screens for the needs of industry.

The anti-acoustic screen is a rigid barrier with certain acoustic properties making it possible to limit the travel of sound produced by a machine, thereby guarding the work environment against noise.

Absorbing the sound on the surface, the anti-acoustic materials are installed on the ceiling or walls of the room. An original calculation method was developed to make it possible to choose the conditions for having the screens work with surfaces absorbing sound. This makes it possible to reduce the noise level by from 5 to 10 decibels in relation to the results presently being obtained. The new screens are suitable for reducing sound levels in industrial halls in which the noise is produced by single pieces of very noisy machinery or equipment. The principles developed are suitable for designers working in this area.

Ultrasonic Method of Measuring Blood Flow From the Surface of the Skin

In the Institute of Basic Technical Problems, Polish Academy of Sciences, a research group under the direction of Prof Leszek Filipczynski has developed a theory, method, and apparatus for ultrasonic doppler measurement of the flow of blood from the surface of the skin. Both the method and the equipment constructed, which have been verified in the course of labora-

tory experiments, represent important new instruments in the diagnosis of diseases of the circulatory system. The work was done under the auspices of the key problem entitled "Nervous System and Biocybernetic Elements and Systems."

Within the framework of the research done an analysis was made of the doppler impulse method of measuring the flow of blood in the circulatory system, taking into account the physical aspects of the diffusion of ultrasonic waves in the blood, and then a mathematical model of blood flow. A separate part of the analysis was devoted to theoretical and technical aspects of measuring doppler frequency. On the basis of the analysis, a laboratory model was made of the ultrasonic doppler impulse measurement of the flow.

Laboratory research on this model made it possible to develop technical conditions and solutions of designs for making a prototype of an ultrasonic flow detector UDP-30 in 2.5- and 5-megahertz variants.

The first UPD-30 version was designed in terms of the blood flow in the heart and in the placenta, the latter in the surface vessels. The prototype of the apparatus is in process of being tested in the laboratory. On the basis of this research optimization of the equipment will take place, and then an information series of ten units of the device will be produced in the experimental department of the institute's TECHPAN.

Valuable for clinical and diagnostic research, the apparatus will serve in subcutaneous measurement during operations of the speed of blood flow, in the detection and localization occluded vessels, the location of arterial-vein fistulas, research on flows within the heart, and research on the motion of heart structures.

Concern for a Clean Sky

At the Institute of the Foundations of Environmental Engineering, Polish Academy of Sciences, in Zabrze (group directed by Dr M. Sadelski, with the cooperation of a group from the former Polish Academy of Sciences Institute of Organization and Management and the Ministry of Science, Higher Education, and Technology, under the direction of Dr L. Krus), a 2-year cycle of research devoted to the problems of air pollution emissions came to an end. It involved in particular the numerical symulation of the processes of atmospheric pollution in the case of many sources in an urban-industrial complex.

A model was developed for the dispersion of air pollution for a separate area, for average weather conditions, for stagnation, and for slight dispersion as the basis for reducing pollution emissions, forecasting, and the steering of prevention of air pollution.

As the result of the research, a series of 20 computer programs in FORTRAN was obtained to automate the execution of various stages of the dispersion of pollution, including two basic models for dispersion monitored

in four towns of the Upper Silesian Industrial District: Zabrze, Gliwice, Bytom, and Ruda Slaska.

On the basis of the optimalization analysis conducted on the verified models, guidelines were developed in detail to help reduce the costs of preventing air pollution in the model area. The models developed, which make it possible to determine the effect which the sources of emissions have on air quality, are at the same time a useful tool in planning clean air protection. They also make it possible to conduct research with many variants on emissions using the help of all the ODRA-1300 series computers.

New Research Methods for Investigating Structural Defects

At the Environmental Laboratory of X-Ray and Electromicroscopic Research, Institute of Physics, Polish Academy of Sciences (group directed by Prof. J. Auleytner, under the auspices of an inter-ministry program) new methods have been developed to make it possible to specify exactly the type of defects which occur in a crystal lattice of semiconductor compounds.

These methods make it possible to specify more exactly the relationships between the type of exactitude of the structure and the electronic or optical properties of the crystal of the semiconductor. Using the technology made it possible to obtain crystals with a high degree of perfection.

The methods developed concerning materials with a wide range of applications in electronics and optoelectronics made it possible to achieve progress in solving structural problems and in obtaining a correlation between the properties of semiconductor compounds and their real structure. They also furthered technological optimalization (improvement of hallotronic parameters). The research methods developed by the group have become an essential instrument in the daily practice of routine research performed for the needs of the technology of semiconductor materials produced elsewhere besides in the PAN Institute of Physics.

Strengthening of Polycrystalline Metals

At the Institute for the Foundations of Metallurgy of the Polish Academy of Sciences in Krakow, work has been completed on the question of polycrystalline strengthening: for MOOB copper and CuZn32 bronze, in tensile, compression, drawing, and rolling tests and also on the kinetics of initial recrystallization under various production conditions. The research was conducted by Dr Engineer A. Grabianowski and Dr Engineer St. Wierzbinski.

As the result of the research conducted it was established that both sheet-metal and wire made under industrial conditions differ spatially in that they have different strengths, and there can be a tendency toward development or decline as plastic working progresses. The strength curves show a metal's suitability for homogeneous strengthening. A mathematical model was proposed for the spatial averaging of hardness measurements along with a method for plotting strain hardening curves on computers.

Wire and sheet deformed to varying degrees were submitted to isothermic and anisothermic recrystallizing heat treatment. Temperatures were determined at the beginning and end of the initial recrystallization in the function of the degree of deformity, temperature, and time of annealing, and a determination was made of the values of the energy of activation and coefficient of speed of initial recrystallization. The use of anisothermic electroresistant annealing made it possible to increase strength properties by 10-15 percent, to reduce surface oxidation, and to greatly shorten the annealing time, from 1 hour to 10 seconds.

The results of the research are applicable in modernizing existing technology, and they particularly make it possible to obtain metals and alloys with a lesser degree of heterogeneity and greater strength properties with minimal anisotropy.

Seminar of the International Ionic Polymerization Laboratory

The International Ionic Polymerization Laboratory, operating under the Polymer Department, Polish Academy of Sciences, in Zabrze, set up a scientific seminar attended by foreign scholars during September and October of 1977.

On 8 September, Prof Thieo E. Hogen-Esch, of the State University of Florida was an honorary participant. He gave a paper entitled "Stereochemistry of Anionic Polygomerization of Certain Vinyl Monomers," in which he presented the phenomenon of stereoselectivity in anionic polymerization of vinylpyridine derivatives and its influence on the kinesis and mechanisms of reactions.

On 27 September, Prof Ph. Teyssie, director of the laboratory of large-molecule compound and organic catalytic chemistry of the University of Liege, in Belgium, presented a paper entitled "Polymerization With Open Ring and Certain New Polymer Materials," in which he presented certain aspects of the polymerization of lactons and cyclic oxides on catalytic systems containing an atom of aluminum or zinc and the possibility of obtaining block copolymers with lactams.

On 29 September Dr J. Adler, of the Technical University in Dresden presented a paper entitled "Research on the Anionic Polymerization of Acrylonitrile."

On 5 October Pro W. J. MacKnight of Massachusetts State University presented a paper entitled "Homogeneous Polymer Mixtures," in which he discussed criteria of creation by two types of polymers of real solid solutions, after the example of the polyoxyphenylene/chlorinated polystyrene system.

The papers drew a great deal of interest and discussion, in which invited representatives of other polymer institutions in Silesia also took part.

Symposium on Mathematical Physics

The PAN Physics Committee, the Institute of Physics of the Nicholas Copernicus University in Torun, the Scientific Society in Torun, and the editors of the bimonthly journals REPORTS ON MATHEMATICAL PHYSICS held an international symposium on mathematical physics in Torun on 2-5 December 1977. Many famous physicists and mathematicians from all over Europe and from Japan attended.

There was a presentation and discussion of the research contribution of the work presently being conducted in the field of mathematical physics in different countries. The symposium was tied in with a session of the international editorial council of REPORTS ON MATHEMATICAL PHYSICS, editor-in-chief of which is Prof Roman Stanislaw Ingarden, director of the Institute of Physics of Nicholas Copernicus University in Torun.

Twentieth Anniversary of the Launching of the First Sputnik

On 4 October 1977, a scientific meeting set up by the Chief Scientific Organization and the Society for Polish-Soviet Friendship, was held in Warsaw to celebrate the 20th anniversary of the launching of the first sputnik.

Papers were presented by Prof Stanislaw Baranski: "Development of Bioastronautics and the Role of Poles in the Interkosmos Program," Prof Zbigniew Paczkowski: "Propelling Equipment of Space Installations Today and Tomorrow," Dr Engineer Piotr Wolanski: "Benefits of Space Research," Dr Andrzej Dozynier: "Scientific Aspects of Investigations of the Earth From Outer Space," and Dr Engineer Zbigniew Krawczyk: "The Poland of Technical Thought in the Investigations of Nonterrestrial Space."

Cybernetics in the Maritime Economy

The first conference in Poland on the subject of "Cybernetics in the Maritime Economy" was held on 16-18 October 1977 in Gdynia and Sopot.

The deliberations were set up in sections: analysis, modelling and simulation of systems, technicoeconomic aspects of systems theory, and the steering and use of systems. There was also a symposium on the subject of the reliability of ship equipment and machinery.

Several dozen papers were presented. Among other things, they concerned the following subjects: the conception of effective planning in ports, optimization in administration of the ship-building industry, problems of steering the process of freighter use, use of a minicomputer in ship engine diagnosis, computer techniques in instruction at marine institutions of higher education, and automated steering of ship movements in the Polish fleet.

Fatigue of Materials and Constructions

The Lublin Polytechnica and the group on the fatigue of materials and construction of the Polish Academy of Sciences Building Machine Committee set up the Second All-Polish Seminar devoted to the problems of the endurance limit of materials and construction in Lublin on 25-27 October 1977. Scientists from Polish and foreign institutions of higher education, scientific institutes, and scientific facilities in industry took part in it.

The program consisted of 45 papers in which scientists presented the results of their own research in the area of fatigue of elements of machinery and equipment. Employees of the Lublin Polytechnic gave eight papers and communiques. This polytechnic specializes in investigating the fatigue of plastics and metal materials and the endurance limit of components of machinery under conditions of random load, which is of great importance in the automotive, aeronautical, and ship-building industries.

The first symposium on the endurance limit of materials and constructions in 1973 also took place in Lublin.

Modern Techniques in Scientific Research

A symposium entitled: "Modern Techniques in Scientific Research, Instruction, and Environmental Protection in Large Industry" was held in Katowice on 8-11 November 1977. Scientific employees from institutions of higher education and scientific research institutes located in the Silesian and Zaglebia region took part in the discussions.

The program of the symposium was made up of papers presented in Polish, German, and English. Among other things, the papers touched upon the problem of using audio visual resources in the teaching of foreign languages, the use of analytic measurement devices in biochemistry and medicine and analytical measuring techniques in the petrochemical industry and in environmental protection, and the question of microorganisms as sources for fodder and food.

In connection with the symposium there was a display of scientific research apparatus and didactive devices both domestically produced and imported. There was a demonstration of apparatus and equipment useful mainly in research in the areas of chemistry and biochemistry, largely from 14 firms, including those in Austria, Japan, Norway, Sweden, Hungary, and Great Britain, and from the Precision Mechanics Plants in Gdansk.

Information System in Technical Exploitation of Ships

A conference on the subject of the information system in the technical exploitation of ships and other technical equipment of the maritime economy was held in Szczecin on 20 December 1977. More than 100 employee scientists engaged in the technical exploitation of the fleet and people involved in practical applications all over the coast attended.

It was emphasized in the discussion that merchant ships and the fishing fleet are systematically removed from service, which means substantial losses to the economy. These withdrawals can be greatly reduced by making wider use of an information system for guiding the technical exploitation of the fleet. The Maritime Institute is the main coordinator of work related to the inculcation of an information system into maritime practice, and the institute has already developed a concrete program in this area.

Polish-French Medical Colloquium

Under the auspices of cooperation between the Pasteur Institute in Paris and the State Institute of Hygiene in Warsaw (going back to 1970) the third Polish-French colloquium on bacterial toxins and the immunology of viral and bacterial infections was held in Warsaw on 3 October 1977. Ten specialists from each institute took part in the deliberations, along with about 500 persons from Poland interested in these subjects.

Such conferences are held every other year and alternate between France and Poland. The representatives of the two institutes discuss selected subjects being worked on in their institutes, discuss research methods, and deliberate over the interpretation of research.

Miscellany

Lectures of the PAN University

During the first semester of academic year 1977-1978, that is, between October and December 1977, the university of the Polish Academy of Sciences set up lectures grouped into three subject areas.

The following lectures were presented in the subject area Most Recent Achievements of Science: PAN Member Kazimierz Michalowski: "Role and Significance of Polish Mediterranean Archeology," Prof Pawel Bozyk: "Socialist Integration -- Theory and Practice," Prof Bogodar Winid: "Changes and Development in the African Continent (Environmental, Social, Political, and Economic Problems)," Prof Jerzy Wolczyk: "Modernization of the System of Education in an Advanced Socialist Society," Prof Zdzislaw Bubnicki: "Optimal Steering of Complex Operations," PAN Corresponding Member Stanislaw Mrowec: "Defects in the Structure and Phenomena of Transport in Ionic Crystals," PAN Corresponding Member Jerzy Seidler: "Teleinformational Networks -- Selected Problems," PAN Member Adam Smolinski: "Light Conductors and Their Application," and PAN Corresponding Member Adam Nowoslawski: "Application of Tagged Antibodies in Biomedical Research."

The following lectures were presented in the subject area Man and the Environment: PAN Member Stanislaw Hueckel: "Role of Hydroengineering in Shaping and Protecting the Coastal and Maritime Environment," PAN Member Wlodzimierz Michajlow: "'Man and the Biosphere' Program and Its Implementation in Poland," Docent Dr Edward Tomaszewski: "Role of Satellite Observations in Environmental

Protection," Prof Przemyslaw Trojan: "Homeostasis of Ecosystems," and Prof Kazimierz Zabierowski: "Protection of Nature in the Light of Intensive Economic Development."

The following lectures were presented in the subject area Science and Progress in Agricultural Production: PAN Corresponding Member Eugeniusz Domanski: "Neurohormonal Regulation of Animal Growth and Productivity," Prof Dyzma Galaj: "Social Changes in Polish Rural Areas and Further Long-range Prospects for Its Development," and Prof Lech Ryszkowski: "Ecological Aspects of the Activation of Agriculture."

During the second semester, that is between January and April 1978, the lectures were grouped into four subject series.

The following lectures were presented in the subject area Most Recent Achievements of Science in the field of the social sciences and the humanities: PAN Member Wladyslaw Markiewicz: "Political Culture of the Polish Society," PAN Corresponding Member Jan Bialostocki: "Art History Among the Humanities," Prof Leszek Kasprzyk: "Problems of Science and Technology in UN Activity," PAN Corresponding Member Czeslaw Kupisiewicz: "Changes in the School System of Industrialized Countries," PAN Corresponding Member Alojzy Melich: "Wage Policy," Prof Kazimierz Romaniuk: "Optimal Structures and Demographic Processes," and PAN Member Wacław Szubert: "Contemporary Problems of the Labor Law."

The following persons presented papers in the natural sciences: PAN Corresponding Member Mieczyslaw Chorazy: "Organization and Function of the Genetic Apparatus," Prof Witold Drabikowski: "Molecular Biology of Muscle Cramp," Prof Stanislaw Dryl: "Role of Single-cell Organisms in Research on Excitability and Motion," PAN Corresponding Member Kazimierz Ostrowski: "Transplantology, Science of Joining Tissues and Organs," and PAN Member Tadeusz Ruebenbauer: "Rye and Possibilities for Improving It."

The following persons presented lectures in exact and technical sciences: PAN Member Kazimierz Dziewonski: "New Research Directions in the Geography of Settlements," PAN Corresponding Member Jerzy Kroh: "Electrons in Radiation Chemistry," PAN Corresponding Member Leon Lukaszewicz: "On Information Theory," and PAN Member Bohdan Paszkowski: "Technology of Light Conductors."

The following lectures were presented in the series Man and the Environment: Docent Dr Roman Andrzejewski: "Ecology of the City," PAN Member Stefan Bialobok: "Forestation in Industrial Regions," Prof Stefan Jarzebski: "Fundamentals of Environmental Engineering," and Prof Barbara Prandecka: "Economic Problems of Environmental Protection."

In the series Science and Progress in Agricultural Production, the following persons presented lectures: Docent Dr Stanislaw Buraczewski: "Physiological Bases for the Production of Animal Protein," Prof Jan Glinski: "Water and Soil, and the Rise in Agricultural Production," Prof Wlodzimierz Starzecki: "Using the Photosynthesis Process to Increase Plant Production," Prof Ignacy

Wiatroszak: "Genetic Structuring of Crop Production," and Prof Jerzy Woyke: "Research on Obtaining

In the Medical Sciences series (selected subjects), the following people presented lectures: Prof Tadeusz Chrosciel: "Pharmaceutical Interrelationships," Prof Sabina Chyrek-Borowska: "Role of the Environment in the Development of Allergic Disorders," Prof Leszek Janiszewski: "Origin and Role of Bioelectric Phenomena," PAN Corresponding Member Maria Kopec, Docent Dr Wojciech Moszczyk, and Docent Dr Zbigniew Latallo: "Venous and Arterial Thrombosis," Prof Stanislaw Kozlowski: "Adapting the Human Organism to Work and Conditions of the Environment," Prof Julian Narebski: "Thermoregulation -- Thermal Comfort of the Brain," Prof Czeslaw Radzikowski: "Experimental Chemiotherapy of Neoplasms," Prof Jozef Surowiak: "Biological Rhythms," Prof Konstanty Wisniewski: "Peptides -- Modulators of the Functions of the Central Nervous System," and Swiatoslaw Ziemianski: "Physiology and Pathology of Human Nutrition."

Courses in the Applications of Mathematics

The program of the 31st Course in the Applications of Mathematics began in October 1977. The classes are set up by the PAN Mathematical Institute in Gdansk, Katowice, Krakow, Lodz, Poznan, Warsaw, and Wroclaw. The program of courses consisted of lectures and classes available to all students in keeping with their interests, and they were grouped into the following areas:

I -- numerical methods adapted to computer calculations and information science -- post-graduate course,

II -- statistical methods for engineers, farmers, and physicians -- post-graduate course,

III -- 19 series of lectures concerned with the following subjects, among others: stochastic models of biological phenomena, probability theory, data structure, problems of numerical methods, methods of finite elements and grids for solving differential problems, statistical analysis for qualitative data, numerical methods of linear algebra, statistical methods of optimization, mathematical analysis, planning experiments, programming engineering, the mathematical foundations of programming, mathematical statistics, elements of mathematical logic and set theory, and the architecture of modern computers.

New International Scientific Society

In the course of the deliberations of an international symposium devoted to the directions of mathematical applications in mechanics, held in Porabiec-Kozubnik in September 1977, an International Society for Interaction Between Mechanics and Mathematics was created. The society has 115 founding members from 19 countries. PAN Member Witold Nowacki, chairman of PAN and director of the Institute of Mechanics at the University of Warsaw, is chairman of the society. Vice chairman is Prof T. B. Benjamin of Great Britain, and Secre-

tary is Prof Henryk Zorski, director of the Continuous Media Department of the PAN Institute for Basic Technical Problems. The 13-member executive committee includes representatives from Czechoslovakia, France, the Netherlands, Poland, the FRG, Italy, Great Britain, the United States, and the USSR. Both mathematicians and mechanics specialists are among the membership of the society.

It is the purpose of this international society to support cooperation between mathematics and mechanics, which, as the history of the development of science and technology shows, is useful for both fields. The program of activity includes, among other things, the setting up of international meetings at which the most important scientific achievements bordering on mathematics and mechanics will be presented. There will also be summer schools intended mainly for young scientists, and scientific exchange will be promoted among the various countries. At the PAN Institute for Basic Technical Problems and at the University of Warsaw there is a large group of scientific employees who are collecting works bordering on mechanics and mathematics. Despite the fact that these are fundamental sciences, they are very important for the development of many applied sciences, such as materials engineering, the strength and optimization of construction design, aerodynamics, and so on.

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The next volumes of the works of the famous economist Oskar Lang (died in 1965), member of the Polish Academy of Sciences, have appeared (Polish Economics Publishers, Warsaw, 1977).

Tom 6, Theory of Programming (444 pages), pertains to the general problems of optimization in economics, optimal decisions, and programming principles. The volume has annotations, and an epilogue by A. Banasinski entitled "Programming Theory in O. Lang's Works," and name and subject indices.

Tom 7, Cybernetics (376 pages plus tables), contains works from the field of economic cybernetics. It consists of two parts: Part 1 -- Cybernetics and Philosophy, and Part 2 -- Cybernetics and Economics.

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PAN Corresponding Member Zbigniew J. Jedlinski is author of a work entitled "Thermal Stability of Polymers Containing Naphthalene Units in the Chains" (Warsaw, Polish Scientific Publishing House, 1977, p 58).

The author has presented here the results of research on polymers containing aromatic rings, mainly dinaphthalene, in the polymer chain. The first part of the book contains general theoretical considerations on polymer thermal resistance based on the basic laws of thermodynamics and structural chemistry. The second part contains generalized results of the research of the author and his group on the synthesis of new thermoresistant polymers containing naphthalene systems. In the work the most important results have been

extracted and synthesized. There is also expanded theory on the subject of the relationship between the structure and the thermoresistance of the macromolecules included. The general principles and conclusions given have been thoroughly discussed and illustrated with the results of experimental research. There is a particularly thorough analysis of the thermal, mechanical, and electrical properties of a new class of polymers, and a comparison is made with the respective properties of conventional polymers in the context of their molecular and supramolecular structure.

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NEW HERBICIDE TO PROTECT TRIFOLIUM CROPS

Bucharest AGRICULTURA SOCIALISTA in Romanian 13 May 78 p 4

Article by Dr Engr N. Sarpe, Research Institute for Grain and Industrial Crops, Fundulea

Text Fagatoxid is the commercial designation for the new Romanian herbicide industrially produced at the Fagaras Chemical Combine, upon the procedure developed by the Research Institute for Pesticides under the Central Institute for Chemical Research.

The herbicide is turned out in the form of a brown, homogenous, and clear liquid. It contains 36+2 percent dinoseb acetate (4,6-dinitro-2 sec-butyphenyl acetate). It is a selctive herbicide for all species of trifolium: alfalfa, clover, sainfoin, bird's foot trefoil, and so forth. It is a contact herbicide which penetrates the plant tissues through the epidermis, in the form of nondissociated molecule, causing the inhibition of the respiratory process. As a result of dehydration the water level dwindles in the cells and tissues which soften and brown in a matter of a few hours after the treatment.

Fagatoxid controls many species of annual and perennial weeds in the group Dycotyledoneae such as: Sinapis arvensis, Raphanus raphanistrum, Chenopodium sp., Amaranthus sp., Sonchus oleraceus, Sonchusarvensis, Cirsium arvense, and so on.

The treatment begins when the first year trifolium plantules developed at least 3-5 trefoiled leaves. The treatment should not begin earlier because the too young plantules do not take the herbicides -- many plantules are burnt and this is instrumental in the nonuniform sprouting of the crop.

In controlling the dicotyledonous weeds, Fagatoxid is effective 95-100 percent if at the stage of the treatment the weeds ar still in the phase of cotyledons up to the so-called rosette phase.

The effectiveness of the herbicide is very rapid if on the day of the treatment the air temperature exceeds 15°C.

The optimal dose of Fagatoxid is 6-7 liters per ha. If the trifolium crops prior to sowing were treated with the Balan herbicide the dose of Fagatoxid may be reduced to 4-5 liters per ha, if the dicotyledonous weeds did not exceed the rosette phase.

The treatment with Fagatoxid should preferably proceed on cloudy days or, for best results, at dusk, after 4 p.m. If the treatment is applied during the day, when the sun rays are very strong, a portion of the active substance is decomposed. Moreover, there is a strong evaporation which results in the concentration of the solution which causes burns on leaves, especially in plantules which do not have 3-5 trefoiled leaves. The preparation of the Fagatoxid solution should proceed in the shade.

For the proper humectation of the weeds the sprinklers must be adjusted for a minimum 400-600 liters of water per hectare.

Because Fagatoxid is a very poisonous herbicide (group II toxicity), all the safety regulations in the requirements and on the packaging must be strictly followed.

The surveys conducted at Fundulea in previous years on new alfalfa strongly infested with *Sinapis arvensis* and other Dicotyledoneae showed that Fagatoxid yields results on a par with Aretite -- an internationally well-known herbicide (see table). It was found that in comparison to the untreated control, the alfalfa output doubled.

<u>Alternatives</u>	<u>First Mowing Alfalfa Yield</u>		
	<u>Total Green Matter</u>	<u>Including Pure Alfalfa</u>	
	<u>Q/ha</u>	<u>Q/ha</u>	<u>%</u>
Control -- untreated	360	170	100
Fagatoxid 7 liters/ha	320	280	165
Aretite 40 EC 7 liters/ha	333	284	167

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DEVELOPMENTS IN CHEMICAL FERTILIZER PRODUCTION

Bucharest AGRICULTURA SOCIALISTA in Romanian 13 May 78 p 8

[Interview with Oliviu Popa, technical director in the Industrial Central of Chemical Fertilizer, by Emilian Albuлесcu]

[Text] The chemical fertilizer industry, which formerly was almost non-existent, has considerably developed under socialist construction. While prior to 1944 there were three small units -- at Valea Calugareasca, Tirnaveni, and Fagaras -- Romania now has 10 large specialized industrial combines which annually turn out more than 3 million tons of mineral fertilizer, active substance.

The orientation of the chemical fertilizer production is based on the needs resulting from soil and climate conditions, the structure of crops, the per hectare output planned, the expansion of irrigated areas, the development of new high-yield strains and hybrids, and the export requirements.

In order to inform our readers about new developments in this area we interviewed Oliviu Popa, technical director at the Industrial Central of Chemical Fertilizer.

[Answer] The task of transforming quantity into a new quality, as formulated by Nicolae Ceausescu at the National Party Conference, is for all working people in the units of our central one of the goals with whose achievement we are constantly involved. Currently with focusing on increasing the quantities of chemical fertilizer we pay great attention to diversifying the output and providing a better and better proportion between the three basic nutrients -- nitrogen, phosphorus, and potassium.

[Question] What are the major products which you are now turning out?

[Answer] We are turning out more than 20 kinds of fertilizer including ammonium nitrate, nitrolime with a minimum content of 28% N, (fertilizing and fodder) urea, anhydrous ammonia, ammonium

sulfate, simple superphosphate (powder and pellets) with minimum 16.5% P_2O_5 , concentrated superphosphate pellets containing 46% P_2O_5 , and so forth.

We also turn out a wide range of complex fertilizer with different contents of N.P. or N.P.K.

For almost 2 years we have been turning out complex liquid fertilizer: C 141, C 411, C 011, and C 313. The same facilities (for complex liquid fertilizer) serve to produce foliar fertilizer with extraradicular assimilation: F 141, F 411, F 011, and F 231.

Results of cooperation with the Academy of Agricultural and Silvicultural Sciences and of the central's own research involve the complex organomineral fertilizers L 300, L 210, L 120, L 121, and L 110 S -- approved products -- for which, however, we have not developed the facilities because such fertilizers are not requested in industrial quantities. They are especially useful for fertilizing sands because, in addition to the active elements N.P.K., they also contain humic acids, which improve the structural features of the soil.

Question Our readers would like to know what new kinds of fertilizer they will use in the future?

Answer At the Craiova industrial center we have a research center for chemical fertilizer, under the sponsorship of the Central Institute for Chemistry, where all the types of new fertilizer, beginning with liquid, foliar, and organomineral complexes, were developed. Presently, 30 types of simple and complex fertilizers, with and without microelements, in solid or liquid form, have been studied and proposed for approval. For instance, we have recently provided agriculture, for testing purposes, with phosphorite activated with both sulfuric acid and phosphoric acid, in powder and pellets. In the Sadova-Corabia major irrigation system our central built a facility for introducing liquid fertilizer (including anhydrous ammonia) into the irrigation water and, in conjunction with the Dabuleni Research Station for Sand Improvement, we are testing, at this location, liquid fertilizer with nitrogen, anhydrous ammonia, and complex liquid fertilizer. The use of these liquid fertilizers results in huge savings for both the manufacturing industry and agriculture, in consequence of simplified and eased transportation of the nutrients and the possibility of phasic fertilization without extra manpower.

For the purpose of the plant's greater use of the active substances through longer retention of these substances in the soil studies focused on several kinds of N.P.K. type complex nutrients, with variable solubility in water (from 30 to 70 percent of the P_2O_5 soluble in water). For the same purpose, nitrogen fertilizer of the

sulfur-coated urea type was made. It was tested at the Plant Center of the Craiova Chemical Combine, in conjunction with the Dabuleni Station. We also developed urea phosphate used in animal fodder. This product is being tested by the Balotesti Research Institute for Animal Food. The Central Institute for Chemical Research has provided us with the procedure for turning out a blended fertilizer -- ammonium sulfate with urea -- which results from the use of an ammonium sulfate by-product in the chemical industry.

We also focus on other types of fertilizer used on a worldwide scale, such as nutrients in the class of ureoformaldehyde resins, which are not easily elutriated and significantly upgrade the structural qualities of the soil. Moreover, we are testing extraradicular fertilizers with growth stimulants, which are applied on leaves, and fertilizer with herbicides. We are also studying polyphosphates (fertilizer with a very high level of phosphorus). We plan to produce complex fertilizer without chlorine.

Question What can you tell us about fertilizer with microelements?

Answer It is known that microelements -- magnesium, borine, zinc, copper, iron, molybdenum, manganese, sulfur, and cobalt -- in small quantities can produce major output increases. For instance, urea with 2 percent zinc, depending on the characteristics of the soil, can help to increase the corn output even 30 percent. Because of the major advantages involved, our research focuses on simple and complex chemical fertilizer with microelements. These kinds of fertilizer will be produced as they are tested and approved and, of course, in light of the demand from the agricultural sector.

In light of the fact that foliar fertilizer also contains microelements and the plant's extraradicular path of assimilation is the most rapid and involves minimum loss, and of the fact that this type of fertilizer can be applied concurrently with sanitary treatments, we advise agriculture to adopt using larger amounts of this kind of fertilizer not only in vegetable hothouses but also in large-scale crops, in vineyards and orchards.

Question It means that most of the chemical fertilizer used on a worldwide scale can also be developed in our country.

Question It is correct. Of course, we need a minimum period to prepare production and firm demand from users must be assured.

Question Since agriculture is your major customer, what would you like to convey to this sector through our journal?

Answer We have very good relations with the Ministry of Agriculture and the Food Industry. We would like this ministry to provide us with specifications as to its long-term needs for the various types, zones, and delivery schedules in terms of chemical fertilizers. This is extremely useful to us both for the optimization of deliveries and the specialization of production, and the scheduling of the overhaul of the facilities involved.

The studies conducted by the Academy of Agricultural and Silvicultural Sciences, at the request of our central, in regard to the new products would be fully used if the Ministry of Agriculture and the Food Industry would provide us with specifications as to the products and quantities which it plans to purchase. This would permit us to switch from microproduction to the industrial-scale production of the new types of chemical fertilizer.

Moreover, the above ministry is the basic factor in propelling the implementation of the "Program for the Use of Liquid Fertilizer in Agriculture." As far as we are concerned, we supply crystalline and foliar liquid fertilizer and are able to provide anhydrous ammonia and liquid nitrogen fertilizer with a high amount of active substance -- products which we already export.

Because of the specific processes in the production of fertilizer the Romanian combines produce large amounts of waste water with a specific level of active substance, especially nitrogen, which must be treated in order to prevent the pollution of the environment. It would be far more economical for this waste water to be used, in the areas adjacent to the chemical combines, for soil fertilization. This is now being tested and even is in the process of finalization in the area of the Slobozia Chemical Combine.

In conclusion, there is a matter relating to the transportation of fertilizer which, according to instructions, should be done in bulk (except for ammonium nitrate) for the purpose of saving polyethylene sheets. This involves taking special measures not only by the Ministry of Transportation and Telecommunications to provide adequate freight cars but also by the Ministry of Agriculture and the Food Industry to promptly transfer the fertilizer from the cars to the appropriate storage centers.

The output of ammonia, a raw material for nitrogen fertilizer, went up from 10 tons a day prior to 1944 to 10,000 tons a day this year, that is by a factor of 1000. As for phosphorus fertilizer, during the same period the daily output increased from about 10 t to more than 2000 t P₂O₅, i.e. by a factor of 200.

During the prewar period Romanian agriculture used under 1 kg of chemical fertilizer per arable hectare. Under socialist construction, the amounts have been increasing every year. While in 1965, 25 kh/ha chemical fertilizer, active substance, were used, in 1975, 71 kg/ha were used, and in 1975 it was more than 120 kg/ha. In 1980 agriculture will use more than 280 kg/ha and this will place Romania, for this indicator, among the countries with a modern agriculture, with intensive cultivation.

The diversification of products has been accompanied by a significant improvement in their quality. The average concentration of chemical fertilizer was about 18-20 percent in 1960, 24 percent in 1964, more than 27 percent in 1965, 30 percent in 1970, and 35 percent in 1975. In 1980 it will exceed 40 percent.

A ton of chemical fertilizer, active substance, on the average results in a production increase equal to the crop over a non-fertilized area of 4-5 ha. This means that 100,000 tons can produce an increase equal to the production obtained over a nonfertilized area of 480,000-500,000 ha.

Among all the factors which increase production, chemical fertilizer plays the major role. Surveys focusing on the cultivation of wheat, for instance, confirmed that from the crop increase, 38 percent is due to fertilizer, 34.5 percent to soil operations, 15 percent to crop rotation, and 12.5 percent to strains.

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