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Information on worldwide political, economic and technical developments in telecommunications, computers, and satellite communications appears in TRANSLATIONS ON TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT.

Information on environmental pollution and pollution control technology, organizations and programs appears in TRANSLATIONS ON ENVIRONMENTAL QUALITY.

Information on Law of the Sea conferences and negotiations, territorial seas and straits, coastal and international seabed economic areas, marine pollution, scientific research and fisheries appears in TRANSLATIONS ON LAW OF THE SEA.

Information on incidence, outbreak and other aspects of human, animal, and plant diseases, insect pests and control, sanitation conditions, immunization and public health programs appears in WORLD EPIDEMIOLOGY REVIEW.

BULGARIA

ACADEMY OF SCIENCES ANNOUNCES NEW DEVELOPMENTS

Sofia TEKHNICHESKO DELO in Bulgarian 6 May 78 p 2

[Text] The Institute for Oceanology and Marine Research Equipment

An instrument has been constructed for registering the microcirculation of water masses in the Black Sea coastal zone. The equipment has been put into use in the scientific-research effort involving the study of wave velocities in the coastal zone. It can also be used by other organizations for the improvement of transportation in the coastal zone.

The Central Laboratory for Electrochemical Current Sources

A new design has been developed for a foam-plastic box as a modular battery which could be combined with all types of traction batteries. Its implementation will increase labor productivity significantly and contribute to the achievement of savings in rubber, lead, and sulphur. In addition, it will also improve the mechanical and operational indices of batteries.

Institute for Organic Chemistry

A new technology has been developed for producing a corrosion inhibitor--ACTINSOL--of ferrous metals in hydrochloric acid. The quantities produced under industrial conditions have demonstrated positive results and a high quality product has been obtained.

Experimental amounts are being used in tests in the Scientific Industrial Trust for the corrosion protection of metals.

Institute for Solid State Physics

A plasma-chemical reactor has been built for producing various dielectric, semiconductive, and metal layers at low temperatures. The instrument has high parameters and good features which broaden the potential research possibilities. It can be used successfully in various plasma technological processes. In addition to this, an instrument has been designed for special measurement and testing units of industrial installations for obtaining neon and helium from the air.

Institute for Mathematics

Program packages have been developed for generating and introducing in operation various types of the BIS 32 information system for the MINSK-32 electronic computer. The implementation of the design results in a significant reduction of the "research-implementation" cycle in the development of information systems. By means of the BIS-32 package, ten information systems have been put in operation in several institutes in the country.

Institute for Nuclear Research and Nuclear Energy

A program of improved accuracy and high operating speed for recharging nuclear fuel in the active zones for determining the operating characteristics, has been implemented in the Kozloduy Nuclear Power Station and the "Energoproekt" Scientific Research and Planning Institute for Electric Power Stations. This institute carried out research involving the replacement of the epoxy coatings in the reactor rooms of the Kozloduy Nuclear Power Station with pentaphtal varnish, which is expected to have a significant economic effect.

Central Laboratory for Space Research

New instruments have been designed for measuring ionic concentration and natural optic atmospheric emission from aboard a meteorological rocket. Both devices have been designed by agreement with the National Physics Laboratory in New Delhi (India).

Institute for the Science and Technology of Metals

As a result of the development and practical implementation of methods for the treatment of materials with gas counterpressure steels 10G2SAF and 17G2SAF have been produced. They are being tested in the production of freight cars, petroleum tanks, and various metal structures.

New technologies have been developed and implemented in the casting of complex components from nonferrous metals and alloys. These are applicable in the casting of parts for automobile manufacture.

The use of electroslag steel making has been expanded. These steels have better operational qualities than the imported ones and are suitable for the manufacture of die-forging dies, instruments, guillotine shears for metallurgical enterprises, machine tool cutters, and for other purposes.

A two-position machine for casting structural foam plastic--the TMT 4000/250--has been designed. It is twice as productive as existing machines and can be operated by only one worker. These qualities make it possible with a few machines to satisfy the annual needs of the country for traction battery cases for electric truck production.

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NEW MULTIPLE-GRADIENT MAGNETIC SEPARATION TECHNOLOGY DEVELOPED

Sofia TEKHNIЧЕСКО ДЕЛО in Bulgarian 13 May 78 p 4

[Article by Borislav Velkov]

[Text] One of the central tasks set forth in the program of the BCP for the development of the national economy during the Seventh Five-year Plan, is related to the solution of the problem concerning the full and comprehensive utilization of iron ore from Kremikovtzi. Since it is difficult to separate useful components (such as hematite) from useless ones by means of the usual methods of magnetic processing, it is necessary to first subject the ore to sintering at 700-800°C in special shaft furnaces. This increases the sensitivity of iron-bearing components to medium and low-intensity magnetic fields. This magnetizing sintering, however, renders the separation of other valuable components (such as barite) more difficult, consumes a large amount of energy, and, last but not least, causes severe environmental pollution.

This is why for a long time specialists throughout the world have been seeking ways of replacing this technology with so-called multiple-gradient magnetic separation (one of the modes of applying high-intensity magnetic fields). After about 6 years, as a result of much labor and extensive experiments chief assistant Todor Kosev and docent Georgi Klisuranov of the Advanced Institute for Mining and Geology succeeded in developing an original design. They call it PMS I-VMGI. Their multiple-gradient magnetic separator has some essential advantages over the best foreign models belonging to the joint U.S.-West German firms "Jones Ferromagnetic" and "Carpc-Amacs." Its basic advantage is in the highly effective and continuous self-regeneration of the multiple-gradient medium (usually small metal balls made of special "soft" iron). In the magnetic field zone the "tendency" of the magnetic lines of force to concentrate occurs at the tangent points of the small balls, resulting in a greater local density of the field in those operating induction "poles" reaching a gradient in the range of 18,000-20,000 oersteds. Revolving around the horizontal axis the separator cage leaves the magnetic field zone while the balls unload the magnetic fraction in a mechanical mode, with a minimal amount of water. A single revolution along the multiple-gradient medium leaves no residual particles, which insures reliability of operation, and the effectiveness of the separation

during the course of many cycles (several months). In the U.S.-West German model the rotor is horizontal, the multiple-gradient medium is static, and requires extra equipment for its demagnetization.

The results of semiindustrial experiments using PSM I-VMGI for the concentration of iron ore proved its capacity to obtain a concentrate with 42.92 percent of metal at a separation rate of 75.02 percent from primary ore containing 31.5 percent iron, this surpasses the results achieved in the United States, Britain, and France. This decreases the price per ton of iron concentrate by about 20 levas. The separator can be used for the separation of iron from quartz sandstones in the glass industry, for the concentration of intermediate manganese products, the concentration of coke fines in metallurgy, etc. The introduction of an industrial variation of PMS I-VMGI in the "Kremikoytsi" Metallurgical Combine alone and the replacement of imported separators with Bulgarian ones will provide the national economy with savings of several millions of foreign-exchange leva.

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CSO: 2202

ACHIEVEMENTS IN MICROBIOLOGICAL INDUSTRY OUTLINED

Sofia TEKHNICHESKO DELO in Bulgarian 13 May 78 p 8

[Article by Ivan Andonov, Vice-President of DSO "Farmakhim"]

[Text] Among the nominations for the Dimitrov prize honor is that of a collective of 13 specialists, who have developed and introduced technologies for a group of new antibiotics and microbial preparations. The collective consists of the following: engr I. Agayn, engr N. Komarov, D. Jovchev, L. Isonova, engr K. Ganchev, B. Lukanova, engr P. Petkov, engr S. Stoyanov, Prof D. Dimitrov, I. Ryakhneva, engr P. Stoyanov, engr P. Todorov, and engr G. Zgumov. This is a well-deserved recognition for the exceptional success the collective has achieved in the dynamic and effective development of the microbiological industry in our country.

In implementing the decisions of the Ninth Party Congress for the 1970-1977 period, the collective successfully resolved a number of problems concerning the intensification, modernization, and optimization of the Bulgarian microbiological industry. This contributed to the creation of possibilities of a fuller satisfaction of the needs of our country for microbiological products, while a portion of these has also been set aside for export to capitalist and developing countries. These are products of a high return value such as: tetracycline, gentamycin, tubocine, leucine, penicillin, oleandomycin, semisynthetic penicillins, tilosine, erythromycin, etc. A significant amount of foreign currency has also been saved for the import of these second-priority preparations to satisfy the needs of the country.

Some of these products are of an exceptional significance for Bulgaria, one which places it among the leading countries in the world with respect to the technical and technological levels, and the economic effectiveness of their production. The People's Republic of Bulgaria, for example, is the second country in the world to initiate the production of the wide-spectrum and highly effective antibiotic uromycin. The situation regarding the new anti-tuberculosis antibiotic tubocine is similar. Among socialist countries, ours was the first to begin producing, with an original technology, the amino acid lysine as a stable lysine bioconcentrate used in cattle-breeding. The same collective also introduced the production of the highly effective veterinary antibiotic tilosine within a

short deadline. In addition, it also introduced a technology for the production of penicillin "G" which is at a world level. This provided a substantial base for the production of semisynthetic penicillin in our country.

At present, our country is one of the large exporters of tetracycline, which this same collective is also responsible for to a certain measure. Since 1967, the collective has expanded and intensified the production of this preparation by over 10 times, while successfully applying foreign know-how and continuously improving the technological processes for the chemical purification and separation of tetracycline.

The technical achievements of the collective in the application, for the first time among socialist countries, of a new type of fermentation equipment--fermentors with turbine agitators facilitating the optimization of the technological processes and achieving high technical-economic parameters--merit a particularly high appraisal. In this context, we should note an additional achievement of the collective, which has been realized for the first time in the world. This is the "rotory freezing cycle" for the cooling of fermentors, which is exceptionally significant for conserving water resources, as well as for conducting a stable technological process.

The new microbiological products introduced by the collective represent an important achievement for our country. They provided the opportunity for the "Farmakhim" State Economic Trust to double its second priority exports, and to realize a favorable foreign exchange balance of over 6 million leva from microbiological products alone.

The new optimal production structure of microbiological preparations created by this collective also solves an additional number of significant economic problems for our country:

Full satisfaction of the needs for modern, highly effective microbiological products in health care and agriculture.

Provision of resources for the fulfilment of the plan for specialization and cooperation with the chemical-pharmaceutic industry of the USSR and other socialist countries with high foreign exchange and budget returns.

Annual foreign exchange savings in the amount of over 6 million leva for second-priority imports.

For these reasons we are of the opinion that the nomination of this collective for the honor of the Dimitrov prize for 1977, by the State Committee for Scientific-Technical Progress, Ministry of Chemical Industry, State Economic Trust "Farmakhim", and the ONS [expansion unknown] Pazardzik, is fully deserved.

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EAST GERMANY

BEHAVIOR THERAPY FROM THE VIEWPOINT OF MARXIST-LENINIST PHILOSOPHY

East Berlin PSYCHIATRIE, NEUROLOGIE, UND MEDIZINISCHE PSYCHOLOGIE in
German No 3 Mar 78 pp 129-137

[Article by Dr med Barbara Franz of the Berlin-Lichtenberg Special
Hospital for Neurology and Psychiatry and Dr phil Achim Thom of the
Karl Sudhoff Institute for the History of Medicine at Karl Marx
University]

[Text] For the practicing psychotherapist, philosophical reflections on man in general and certain neurosis theories in particular do not immediately appear to be of great importance. First of all, he must find and apply concrete psychotherapeutic methods and measures, in order to be able to treat the neurotic disorder. In his practice, he can select methods from a broad spectrum, but in doing so he must be able to assess what theoretical concepts these techniques are based on. The analysis of such theoretical concepts reveals differences in basic definitions, e.g. in regard to the definition of the interrelationship between symptoms and personality changes and in regard to other statements concerning the nature of the neurotic process. Since these statements are always related to ideological views concerning the interrelation between somatic and psychological and between psychological and social factors as well as to the position of the individual person in society, every neurosis theory has a directly or indirectly philosophical content which has a retroactive effect on the theory's methodological inferences. Thus the critical evaluation of these philosophical presuppositions of psychotherapeutic concepts and their methodological inferences can be a means of testing their scientific content and practical significance under certain social conditions. Since the particular theoretical concepts and their methodological procedures are also always based on empirically established insights and experience, such criticism must aim to uncover this rational content and to conceive it as part of the development of knowledge. It is these two aspects which will be considered in the following discussion of behavior therapy.

Behavior therapy is a specific system of therapeutic procedures, which is based on certain theoretical assumptions concerning the character of behavior disorders and on an experimental methodology. The theoretical axioms of the classical form of behavior therapy have been explicated by Eysenck and Rachmann (1967). A characteristic statement in this system of methodological theory reads as follows: "In neuroses, one must expect to encounter nothing but conditioned and maladjusted behavior" and "there is no neurosis underlying the symptom; there is only the symptom itself." In this view, the symptom is equated with behavior and the whole therapeutic process is believed to consist in systematic behavior modification. To the extent to which the methodological repertoire of behavior therapy was extended and differentiated on the basis of practical experience, it became clear that the central assumptions of the original theoretical conception--the reduction of the neurotic disorder to its external symptoms, the conditioning thesis and the negation of the role of subjective decision-making options--are not valid in that they are too simplistic and schematic. The dismantlement of this core of initial theoretical positions was in part undertaken by behavior therapy-oriented schools, e.g. by Kanfer's "self-therapy" (1976), in which the patients' conscious decisions and thus also more complex learning processes are taken into consideration. This development also gave rise to very broad definitions of "behavior therapy," which do not do justice to its characteristic theoretical foundation. A good example of this is Brengelmann, who conceives behavior therapy as "the application of the entire system of experimental psychology to the solution of emotional problems" and who by making reference to "emotional problems" introduces an element of behavior therapy, which according to the theoretical assumptions of the classical form of behavior therapy does not exist (1976). Equally incompatible with the classical assumptions is his delineation of the tasks of behavior therapy: "Of crucial importance is an analysis--tailored to the individual concerned--of the factors triggering or maintaining the behavior disorder, the modification of these factors so as to prevent any negative effect on the behavior and the familiarization of the patient with problem-oriented self-control exercises " (1976). This process of gradual abandonment--which has only been sketched here--of initially extreme theoretical positions is in certain respects comparable to the longer developmental history of the behaviorist school in psychology, which was critically and thoroughly described by Jaroschewski (1975). Since in some industrialized capitalist countries behavior therapy became within a relatively short period of time an important factor in the psychotherapeutic practice in the fields of medicine and psychology, a number of studies examining behavior therapy from a Marxist-Leninist point of view have been published in the last few years. In spite of differences in emphasis in regard to certain specific questions concerning the theoretical foundation of behavior therapy and its methodology, these studies adopt essentially identical positions. To the best of our knowledge, the list of authors comprises the following names: Durst and Schlirf (1973); Gleiss (1975); Kohler (1974); Köhler and Seidel (1974); Sachepitsky (1975); Thom and Loether (1976). The authors concur in regard to the following

points: The assumptions--indeed characteristic of behavior therapy--concerning the nature of the behavior disorder and the crucial importance of learning processes in regard to the formation of this disorder have a rational basis in the development of the idea of the conditioned response-character of the psychological symptoms; from this starting point, however, they went to untenable extremes in the restriction to elementary learning processes and in the theoretical elimination of the patients' conscious reactions. This theoretical approach, which is also taken in some present-day extreme variants, is in keeping with the mechanistic interpretation of man frequently encountered in bourgeois society; it is supported by relevant philosophical arguments and by ideologically motivated hopes regarding the development of procedures for the manipulation of behavior.

The special methods developed by behavior therapy are successful, since they make systematic use of partial insights into relatively simple learning processes; these insights are applied in cases, in which the nature of the disorders does indeed make possible the elimination of symptoms by this method, i.e. in a limited number of cases characterized by specific forms of behavior disorder and by specific personality profiles.

Thus in spite of the necessity of a critical attitude toward the theory of behavior therapy, especially toward its classical form, it is possible--if the specific indications and objectives are defined--to integrate concrete methods and techniques into complex psychotherapeutic procedures (see also Dummer, 1976; Strauss, 1976; Sydow, 1976).

In our opinion, the truly basic problems, the solution of which would make it possible constructively to overcome the theoretically acknowledged one-sided positions in behavior therapy (as well as in other important trends of present-day psychotherapy in the capitalist countries), are related primarily to the following: a) the understanding of the complex character of behavioral and psychological disorders; b) the understanding of the various learning processes operant in therapy and in other forms of behavior modification; c) a correct attitude toward the therapy objectives relevant to psychotherapy in our society; d) the dialectic understanding of the role of different schools and emphases in regard to the therapeutic strategies and the required integrative procedures of a scientifically grounded psychotherapy.

In regard to the first set of problems, it is necessary objectively to examine what weight can be assigned to the term "behavior disorder" and whether it should be employed at all in a future theory of psychotherapy.

As far as human behavior is concerned, it is necessary to define its determinant qualitative characteristics within the framework of a socio-psychological personality theory. An awareness of goals, value criteria, means and consequences in connection with behavioral acts is of fundamental qualitative importance. In regard to these specific conditions, "activity" appears to be a more suitable term. Human behavior, especially

behavior in the form of socially oriented activity within the framework of communicative relations, is primarily the vital expression of an individual, who is shaped by his own historically unique background, who consciously pursues his objectives, who within the framework of his or her personality structure and physical and psychological condition can at discretion draw on a wide range of behavioral options and who can acquire and creatively employ modes of behavior. Naturally, human activities and the concomitant modes of behavior are also bound up with biological conditions of existence and are largely acquired by elementary learning processes, but they cannot be completely explained by these, nor can they be analyzed apart from the integral personality.

Thus those neurotic symptoms indicative of subjective suffering which manifest themselves as behavior disorders are on the one hand the result of a complex psychological development and on the other hand the expression of a personal relation--formed via specific attitudes and experience--to the given circumstances and requirements of the social environment. Consequently, in practice psychotherapy is often primarily concerned with changing the attitudes determining behavior, in order to eliminate the preconditions for the occurrence of external forms of behavior disorder. On the part of the therapist, this calls for understanding for the subjective attitudes ensuing from behavioral difficulties and for the subjective meanings which certain individuals attach to situations and reactions (Lingart and Sukhorukov, 1976); it requires the application of methods by which new attitudes and new meanings can be developed. Considered in this context, the techniques characteristic of behavior therapy are part of an initially merely symptomatic therapy, and behavior disorders--as understood in the classical sense--are external manifestations of fundamental and complex rearrangements of the individual personality's "subjective world."

As regards the second set of problems, the connection between learning processes and "behavior," a theoretically more cogent solution of current problems will largely depend on the progress made in psychological research and in the development of theories. At present, the following trends are appearing in outline: a) a differentiation between the established learning processes, which goes far beyond the concepts developed in traditional behavior therapy; b) a dialectic interpretation of the interrelation between activity and learning and of the development of the learning capacity, which is no longer adequately explained by the traditional model concepts of behavior therapy; c) a growing understanding of the crucial function of social living conditions and of the resulting activity requirements and opportunities in regard to the development of the individual personality and the--as a rule attainable--level of capabilities concerning the conscious and flexible interaction with the environment (see also Seve, 1976; Gleiss, 1975; Vorwerg, 1974, 1975; Abulkhanova-Slavskaya, 1976 and Juelisch, 1976).

This entails important consequences in regard to the third set of problems concerning the therapy objectives. Under the conditions prevailing in

socialist society, the therapy of neuroses and other psychological disorders can and must go beyond the immediate elimination of symptoms; It must try to develop as much as possible the potential--so essential for the development of society and for the individual--inherent in an active and independent interaction with the environment. In terms of the therapist-patient relationship, this requires on the part of the therapist an understanding of the characteristic demands imposed on the individual personality by our society. According to Kossakowski (1976), these demands are

--clear conceptions concerning the societally required objectives of the individual's activity,

--the conscious decision in favor of socially and individually significant objectives..., which presupposes conscious reflection on the social and individual consequences of one's actions,

--the ability to anticipate the results of one's actions and the largely independent acquisition of the means and strategies necessary for their attainment...

--the readiness and ability to attain the social and individual objectives with the help of and in collaboration with others and

--the conscious and deliberate employment of all sociological and physical resources in the realization of the objectives, especially in the presence of external and internal obstacles.

The demands placed on socialist personalities are not in themselves therapy objectives, since the sick individual must first be helped through symptomatic treatment and relief from suffering, but they represent the starting point and framework for the therapeutic process. Since every concrete therapeutic strategy is in a certain way related to the development of the personality, a behavior therapy aiming at the elimination of symptoms must be incorporated into such complex tasks (see Helm and Thom, 1976; Kondas, 1975; Katzenstein et al., 1976; Schmieschek, 1976).

Finally, in regard to the last set of problems, namely the dialectic understanding of the role of schools in psychotherapy, it is striking that in the very dynamic development of psychotherapeutic concepts and methods within the framework of the movements in the socialist countries specific germinal ideas are now as ever quickly elevated to the rank of an independent psychotherapeutic trend, with appropriate labeling and theoretical substantiation contributing to the impression of independent systems. This is true of some of the models introduced lately, e.g. the "communicative psychotherapy," the "conversational therapy," the "disszent [sic] psychotherapy" the "dynamic group psychotherapy," and others. Although in most cases this is probably not intended, these tendencies impede to some extent the development of a relatively uniform, complex and essentially integrative

psychotherapeutic strategy. On the one hand, there is no doubt that the increase of knowledge in this field calls for the continuous new formation of scientific schools and personal standpoints; for this reason, the above-mentioned tendencies can be said to have productive potential. On the other hand, from the point of view of science and health policy, it is extremely important theoretically to consolidate the various insights gained--under specific conditions--in regard to certain types of disorder and certain aspects of the therapeutic process so as to establish a largely uniform and differentiating system of psychotherapeutic strategies and methods. Considered from this point of view, it would probably not be conducive to further progress, if modified forms of behavior therapy were considered as established psychotherapeutic systems championed in direct and intolerant opposition to the results of other schools, even though the research, methodology and application of behavior therapy are entitled to their place in our republic and may be effective within the framework of complex therapeutic systems.

Summing up, we would like to state the following:

1. The great response which the traditional behavior therapy and its therapeutic techniques have met with in bourgeois society is based on several factors, the most important of which are the following: The affinity with an essentially bourgeois model of human nature; the compatibility with an educational practice which is largely oriented toward conformity; the broad applicability--extending beyond the framework of medicine and allowing practice by professionals without medical training--and the economic efficiency of the procedures within the restricted framework of certain neurotic disorders.
2. The therapeutic techniques developed by the various types of behavior therapy contain rational elements and are based on empirical insights into individual components of behavior (practice, reinforcement etc.). The theoretical criticism of the presuppositions of these techniques does not negate their--in our view demonstrable--practical effectiveness for certain tasks and purposes. Psychotherapists in the GDR also employ behavior-therapeutical methods without subscribing to their underlying characteristic theoretical-ideological views, according to which man is merely the executor of psychological and social functions, not their subject.
3. The scientific problem consists above all in integrating the procedures adopted by the various independent schools into a complex therapy system; while taking into consideration specific indications, this integration is part of a process which in terms of the therapy objectives must be regarded as complex. For the theoretical substantiation of such a complex and socially acceptable therapeutic methodology of psychotherapy, the conception--advocated by socialist psychology--of the extreme significance of activity for the development of the personality is of crucial importance. Considered as theoretical categories, the concepts of "behavior" and "activity" are essentially dissimilar, especially in regard to the role

played by the subject and its subjective reflection and decision-making ability and in regard to the activity requirements resulting from its social interaction.

4. In a scientific theory of psychological disorders, which is oriented toward Marxist-Leninist views regarding the individual personality, the theoretical-ideological standpoint, the practical place value and utility and also the limits of behavior-therapeutic procedures should be accurately defined and thus "neutralized."

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EAST GERMANY

GENETICIST INTERVIEWED ON IMPLICATIONS OF GENE RESEARCH

Dresden SAECHSISCHE ZEITUNG in German 19 May 78 p 3

[Interview with Prof Erhard Geissler, head of the Department of Cell Genetics of the Berlin-Buch Central Institute of Molecular Biology of the GDR Academy of Sciences by Dr Vera Kliemann and Hans Pietschmann]

[Text] Erhard Geissler was born in 1930. He studied biology at the Karl Marx University in Leipzig. In 1959, he took his doctorate and in 1964 he qualified as a university lecturer at Humboldt University, Berlin. From 1955 to 1965, Geissler worked for the Academy's Berlin-Buch Institute for Cancer Research, where eventually he was appointed head of the Genetics Department. In 1965, he was appointed director of the Institute of Microbiological Genetics at Wilhelm Pieck University, Rostock. Since 1971, Geissler has again been teaching in Berlin-Buch, while holding the position of docent for genetics at Rostock University.

Geissler is a member of the board and office of URANIA and of the International Cell Research Organization.

Geissler is married to the educational program editor of the Rostock Broadcasting System. There are two children in the family.

[Question] In December 1977, it was reported around the world that American scientists had succeeded in creating an artificial heredity determinant. By implanting an artificial gene, they induced bacteria to produce a hormone which in nature occurs only in the body of highly developed animals. What is behind this report? Is this a scientific sensation?

[Answer] This report comprises a whole complex of sensations. Behind it there is first of all the collective effort of several research teams which on their part draw upon studies from all over the world.

[Question] Could you tell us a little about what goes on in the research laboratories?

[Answer] I will try. Firstly, the problem was to determine the structure of the mammalian hormone in question. In this case, it was a hormone which counteracts the growth hormone. Secondly, it was necessary on the basis of this information to formulate the presumable structure of the corresponding genetic constitution. Thirdly, the problem was to reproduce this genetic constitution, i.e. the gene. Fourthly, it was necessary to link this test tube gene to a suitable carrier--a molecular vehicle as we call it. And fifthly, it was necessary by means of this carrier to insert the synthesized gene into bacteria and thus genetically redesign these bacteria, i.e. to induce them to produce this mammalian hormone.

[Question] Professor Geissler, before we go into the significance of such complex experiments: What is a gene?

[Answer] A gene is simply a heredity determinant. It is the determinant which Gregor Mendel discovered in 1865 in his cross-breeding experiments. This gene represents a certain segment in the genetic material of every living organism. A segment, which is responsible for the formation of a gene product, of a protein. These gene products--proteins--work in concert so that a mature specimen can develop from a fertilized egg cell. Depending on what heredity determinants are present, there develops a plant, an animal or a human being.

[Question] What do such heredity determinants consist of?

[Answer] The genetic information of all organisms is coded in the DNA (deoxyribonucleic acid) in a certain sequence of molecular elements, comparable to a word in a line of print. The genes themselves are partial segments of these giant molecules, which in more highly developed organisms are found primarily in the chromosomes of the cell nucleus. It is estimated that man has between 50,000 and 100,000 genes. A child "inherits" from each of its parents a set of 22 chromosomes. This is as it were the blueprint of its life.

[Question] How big is a gene?

[Answer] In 1969, the first bacterial gene was isolated. Measured under the electron microscope, it proved to be one-thousandth of a millimeter long. But in regard to gene size, it is customary to give the number of DNA elements making up its structure. The rule of thumb is: Genes consist of approximately 1,000 twin elements.

[Question] Was it difficult to determine the structure of the hormone mentioned?

[Answer] Quite difficult! To do this, the researchers required approximately 5 milligrams of this hormone. In order to isolate these 5 milligrams, it was necessary to process the brains of 500,000 sheep. This is approximately equivalent to the sheep population of the Rostock, Schwerin, Neubrandenburg, Potsdam and Frankfurt (Oder) bezirks. And this was only the first step! At least as expensive--albeit on a micro-scale--was the subsequent reconstruction of the corresponding heredity determinant, which then was inserted into bacteria.

[Question] What benefit can be derived from this tremendous effort?

[Answer] In terms of the history of science, the benefit is obvious: Man can not only decode the basic blueprint of life; he can also himself construct genetic material. This impressively confirms the Marxist thesis concerning the perceptibility and changeability of the world. In a way, man thus becomes the creator of novel organisms such as could never come into being through natural development; for intestinal bacteria, e.g., the production of such a hormone would be totally pointless.

[Question] All this is exciting for the scientists. But what can the common people expect of such research?

[Answer] In concrete terms, the production of the anti-growth hormone by bacteria is expected to open up new ways of treating certain growth disorders or certain forms of diabetes mellitus. Moreover, the above-described experiment represents a model experiment: If in principle it is possible to induce bacteria to synthesize this mammalian hormone, it should also be possible to force them to produce other animal or vegetable gene products. Take diabetes, for example. As a disease of civilization, it is on the increase. For the treatment of diabetics, constantly increasing amounts of insulin are needed. So far, we have extracted insulin from animal products obtained primarily from pigs. This is very costly and there are natural limits. It would be fantastic, if one could induce bacteria to produce insulin. We have already succeeded in inserting the rat insulin gene into bacteria. But the bacteria do not yet produce any insulin. They have difficulties in understanding the genetic message coming from the pig. Although it will not be easy to "teach" them, it will be done sooner or later. And the reverse process, the programming of mammalian cells, should also be possible. I am convinced that in the 1980's at the latest it will be possible to insert genetic information into mammalian cells, including human cells, in order to correct certain genetic defects.

[Question] So as far as the practical application is concerned, such research will be used to change the genetic code?

[Answer] Not only that. The geneticists study the action of heredity determinants in healthy as well as in sick cells.

How is it, e.g., that a certain percentage of new-born babies has a genetic defect? What can be done to remedy this? Or: What is the inter-relationship between genes and malignant tumors? A broad spectrum.

Among other things, we study the cells of individuals suffering from incurable hereditary diseases. Through an accidental discovery, we succeeded in curing such cells to all intents and purposes. This provided quite a few important intellectual impulses. Even if decades will pass before we will be able to help sick people in this way.

[Question] So mankind pins its hopes on this science. And yet there are more and more warning voices, especially in the United States. Some time ago, scientists convened in San Francisco at an "International Conference for the Unity of Science." Pondering the future of mankind, this assembly expressed the fear that through gene manipulation the researchers might lose control over their work. Genetics as a weapon, for example. Are these fears to be taken seriously?

[Answer] This problem is being discussed throughout the world. Generally speaking, however, this is not a genetic problem; the problem is that any scientific-technological discovery can be used or misused for the benefit or detriment of mankind.

However, any improper use of genetic findings would be a very serious matter, since through fundamental changes in the genetic substance it could be possible radically to change, even exterminate, mankind. Through bacteriological weapons, for example.

Fortunately, thanks to the initiative of the Soviet Union and the other socialist countries, over 100 states ratified the convention concerning the prohibition of development, production, storage and employment of biological weapons, thus at least formally blocking bacteriological warfare. But there is the danger that modern genetics may give rise to developments not affected by this convention.

[Question] What are the serious concerns?

[Answer] It is feared, e.g., that the researchers may lose control over synthetic viruses bred by them. The term "genetic engineering" made headlines. In the Western countries, there is the politically motivated fear that the biologists could breed "monsters." For this reason, the mayor of the American city of Cambridge, which is the home of two important biological research centers, prohibited certain genetic experiments for a period of time. For reasons of potential security risks, the public health authorities of the United States likewise insisted on the observance of appropriate strict safety regulations for experiments of this kind. Among the American scientists, there is disagreement concerning the justification of such fears. Some say that with appropriate safety regulations being observed nothing could happen. Others caution; they point out, e.g., that

some day somebody may try through genetic manipulation to reduce "human aggression" in order to improve people's social conduct.

[Question] Such opinions are not only instructive; they also testify to the scientists' sense of responsibility in a basically inhuman imperialistic society.

[Answer] Such a "biological revolution" would indeed be an inhuman alternative to social revolution. In such an atmosphere, the Western scientists are willy-nilly confronted with political decisions, whenever they make new discoveries. A responsibility which goes far beyond the responsibility for individual experimental results.

[Question] Do the geneticists in the socialist countries face similar problems.?

[Answer] Nobody can shirk political responsibility, wherever he may live. But aside from the fact that like many other disciplines genetics requires effective safety regulations--and in all socialist countries such regulations are prescribed by law--, under socialism the scientist is basically free from the fear that his findings could be misused. Since conditions of exploitation have been eliminated, misuse of science is impossible. Science is not used for profit.

Thus there is a stable basis for the moral accord between the scientist and society, a society which constantly exhorts him to participate in the democratic decision-making process, which listens to him and respects his views. At the same time, this naturally obligates every scientist to inform society of the consequences of his work.

[Question] This principle also illustrates a distinguishing characteristic of our concept of freedom ...

[Answer] Which for the scientist in the socialist system largely consists in the firm conviction that his research exclusively serves the common weal. This in turn stimulates creativity. On the other hand, any free creativity must end when the interests of the scientist are not in harmony with the interests of society.

These are the problems which modern genetics is confronted with. In a way, they make evident which social system is most concerned about science. We can reassuredly and optimistically await the further development of genetics, since all problems posed by new insights will be solved in the spirit of socialist humanism.

Toward this end, however, it will be necessary to put forth a supreme effort, in order to make the most effective use of the favorable conditions created by society. But this is a stimulus not just for geneticists.

[Question] Thank you for the interview.

OFFICIALS COMMENT ON NUCLEAR POWER DEVELOPMENT

Warsaw ARGUMENTY in Polish No 22, 28 May 78 p 13

[Interview with Prof Jerzy Minczewski, Director of the Institute for Nuclear Research in **Swierok** and Docent Zdzislaw Celinski, Deputy Director for Matters of Scientific Research by Malgorzata Jarocka: "This Unknown Atom"]

[Text] [Jarocka] The world is seeking new sources of energy which would assure further development of civilization or the maintenance of its current level with a constantly increasing number of residents on our globe. Do you not think that nuclear energy, as a future basic source of energy, is the most promising solution?

[Celinski] Coal and oil are not able to satisfy the growing needs of the people. Nuclear energy can easily meet these requirements.

[Jarocka] Some people think that it will have an unfavorable effect on the environment.....

[Celinski] Quite the opposite. It will help to keep environmental purity, consistently polluted by traditional sources of energy such as electric power plants run by coal or oil. Research carried out in the most industrialized regions of the world have shown that air pollution there exceeds all acceptable norms.

[Jarocka] What means are used at present in Poland to reduce air pollution?

[Celinski] Chimneys are being made higher and proper filters are being installed.

[Jarocka] How do you evaluate the effects of this kind of purification?

[Celinski] Air pollution, for example in Silesia, is so serious that there are no tangible effects of this purification. One solution would be to provide energy from outside or to build atomic electric power plants in such areas of the country.

[Jarocka] The GDR already has a nuclear power plant with a power of 950 MW, Bulgaria has one of 880 MW, Czechoslovakia has one with a power of 110 MW, and Hungary, Yugoslavia and Romania are finishing construction. It seems that we intend to implement the first Polish atomic power plant quite late, only in 1984-1985.

[Celinski] We shall be the last European state in the socialist camp. These are effects of the policy of the 1960's, when the development of nuclear energy was deliberately delayed. At that time all the countries of the world were ceasing the combustion of coal in power plants. They were switching to oil. Since we have considerable coal resources in Poland and would have to import oil, we stuck by our traditional power plants.

[Minczewski] It turned out well, because if we had switched to oil at that time, the situation now would be considerably more difficult.

[Celinski] Coal is a very important export product of ours. It is also the basic raw material for carbon chemistry. Burning it in power plants is a waste of a valuable chemical raw material.

[Jarocka] Why is the development of energetics in Poland not based completely on the construction of new coal power plants?

[Celinski] It would be necessary to construct new mines for the needs of the new power plants. The construction of mines is unusually time-consuming and requires large outlays. Other problems are transportation and finding men willing to do the heavy work in the mines.

[Jarocka] From the point of view of the annual consumption of energy per inhabitant, Poland is now 14th in the world and 11th in Europe. Prognoses show that in the year 2000 the proportion of nuclear energy to the entire production of electrical energy in the world will amount to 62 percent, and therefore the consumption of nuclear energy at that time will be more than twice the current consumption of energy originating in power plants burning coal. Unfortunately Poland is not keeping up with the economically developed countries, and is not developing its energy in accord with world trends.....

[Celinski] We are trying to keep in harmony with world trends, and we are preparing to develop nuclear energy. In the year 2000 we shall already have a considerable proportion of nuclear power plants in the production of electrical energy. In them we shall develop up to 134 billion kWh.

[Jarocka] Where do the difficulties lie in introducing this new source of energy?

[Minczewski] The basic difficulty is the share of our industry in constructing a nuclear power plant, something begun only recently. It is necessary to master new technology in the production of steel and various special

materials and new technology in building apparatus in order to become a respectable partner in the construction of these power plants in our camp. Czechoslovakia began considerably earlier to prepare for a switch to atomic energy. As a result of this the Skoda plants have become specialists in the area of manufacturing basic parts of autoclaves.

[Jarocka] And what will be the solution for the processing, storage and destruction of so-called burned out fuel rods from atomic reactors? This is a highly radioactive material requiring special treatment, always a threat to the people dealing with it.

[Celinski] Not only energy specialists, but also politicians throughout the world are puzzled by the problem of dealing with burned out fuel containing plutonium, uranium and the very active fission products of uranium.

[Minczewski] The method of handling burned out fuel has been technically mastered. In special plants a chemical treatment separates the uranium and plutonium from them, which are then used for the production of new fuel, while the highly active fission products can, for example, be sunk in glass and stored in this insoluble form underground in places especially chosen for this purpose, obviously with suitable safety and control measures.

For Poland this is a matter which is still in the distant future. Fuel processing is conducted by only a few of the countries most advanced in this field, to which burned out fuel is forwarded in special containers safe for the environment.

[Jarocka] There is talk of the harmful effect of ionizing radiation on living organisms, which is an effect of the work of atomic power plants....

[Minczewski] This is an entirely groundless fear. Ionizing radiation is obviously harmful, but a normally operating atomic power plant is so carefully safeguarded that it does not threaten the health of its workers nor of the neighboring populace.

[Celinski] The existing background of natural radiation amounts to about 1,000 mrem annually, and an atomic power plant only emits 0.003 mrem annually. This radiation is practically imperceptible.

[Jarocka] Then how can you explain the protest of the people in many countries of the world against the construction of atomic power plants?

[Minczewski] It is undoubtedly based on emotions connected with the "Hiroshima complex" and the lack of technical knowledge. So far there has not been a single accident in this type of power plant which has threatened the environment.

[Jarocka] What proportion of energy used is nuclear energy?

[Celinski] Quite a bit already. For example in Switzerland about 20 percent of the energy comes from atomic power plants, 9 percent in the United States, 17 percent in Sweden, 13 percent in Great Britain and 10 percent in France.

[Jarocka] How do you judge the use of atomic studies in Poland outside of atomic energy?

[Minczewski] Let me first say a few words about the base for the use of atomic studies in the national economy outside of nuclear energy.

Ionizing radiation, whether formed from radiation-producing isotopes or obtained in suitable equipment, has several essential features: It is easy to measure, penetrates through various materials in various ways and causes diverse changes in materials and human organisms. All of these phenomena are used in so-called nuclear techniques and nuclear apparatus used in industry, medicine, agriculture, control of the composition and quality of materials, and control over environmental pollution purity.

Particularly in this field there has been a drastic change in the situation in Polish atomic studies during the last 4 years. A couple of years ago we were "pressuring" nuclear technology on unwilling customers, and now we must often regretfully refuse aid required of us, because of our lack of sufficient resources to provide it. Nuclear technology is exceptionally profitable. It has been calculated that one zloty invested in it produces a profit of up to 18. For example, it can be estimated that the average effects of the work of Polish atomic studies in 1977 came to about 3 billion zlotys.

Unfortunately the Polish nuclear industry, working for the needs of all fields of the national economy has not yet developed enough, although there exists great demand for nuclear apparatus and services in the area of nuclear technology.

[Jarocka] Could you give a few examples of this type of application?

[Minczewski] By all means. We began in the Experimental Department of Nuclear Apparatus of our institute in cooperation with the French CGR-MEV company to produce electrons from NEPTUN-10p equipment at the top world level used for tumor therapy. We carried out this work within the framework of the Government "Tumor Control" Program. In the West every such linear accelerator used to irradiate patients in cancer therapy costs about \$500,000. The first accelerator supplied by IBJ [Institute for Nuclear Research], the so-called NEPTUN-10, is already working in the Oncological Hospital in Lodz, and the second was exported by us to France within a framework of cooperation. This year we shall be the only socialist country producing 6 more accelerators of this type. Electronic accelerators are

also used in industry, in addition to medicine. We are also working in IBJ on the construction of a suitable type of such equipment. A couple of years ago in the United States more than 2,000 pieces of such equipment were used, among other things, to purify plastics, and to produce thermoshrinking pipes which preserve a memory of shape after being irradiated. We have already developed the technique of producing such pipes and are using it already on a very small scale. However we need continuous accelerators. It should be added that we have customers anxious for this apparatus.

Electronic accelerators are an example of heavy nuclear apparatus. In this group we also built betatrons (working in Zagłębie Miedziowe), and ion implanters of interest to the semiconductor industry.

In addition to these large pieces of apparatus, many other pieces of nuclear apparatus of great significance for the national economy have come about in Poland. Recently, for example, the workers in the Experimental Department of Electronic Apparatus have developed a mine radiometer for detecting radioactive radons in mines. This apparatus won one of two gold medals at the last Leipzig Fair.

We also have orders for nuclear apparatus of our construction for detecting dust pollution in the air. By the end of 1979 160 pieces of such apparatus will be necessary in our country for environmental research, and our productive capacity is limited to 30 annually.

[Celinski] These are obviously only individual examples. Our workers have produced many pieces of such apparatus alone or in cooperation with ZZUJ POLON [expansion unknown]. Densimeters, planimeters, isotope scales and many other examples of our construction and of ZZUJ POLON production are at work in industry: building, chemical, food, mining and other types of materials.

[Minczewski] And there is another whole field of application of radio isotope methods for optimizing apparatus and technological processes in industry, in material research and in machinery parts. We are even putting forth considerable effort in our industry and are still unable to keep up with orders.

[Jarocka] In particular a great deal is heard recently about nuclear medicine...

[Minczewski] In essence, along with the applications of electron accelerators discussed in the struggle against tumors, modern medicine makes use of radioactive isotopes and suitable chemical compounds containing radio isotopes, so-called labelled isotopes, in therapy also, and perhaps above all in diagnostics.

[Jarocka] How do you two see the future of atomic studies in our country?

[Minczewski] Perhaps I can answer this question, not only for the two of us, but in the name of all of those working in atomic studies. Our conversation has only brushed several atomic study problems and its role in the socioeconomic development of our country, but this is indeed a field without which modern Poland cannot be imagined. Despite great difficulties we must rapidly develop the Polish nuclear industry, the large one which is the construction of elements for nuclear power plants and systems for their control and operation, and the lesser one of nuclear apparatus and radio isotope production. Without saturating the country with equipment of the most modern technology we cannot imagine Poland in the 1980's.

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POLISH INTERKOSMOS CONTRIBUTIONS, AIMS REVIEWED

Poznan PRZEGLAD WOJSK LOTNICZYCH I WOJSK OBRONY POWIETRZNEJ KRAJU in Polish No 5, May 78 pp 52-56

[Article by Col Docent Dr Eng Janusz Molski, Military Institute of Communications, and Lt Col Eng Jan Bekisz: "Cosmic Communications Under the Auspices of the Interkosmos Program"]

[Text] Interkosmos and Poland's Role in Research Into Outer Space

Interkosmos encompasses countries working in cooperation with the Soviet Union in the area of investigating and utilizing outer space for peaceful purposes, on the basis of bilateral and multilateral agreements. A cooperation agreement was signed at a congress of representatives of socialist countries in Moscow in 1965 and was expanded at a congress in 1966.

The cooperation program of the organization, to which Bulgaria, Czechoslovakia, Cuba, Mongolia, GDR, Poland, Romania, Hungary, and the USSR belong, was adopted at a congress in Moscow (3-13 April 1967). It includes research on the physical properties of outer space and the upper atmosphere, satellite meteorology, cosmic communications, biology, and medicine; launching satellites and rockets, and setting up conferences, symposia, congresses, and practical training sessions. The newest working section encompasses teledetection, or remote research concerning the Earth, its resources, natural environment, and atmosphere.

Last year was the first jubilee of operations under the auspices of Interkosmos. Here is an abbreviated balance-sheet of some of the achievements after the launching of 16 satellites, four geophysical rockets, and several dozen meteorological rockets.

1. The Werikal-1 rocket went up on 28 November 1970 to an altitude of 500 kilometers. It was constructed with the aid of Wroclaw astronomers, who built the X-ray spectroheliograph and the battery of cameras used in investigating the sun's emission in the ultraviolet and X-ray band. This was Poland's debut in outer space.

2. A block of emissions later subjected to cosmic radiation was sent up on the Interkosmos-6 satellite. Krakow physicists prepared this experiment.
3. The Interkosmos-9 satellite went up to an altitude of 202-1,551 kilometers. The radiospectrograph used to examine the radio emissions of the sun in the short waves was built in Poland. This experiment, known as Copernicus-50Q, was prepared by the Laboratory of Astronomy of the Polish Academy of Sciences, the Computer Institute, and the Aviation Institute.
4. The prototype of new satellites (Interkosmos-15) was launched into space in June 1976. It is what is called a technological satellite, to study newly installed systems. It differs from the previous ones in that it has more scientific apparatus and is stabilized in its situation in space in terms of the three axes. It was an international effort. Its radio transmitters were constructed in Czechoslovakia. Its numerical data recorders are from the GDR. The digitizer and feeder came from Hungary, and the apparatus steering panel was produced in the USSR, where the overall assembly was also performed. The system for transmitting part of the information obtained in analogue form was created in the Aviation Institute in Warsaw.
5. An important event of this cooperation was the flight of the Sojuz-22 in September 1976. In this experiment a special wide-angle lens camera constructed by specialists from the USSR and the GDR was used.
6. Reception stations for meteorological satellite data used daily in the work of synoptic meteorology are in operation in Krakow, Poznan, and Warsaw.
7. The PAN Institute of Geophysics, the PAN Laboratory of Astronomy, the Computer Institute, and also the Military Institute of Communications began in 1973 to work out dynamic models of the ionosphere. This work, which initially was of an exploratory nature, has brought practical results. On the basis of it monthly forecasts and daily information on radio communications conditions are issued. They are used by LOT Polish Airlines, the foreign affairs ministry, the Polish Press Agency, radio and television stations, the main administration for interurban telephone communications, and shipping. Communiques on heliogeophysical activity are also transmitted to scientists doing research on the effect on live organisms.
8. The PAN Observatory in Borowiec undertook research related to using satellite flight observations to measure the shape of our globe, using laser range-finders, among other things. On the other hand, the PAN Geodetic Laboratory and the Institute of Higher Surveying and Geodetic Astronomy of the Warsaw Polytechnic are involved in the applications of similar observations to create joint surveying networks of the CEMA countries. This work will make it possible to draw up far more accurate maps, will aid in marine and air navigation, and will also provide new information on the motion of continents and oceans.

9. The Center for the Production of Aerial and Satellite Photographs of the Institute of Surveying and Cartography is carrying on advanced work in the area of Earth research using aerial and satellite photographs.

10. The activity of a group of Computer Institute scientists engaged in computerized satellite data processing is of fundamental significance.

11. Important achievements have been made in space medicine and biology. In this area the Military Institute of Aviation Medicine is a leading facility, and so are the Medical Academies in Warsaw and Poznan.

Since 1971 Poland has been taking part in the Intersputnik international organization of socialist countries. The organization's purpose is to conduct experiments and exploit the satellite communications system. The earth research and reception station put into operation in October 1974 in Psary near Kielce is part of this system.

Although they pertain to various areas of space research, the Polish achievements have a great impact on each of them, and also on both the possibility and rate of development of satellite communications in Poland. Aeronautics encompasses a complex of interrelated problems and is a stimulus to technical progress, particularly in the area of electronics and communications. The satellite lines have proved more effective and economical than land lines, particularly for long-distance routes. They have reliability, flexibility, and flow capacity as characteristic features.

Intersputnik International Communications System

An agreement on the organization and inculcation of the Intersputnik International Satellite Communications System [MSLS] was signed in 1971 and later ratified by the governments of the nine socialist countries, including Poland.

The project of the system resulted from the work of the Permanent Working Group of Experts of the Socialist Countries on Space Communications. This group began operations in 1965, as the result of an agreement among the socialist countries' academies of sciences.

The concept of the Intersputnik MSLS is aimed at implementing satellite communications to serve the telecommunications of the above-mentioned countries. Nor has the possibility of expanding the scope of operations to other countries expressing the desire to join this organization been excluded. During the first period the system is to provide telephonic communications and the exchange of television programs. The capacity permits more than 100 two-way telephonic channels and a single-direction channel for black-and-white and color television. There is the possibility of again increasing the telephonic channels for telegraphic and phototelegraphic transmissions. Here all the technical requirements included in the appropriate instructions of the International Telegraph and Telephone Consultative Committee and International Radio Consultative Committee have been met.

The system makes a distinction between the space sector and the land sector. The space sector is made up of a telecommunications satellite and a group of land devices designated for steering and control, in order to insure the satellite's proper operation. It is based in the first stage on using telecommunications satellites located in elongated elliptical orbits inclined at an angle of 63.5 degrees relative to the surface of the equator. A complete orbit takes 12 hours. The apogee is located over the northern hemisphere of the earth and is about 40,000 kilometers, and the perigee is located over the southern hemisphere and is about 500 kilometers. At this stage satellites of the Molnia type, which the USSR has made available, are being used. The frequencies assigned by the UIT are located in the bands for communications: earth-satellite, 6 gigahertz, and satellite-earth, 4 gigahertz. An analysis of the scope of the satellite's visibility shows that one satellite with the orbit parameters given above can provide communications between Intersputnik MSLS member countries for many hours during the day. The placement of several satellites apart from one another in orbit can provide 24-hour communications around the clock. There are also plans to utilize the satellite in a geostationary orbit, that is, equatorial or circular orbit, 35,800 kilometers up. Its range would cover all the countries participating in the system with the exception of the Republic of Cuba. The long-range plans include using two satellites in a geostationary orbit, one over the Indian Ocean and the other over the Atlantic. The number of retransmission devices will also be expanded, thus increasing the information flow capacity.

The land sector consists of a stationary satellite on land. This installation is being built and used by the country participating in the system, and the given country bears all the related costs. Antenna, reception, transmission, and auxiliary devices equip the land station.

Up until now there is in operation in the country one land station which, using one satellite, provides a working time of 10 hours per day. Such stations are to be found in the USSR, Mongolia, Czechoslovakia, the GDR, and Cuba.

During the initial stage, two complex systems were developed: the Intelsat international satellite communications system and, within the USSR, the Orbit system operating inside that country. It seems useful for our country to hook up to the world system and also to set up satellite radio transmission systems.

Ground Station for Satellite Communications in Poland

Following the government decision in 1971 regarding Poland's participation in the Intersputnik international satellite communications system and the construction of a ground satellite station, work began to select a location and draw up the necessary documentation.

Besides the requirements stemming from the whole system's technical conditions, the project assumptions of this installation had to take into account a score of other factors: requirements concerning biological protection owing to the substantial radiation output of the ground station antenna, the stability and rigidity of the substructure upon which the station is constructed, the low level of radioelectronic interference near the installation, and the restricting of its own influence on the services using the equipment of the microwave and tropospheric lines and radar stations. There is the simultaneous requirement that the station be located sufficiently close to the center of telecommunications and television traffic.

Eight variant locations were proposed. From among them the choice was made to build the station on a site in the region of the Holy Cross [Swietokrzyskie] Mountains (Psary) on a forest clearing of about 30 hectares. The site selected basically meets all the fundamental conditions. It also has the virtue of being surrounded by mountains, thus protecting the station from possible radioelectric interference in the future. The proposed construction site insures the possibility of expanding the station with the installation of five antennas ultimately.

The station currently has two basic buildings. In one are the hydrophore and pumping units and the power-supply equipment. The second building, called the station building, has been designated for the radio engineering equipment and for social and administrative purposes.

The antenna system is an important element of the station. It is made up of a Cassegrain type antenna with a parabolic reflector 12.5 meters in diameter and an auxiliary hyperbolic reflector 1.2 meters in diameter, with an accuracy to 1.5 millimeters. Here are the basic specifications:

Power gain of the antenna: 54 decibels for broadcasting, 50 decibels for receiving;

Width of main beam with 3 decibels drop: 15 for broadcasting, 23 for receiving;

Temperature of noise in good weather with gamma elevations as follows: 5 degrees: -40 Kelvin, 90 degrees: -10 Kelvin;

Range of operating temperature: -50 Celsius to +50 degrees Celsius at 98 percent humidity;

Range of rotation: azimuth: ± 270 degrees; elevation: from 0 to 90 degrees;

Maximum speed of motion: 5 degrees per second for azimuth, 9 degrees per second for elevation;

Permissible wind velocity during operating time: 25 meters per second;

Weight of entire antenna system: 55 tons.

The satellite can be monitored with great accuracy (2' error) using one of the following methods: automatically, using a program, using a program with automatic correction feature, or manually.

In the programmed aiming system, the motion of the antenna is guided by a special digital machine. The system of automatic aiming consists of conical scanning. The characteristic antenna radiation gyrates about an axis set at a certain angle to the axis of the main beam, which describes the conical surface. The direction towards the satellite should coincide with the axis of rotation of the beam. Otherwise, there is the amplitude modulation of the signal received with the frequency of the characteristic gyration. The error signal proportionate to the depth of the modulation then sets the antenna steering system in motion.

The broadcasting equipment has a terminal degree with a klystron tube with an initial power of about 10 kilowatts in transmitting television signals and of about 3 kilowatts in transmitting multiple telephony. Frequency deviation amounts to ± 15 megahertz, and carrier deviation of telephonic signals is ± 45 kilohertz.

The reception equipment includes a very sensitive initial amplifier with very little noise of its own. This system is situated in liquid nitrogen. The receiver's noise level is 60 K.

The ground station is connected by radio line to the Television Center and to the international telephone exchange in Warsaw. This line permits two-way transmission of television signals along with the accompanying sound, 60 telephone channels, and signals for remote control, steering, automation, and official calls.

The fact of the intended development of the Intersputnik communications organization's system by (among other things) locating satellites in geostationary orbits and Poland's possible use of the Intelsat satellite organization given the growing domestic demand for international connections was the reason why, in the planning of the location and technical equipment, consideration was given to the possibility of expanding the station.

Long-Range Prospects for Activity

In September 1976 the Presidium of the Polish Academy of Sciences passed a resolution to create a Space Research Center under the Committee on Cosmic Research and the Peaceful Use of Outer Space. This center will be developed in stages. The first laboratories operating in it will take up space physics and planetary geodesy. Later operations will expand to include laboratories for research on the earth's resources and the environment, the applications and exploitation of space engineering, materials research, and so on, a computer center, and others.

The outline research program provides for four directions of action: investigation of outer space, research on the earth using satellite methods, the use of weightlessness and ultra-high vacuum in "orbital laboratories," and the creation of a complex of technical means -- mainly in the area of electronics and information science -- necessary for investigative and utilitarian purposes. Among other things, there are plans to investigate gamma emissions of galactic and solar origin and neutral hydrogen, which exists in interplanetary space, which research may explain the mechanism of the structuring of the climate in geological periods. Primary attention is being given to learning about the earth from outer space, along with the earth's ionosphere, atmosphere, and surface. Work on the development of special information systems to process large amounts of data and communications is a condition to the general effectiveness of using satellite techniques.

A substantial proportion of the cosmic research being done in the country is part of the coordinated plan directed by the Space Research Center [CBK]. It is included in the international problem of basic research for the years 1977-1980 and pertains to (MR-I.29) research on interplanetary space and the space near the earth. This program is part of area 06: methods and systems for measurement, control, steering, and automation and communications systems and equipment.

Space research in Poland only has a *raison d'être* owing to the possibility of comprehensive participation in the joint program of the socialist countries, the Interkosmos organization.

This is also why nearly all the aspirations of the above-mentioned coordinated plan will be carried out under the auspices of comprehensively-developed cooperation, especially with the Soviet Union, as well as with the other socialist countries. The execution of the work requires continual contact with many international organizations engaged in coordinating space research worldwide, especially the following:

COSPAR (Committee on Space Research);
SCOSTEP (Special Committee on Solar Terrestrial Physics);
IUGG (International Union of Geodesy and Geophysics);
URSI (International Union of Radio Science);
IUA (International Astronomical Union).

Besides the problem mentioned above, MR-I.29, which is basic in nature for other areas too, there are separate programs which are not coordinated by the Space Research Center (see table below on next page).

Particular Subject Matter in the Area of Space Communications:

1. Satellite radio broadcastingreceiving equipment designated for joint antenna tracking.

Problem No	Subject	Main Executing Body
PR-5; 06.2	Space communications	Communications Institute
RB-101	Teledetection	Surveying & Cartography Institute
--	Space biology and medicine	Military Institute of Aviation Medicine
MR.I-4	Materials research in outer space	Institute of Physics, Polish Academy of Sciences
RB-418	Space meteorology	Institute of Meteorology & Water Economy

2. Investigation of the properties of the country's radioclimate necessary to determining the bases for designing the radio service systems, earth and satellite, in frequency ranges above 10 gigahertz.

3. Determination of the nature of the effects of the area's shape and covering on the parameters of the field strength break-down with various angles of approach of centimetric waves, in order to determine the basis for planning satellite and earth distribution services.

4. Satellite communications equipment and systems.

In addition, it would be desirable to expand the program of research on trans-ionospheric wave propagation. The satellite station in Psary can be used in part for this.

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POLAND

NEW POLISH RADAR DESCRIBED BY DEVELOPERS

Warsaw ZOLNIERZ POLSKI in Polish No 6, 12 Feb 78 pp 9, 10

[Article by Edward Frankowski]

[Excerpts] We come across Lt Col Eng Mieczyslaw Sitnik at an apparatus for tuning radar components. He has served in the Army for 25 years. He deals with research problems of electronic equipment. Recently, towards the end of 1977, he and his team received the Ministry of Defense Award First Class for the development and introduction into production of a new type of radar station.

Col Krzysztof Lozinski, who has devoted himself to radar since 1952 (having begun at the Wroclaw Politechnical Institute) explains:

"The radar station which won the Defense Ministry's team award is our latest achievement. It is used for the detection of low-flying objects and is characterized by high reliability and very good technical-tactical parameters. It functions in diverse climatic and terrain conditions. It is relatively cheap to produce. It is constructed of transistors and integrated circuits which assure a high level of automation."

Col Lozinski is a winner of a Defense Ministry award for the development of optimal research methods as well as for research and introduction into production of materials which absorb electromagnetic radiation. For the latter he also won the PAN Secretary's Award. Moreover, he has been distinguished for his development and improvement of radar technology.

"We test, we measure," says the colonel, "as before but now significantly faster." The electronic super-technology of the third and fourth [computer] generation helps us to do this.

Among other things, the designers have set to work on decreasing radar station size and weight and increasing its reliability. They feel that through substitution of electron tubes with semiconductor devices, one can achieve a total solution to these problems. This is so because, supposing

the weight of a tube is, on the average, 150 grams; the weight of the replacement component is barely a part of a gram--that is to say, the component is several hundred times lighter. Furthermore, suppose the working life of an electron tube is no more than 2,000-3,000 hours while the working life of semiconductor devices is 70,000-100,000 hours--well this is several tens of thousands times longer. Moreover, the power requirement is thousands of times less than for the same number of tubes.

Military scientists are trying to develop ever better equipment; substituting "good" with "more perfect," taking into consideration among other things, range. The following attests to how important detection range is in defense. Let us assume that a radar station detects an aircraft at a distance of 500 km flying at a speed of 1,200 km/hr. The question arises, how long will it take the aircraft to cover the distance between it and the radar station? By our calculations, the time is 25 minutes. This is a relatively short period of time if you consider that in this time period it is necessary to inform everyone of the impending danger and to prepare for repelling the attack. The longer it takes to detect the target and the faster the target's speed, then the shorter this time will be. This is why scientists want to make a more precise radar detection device out of every "good" one.

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ROMANIA

SYMPOSIUM ON NATIONAL DRUG INDUSTRY HELD IN BUCHAREST

Bucharest FLACARA in Romanian No 5, 2 Feb 78 pp 10, 11

[Article by Liviu Maior: "Symposium on the Nation's Drugs"]

[Text] The broad area of therapeutic investigation and methods of treatment is inconceivable today without the indispensable and outstanding contribution of the pharmaceutical industry. It is a young, strong and fully developing industry in Romania, created almost entirely during the years of the people's power and particularly in the last two five-year plans. The value of our drug output is known and recognized throughout the world today, and it should be noted here that this important field of our chemical industry has distinguished itself not only by its wide assortment of pharmaceuticals with an old tradition in the world or by those made with imported licenses but also by the returns on its investment of Romanian intelligence. The drugs we have developed certify today the wisdom that identifies our technical and scientific civilization in the world. In referring expressly to the whole activity of health care, to the progress made, and especially to the high standards of this trade dedicated to the health of our fellow men, the party secretary general in his speech to the Plenum of the Party Central Committee of October 1968 made a point of saying, "We should note that our main failing is our lag behind world developments in a number of fields very important to people's health ... we must concern ourselves not only with the diseases that are easier to combat and which we have succeeded in mitigating or eliminating under socialism but also with the serious diseases that are ravaging the world today and call for greater efforts on the part of the medical profession."

The recent symposium on drugs of Romanian origin held in Bucharest on 19-20 January realistically confirmed the correctness and specific possibilities of a competitive therapeutic program to exploit the extensive inventive spirit of the Romanian intellect.

The results are noteworthy. The Romanian drug industry is now making about 130 active chemical substances by medium, fine and heavy synthesis, semisynthesis, biosynthesis and extraction as well as 1,200 processed items. About 95 percent of the domestic requirement for drugs is manufactured in Romania, including the latest types belonging to all the therapeutic groups known to the world.

One more essential point: A great many of the drugs produced in this interval have not only reduced imports considerably but have also won recognition on the world market for their exceptional therapeutic properties.

As a novelty, the symposium also brought out the growing interest in drugs derived from plant extracts and animal by-products as an effort that is gaining more and more support throughout the world. Short of underrating the importance of synthesis chemistry, the modern researcher is taking an increasing interest in revaluation of some methods of empirical medicine and discriminating use of the active principles in medicinal plants through modern means of pharmaceutical investigation.

But let us note the considerable contribution to this field of the medical practitioner and clinician who have set out to make studies without a "lengthened hand." This is no accident. The supply of medical units with modern equipment for investigation and treatment has provided fertile ground for scientific research outside the strictly specialized institutes, and the 11 reports of the research group under Dr Ion Puscas have attracted particular attention. The appearance in pharmacies of Ulcosylvanil, a drug with widely demonstrated advantages, is anxiously awaited. An interesting report has also been contributed by Dr Vasile Boici, the inventor of "strong Boicil," a primarily analgesic drug with no toxic effects that has been improved recently.

A research group under Academician Prof Dr Stefan Milcu has made the important discovery of a hormone whose existence was surmised years ago by the late endocrinologist C. I. Parhon and which is to be used in the treatment of prostate endomas. It promises new treatments in antineoplastic therapy.

Researchers at the Iasi IMF [Institute of Medicine and Pharmacy] have made another surprising discovery, namely an antimycotic that has shown, among other things, a surprising capacity to check the development of malign tumors. It calls for reorientation of studies of anticancerogens aided by antibiotics.

Trofopar, invented by Dr Magda Timar of the Bucharest ICFF [expansion unknown], is another drug derived from natural extracts, with a demonstrated curative effect upon acute and chronic hepatitis and cirrhoses of the liver.

All the medical and pharmaceutical institutes of Romania made valuable or promising contributions, and the scope of the first symposium on drugs of Romanian origin far exceeded expectations in the variety of the efforts and in the value of the pharmaceuticals presented. Our very few examples can provide only an incomplete picture of this veritable display of forces and this vast peaceful war waged against the most treacherous and rapacious enemy of man. Pharmaceutical research, an essential of all health protection, passed a difficult test on this occasion, that of professional competence and ethics and of people's respect and love. It was a test prepared for throughout the last decade in the spirit of Nicolae Ceausescu's words to all those called upon to save man from suffering by their skill, dedication and self-denial: "Medicine is truly a profession but not a profession like all others. It requires not only great skill but also much love for man, great charity and the dedication to devote oneself to the health of one's fellow men."

ROMANIA

INVENTION EXHIBIT BY NATIONAL COUNCIL FOR SCIENCE, TECHNOLOGY

Bucharest FLACARA in Romanian No 5, 2 Feb 78 pp 10, 11

[Article by I. Murgu: "Technical and Scientific Invention"]

[Text] Last week the CNST [National Council for Science and Technology] started the symposium on "Scientific Research, Technological Development and Technical Progress as Seen by Nicolae Ceausescu, Party Secretary General and President of the Socialist Republic of Romania."

On the occasion of this enthusiastic homage paid to the first man of the nation, outstanding figures of Romanian science noted Nicolae Ceausescu's constant and predominant contribution to the advancement of science and technical progress as well as the high and decisive value of his help in making science a directly productive force.

The symposium also occasioned the organization and opening of a working exhibit which is a true demonstration of scientific and technical power, enterprise and ingenuity and which proves once again that invention in this field is a traditional characteristic of the Romanian mentality.

The originality of the exhibit also lies in the fact that its stands house not only patented results well known at home and abroad but also inventions and discoveries still awaiting future scrutiny, offering the visitor a broad view of original scientific and technical innovation and of the current and long-range efforts in the field. We shall take as examples only a few of the most significant innovations made with the CNST's help by various scientists or research collectives. We think our readers should also be informed that a good many of the results are still covered by the state security regulations and obviously cannot be discussed in public for the time being.

Let us dwell for a moment on the energy studies of those employed for the express purpose of discovery and use of new energy sources and, for a start, on some newer developments in a "somewhat older" field of investigation, namely the conversion of solar energy.

Our experts have been interested for some time in the use of solar energy in the form of thermal energy. Solar heat engineering is already distinguished

by several notable achievements, such as the Jimbolia Ceramics Enterprise's pilot station with a capacity of 5,000 cubic meters of hot air per hour, which is enough heat to dry 100,000 conventional ceramic items.

The flat solar collectors developed in collaboration with INCREST /Institute for Scientific and Technical Innovation/ are a more recent solution. Installed on a surface of 10 square meters, they can replace about 1 ton of conventional fuel a year.

These energy traps were installed on the first two solar houses built in Romania, in Cimpina. They are buildings functionally designed for this purpose. They have to be turned in a certain direction, since the southern part is occupied by the solar panels. Heat is stored in a boiler of about 10 cubic meters feeding the heating and hot water installations. Sunlight will provide an estimated 60 percent of the energy requirement, the rest having to come from other sources.

The process is also to be applied to a group of hotels at the seashore, and a solar heat plant is under construction at Saturn. Here the collectors will be installed over some ONT /National Office of Tourism/ parking facilities, and the designer estimates they will be powerful enough to supply the three adjacent hotels with hot water. They will be activated this year.

The model of the first solar electric power station is as follows: The electricity is produced according to the conventional thermal cycle (heat source, water boiler, turbine and generator), with the sole exception that a primary energy source, namely the sun, will be used instead of the usual burner. The station is being built in collaboration with ICEMENERG /expansion unknown/ and will have a capacity of 30 kilowatts (300 100-watt bulbs). Of course the performances are modest, but when we consider that the energy source is practically inexhaustible and also free of charge, and that future construction of more productive collectors will multiply the power of solar energy, we can only welcome this new triumph of the human mind.

We witnessed a striking demonstration at the stand for silicon-based photoelectric cells (the famous solar cells with the property of directly transforming solar energy into electric power). To show us the power of the small feeders with solar cells, Engineer Nona Milea used a simple flashlight, shining it on a radio set and a fan. The radio receiver and the fan started up instantly.

The energy shortage finally forced researchers to probe the most hidden recesses of nature. As the experts know today, nature has been converting solar energy into electric power for billions of years by means of photosynthesis. What makes it possible to produce life, the most amazing miracle of the universe, in the presence of sunlight? Meanwhile the bioenergy experts have determined the role of chlorophyll in this mysterious and complex natural process and have tried to reproduce it in the laboratory. Production of the first photoelectric cells with chlorophyll extracted from spinach leaves portends a fabulous world of the future. To be sure the conversion power is very low for the time being, but it exists. The photoelectric cells are essentially a miniature electric power plant capable of extracting particles of energy in the presence of chlorophyll. The

field is a new one and world progress is modest, while the path taken by the Romanian researchers is one of their own. How will this discovery affect the energy crisis in the future? It is hard to say, and difficult to make predictions or preliminary statements. But any road begins with the first steps.

In a less spectacular field, efforts are being made to make industrial use of another energy bearer, namely hydrogen. Notable progress has been made here too, thanks solely to some Romanian research collectives under the CNST.

As we know hydrogen is extracted today from water by electrolysis or from hydrocarbons (especially from methane gas in chemical fertilizer combines), but the main thrust of current studies is to obtain this highly versatile element with less energy input. Producing energy by expending energy is a new way of robbing ourselves, and the experts say the power engineering of the future is inconceivable without this gas and its particular advantages: It can be stored, shipped through conduits, and consumed in various forms and it can produce electricity, light and heat.

The exhibit also includes an ingenious model of a tank for storing hydrogen in metal hydrates. We shall not go into details here but, flying on the wings of fancy, we ask our readers to imagine a life in which they will buy small containers of hydrogen from a store to heat their homes or to fuel their cars.

The same building also houses an experimental model of a catalytic hydrogen burner, which we shall not describe in detail either but shall only say that the small radiator operates without a flame, which is obviated by some cathodes. In conclusion it should also be noted that the ecological cycle of hydrogen is very short (it is obtained from water and reverts to water upon combustion), so that this potential source of energy is practically inexhaustible.

The studies to obtain organic gas from hog droppings have produced outstanding results. A panel and a model in the exhibit demonstrate the value of these studies, made chiefly at the Peris Central Research Station for Hog Raising, by proving that the vast quantity of droppings (practically useless and highly pollutant) in the big combines for raising and fattening hogs is convertible into gaseous fuel and natural fertilizers. The process perfected by the Romanian specialists now permits extraction of a gaseous fuel with the same properties as methane gas (about 6,500 kilocalories per cubic meter), while the defermented mass (after anaerobic fermentation) makes an excellent fodder and fertilizer. The fact that 600 liters of organic gas can be extracted from 1 kg of dried substance indicates the profitability of the process.

The CNST also sponsored some of the studies made by the Romanian Institute of Marine Research in Constanta. Some of the more recent methods of cultivating or acclimating indigenous species of invertebrates (mussels, shrimps, the white oyster, *Mya arenaria*), the Japanese oyster, etc. are notable and are intended to increase the Black Sea's productive biological potential and to develop new varieties of industrial raw materials. The methods have been tested in the laboratory and small-scale pilot stages. Some aquatic farms have been planned, which will soon produce annual yields of several tens of tons, making a major contribution to the population's protein supply. This would also diversify

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our food products and preparations by introducing some raw materials for consumption that are quite new to Romania, and intensive cultivation of these organisms would provide a new source of raw materials for the chemical and pharmaceutical industries. New substances have been found in mussels and other molluscs that are of great interest for their pharmacological effects, and they are being studied for purposes of perfecting some drugs and preparations for industrial use.

The biological research subjects, designed and planned for an integrated cycle from basic research to applications, cover a very broad field. We note the studies on energies of muscular contraction and propagation of nervous influx, with as yet undetermined implications for the development of technical devices capable of reproducing the respective biological mechanisms and processes. Among the genetic studies we remember those to develop new strains of micro-organisms capable of fixing nitrogen in the soil.

As for subject matter, the exhibit presents evidence of the inventive spirit in the most varied fields, such as motor building, electronics, electrical engineering and medicine. A whole stand is devoted to the world-famous achievements of the group of biophysicists under the physician Ioan Florin Dumitrescu. The performances of the "pocket" passenger car and electric motor bike (vehicles designed and built by Eng Iustin Capra) are on display, and a special panel records the results of the use of some posthumous works of the late renowned Romanian scientist, physician and scholar Nicolae Stefan Chisiu.

By its demonstration of energy and invention the exhibit also sanctions the unsound views of those who are still declaring themselves prisoners of outmoded working methods and underrating the national intellect. The struggle between progress and inertia goes on forever.

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