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AEROSPACE MEDICINE

HANDSHAKES ON EARTH

Moscow PRAVDA in Russian 1 Mar 77 p 3

[Text] The hotel "Cosmonaut" in Baikonur, which Victor Gorbatko and Yuri Glazkov left three weeks ago for the launching pad, is again running on the cosmonaut's schedule. The space crew of the orbit station "Salut 5" has already completed the research program on board. However, the medical program of the flight has not yet been completed.

Doctors have had their first conference with the flight crew, previously they set up on board many complex scientific experiments along with traditional programs of medical supplies. The cosmonauts again stated that during the time spent working in orbit, they felt no discomforts. In their opinion, "Salut 5" is a wonderful house in which one can work and rest.

Having newcomer's rights, Yuri Glazkov shared his first impressions about his return to the earth.

"At first I was worried about the Arkalyk residents when our desent apparatus, in going through the sound barrier, filled the area with rolling thunder," he said. "My second strong impression was that of the Earth's real, warm embrace. The lightness you live with in weightlessness disappeared, and my arms and legs became heavy. The first handshakes seemed very strong."

Now the embrace of Earth's gravity is not noticeable. The cosmonauts have practically gotten back to normal, regained a great amount of the weight they lost during the flight. After morning breakfast they went for a walk, in spite of the severe frost.

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AEROSPACE MEDICINE

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ASSESSMENT OF PAROXYSMIC SLOW WAVES IN THE EEG OF PILOTS WITH NEUROCIRCULATORY DYSTONIA

Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 5, 1977 pp 39-42

[Article by Cand Med Sci, Lt Col Med Serv B. I. Parmenov-Trifilov and Maj Med Serv L. I. Starikov]

[Text] Arisal of paroxysmic activity in an electroencephalogram can be interpreted in a number of cases as a bioelectric effect indicating possible paroxysmic disturbance of consciousness. For this reason analysis and assessment of paroxysmic activity in the EEG have important significance to the practice of medical flight certification.

The question as to the mechanism behind arisal of bilaterally synchronous slow oscillations in the 4-7 Hz range using frontal-central points of contact has been discussed extensively in recent years. In the opinion of most electrophysiologists, the medial structures of the brain are the zone in which this rhythm is generated. However, their functional significance is interpreted differently. Penfield and Jasper (7) and Bekhtereva (1) believe that the dominant role belongs to the activating influences of the ascending reticular system upon cortical function, and that these influences are expressed electroencephalographically in the form of bilateral slow oscillations.

Mayorchik (5) views slow synchronous rhythms of periodic nature as a phenomenon reflecting the reaction of the cortex to the effect of the upper (oral) zones of the brain stem. The author believes that these are secondary, reflected changes resulting from a pathological process in brain stem and subcortical formations. The fact that these changes are most highly pronounced in frontal zones can be explained by presence of rich associations between the forebrain and hypothalamic formations, by the physiological properties of the cortex of the frontal zones, and by their greater reactivity to various nonspecific autonomic and somatic effects produced by brain stem and subcortical zones of the brain.

According to Zhirmunskaya (3) paroxysmic discharges of slow waves are recorded from patients suffering various diseases (epilepsy, parkinsonism, vascular afflictions of the brain, hemorrhaging and softening, mild coma,

hypoxia, somatic diseases, neurasthenia, and others). Absence of nosological specificity in these changes in the EEG as well as presence of such changes among practically healthy persons elicit a need for clarifying the causes behind their arisal.

Paroxysmically arising spikes of bilaterally synchronous theta waves with a frequency of 4-7 oscillations per second were discovered in 48 pilots 30-40 years old with neurocirculatory dystonia of the hypertonic type in the frontal and central zones. None of the subjects complained about their health. Observations revealed emotional lability and unpronounced phenomena of autonomic dysfunction (acrohyperhidrosis, acrocyanosis, tremor of the fingers of outstretched hands, persistent restricted dermatography), attesting to presence of the signs of autonomic-vascular dystonia. Paroxysmic slow activity in the EEG was combined with opticokinetic disturbances taking the form of eye tremor or spontaneous nystagmoid phenomena, which intensified when the eyes are closed.

Assuming that arisal of a theta rhythm among persons with neurocirculatory dystonia of the hypertonic type could stem from superimposition of corneo-retinal potentials of the eyeballs over the EEG owing to nystagmus, we performed electroencephalographic analysis in which oculograms (OKG) were recorded simultaneously. We used a specially assembled electrode frame to record corneoretinal potentials. The locations of the electrodes used to record eye movements are shown in Figure 1. The research was conducted with a 17-channel electroencephalograph manufactured by the Nikon-Koden company.

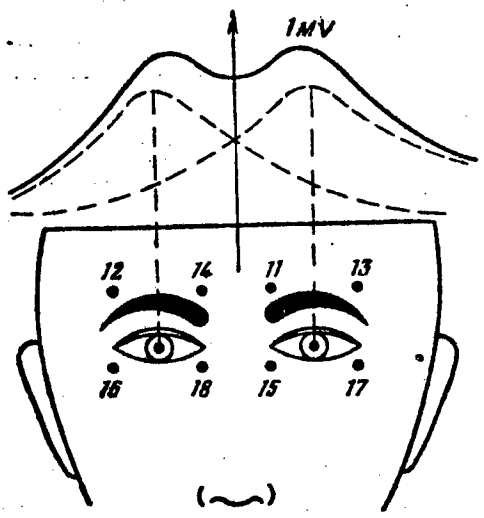

Figure 1. Arrangement of Electrodes to Record Oculograms (OKG): *13-15, 12-18*--Electrode connections to record OKG from vertical and rotary eye movements; *11-13, 15-17, 12-14, 16-18*--electrode connections to record horizontal movements of the eyeballs; the gradient of corneoreticular potentials (up to 1 mv) is shown in the upper part of the figure.

Inhibition of the alpha rhythm and a shift in the direction of desynchronization of the dominant rhythm and arisal, in the frontal-central zones, of bioelectric potentials of high amplitude which had the shape of paroxysmic slow waves with a frequency of 4-7 oscillations per second occurred in the EEG among all subjects at the time of arisal of rhythmic movements of the eyes recorded in the oculogram (Figure 2). Intensified generation of a paroxysmic slow rhythm in the OKG, exceeding the synchronous rhythm in the electroencephalogram by more than a factor of two in amplitude, permits the conclusion that there is a bioelectric effect of the oculomotor apparatus of the visual analyzer on the EEG in this case. Other evidence of this is that slow waves are observed with OKG and EEG points of contact with parallel axes (the axes coincide with the direction of movement of the eyeballs in the presence of vertical and rotary nystagmus). This conclusion is also confirmed by electroencephalographic and oculographic research on persons lacking both eyeballs (Figure 3).

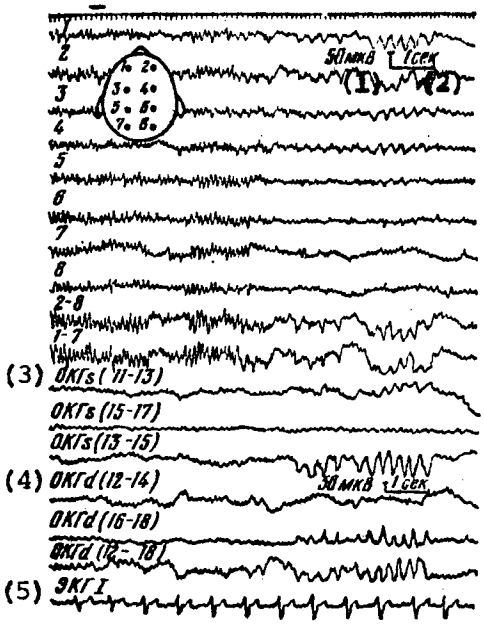

Figure 2. Artifacts in the EEG Associated With Movement of the Eyeballs.

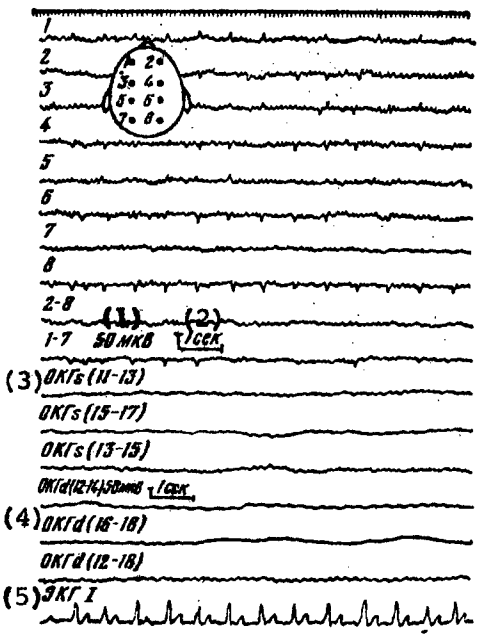

Figure 3. EEG of Patient S. With Both Eyeballs Enucleated, Recorded During Blinking.

Key:

1. μv
2. Second
3. Left OKG
4. Right OKG
5. EKG

Thus the obtained data show that movement of the eyelids does not by itself elicit artifact potentials in the EEG. Arisal of slow bilaterally synchronous potentials in the frontal-central zones may be associated with a corneoretinal bioelectric effect and assume the nature of artifacts in the EEG. Such potentials are viewed in the literature as physiological artifacts (9).

It is difficult to identify corneoretinal potentials and brain potentials. This is why if an OKG is not recorded the presence of slow paroxysmic activity with a frequency of 4-7 oscillations per second in the EEG may be interpreted erroneously as pathological activity of the brain, though in a number of cases, in view of the far-reaching associations of the visual analyzer (especially with profound divisions of the brain), oculomotor disturbances may indicate changes in ascending and descending influences of the reticular formation and the hypothalamus. The exceptional position of the visual organ in relation to its anatomical associations with different horizontally and vertically located divisions of the brain and the periphery plays a significant role in this regard. They include indirect and direct associations with the cortex and the diencephalon, in which the cortical visual centers are located--the superior colliculi of the corpus quadrigeminus, the tubercles of the optic thalami, and the external geniculate bodies. The retina of the eye is connected by the basal optic nerve root to the area of the nucleus of the oculomotor nerve (parasympathetic innervation), and by the posterior optic hypothalamic root to the hypothalamus and sympathetic innervation (6). There is a direct dependence between the functional state of the visual organ and the hypothalamomesencephalic region.

Opticokinetic disturbances taking the form of spontaneous nystagmus may arise in the presence of various disturbances of the central nervous system. Rhythmic movements of the eyes occurring in this case produce bioelectric potentials in the EEG which take the form of paroxysmic slow waves of variable amplitude and frequency (4-7 oscillations per second). Considering that the subjects had oculomotor disturbances taking the form of spontaneous nystagmus, disturbances which could attest to functional disturbances at the mesencephalic level, we additionally analyzed general and cerebral hemodynamics as well as resistance to moderate hypoxia in a pressure chamber at a barometric pressure of 405 mm Hg for 30 minutes. The control group contained 32 pilots 30-40 years old exhibiting no disturbances in vascular tone or EEG changes.

Using mechanocardiography on persons with neurocirculatory dystonia of the hypertonic type, we managed to reveal changes in general hemodynamics taking the form of enlargement of heart minute volume and an inadequate, 37 percent, rise in actual peripheral resistance of the blood channel as compared to normal. We also observed an increase in minimum, mean dynamic, lateral, and systolic arterial pressure, which was accompanied by change in cerebral hemodynamics (according to rheoencephalographic data).

On analyzing the rheoencephalograms we noted signs of dystonia in the vertebral and carotid arteries taking the form of bilateral asymmetry of blood volume, reduction of the rheographic index, and an increase in the coefficient of tonic tension of cerebral vessels. Hemodynamic changes attested to presence of hyperkinetic circulation and disturbance of vascular regulation (8). The degree of compensation in regulation of vascular tone turned out to be variable. Thus 80 percent of the pilots with neurocirculatory dystonia of the hypertonic type exhibiting bilaterally synchronous slow potentials in the frontal-central zones in the EEG withstood the hypoxic functional test in the pressure chamber satisfactorily or poorly.

Taking account of the data above and considering the anatomical and physiological features of innervation of the visual organ (the muscular apparatus of the eyes), we can hypothesize that arisal of an artifact corneoretinal rhythm with a frequency of 4-7 oscillations per second in a synchronous OKG and EEG recording is a negative prognostic sign.

Because an erroneous conclusion can be made as to presence of pathological bioelectric activity in the brain, in such cases EEG must be recorded simultaneously with OKG, and in dynamics. When such persons undergo medical flight certification, the stability of compensatory mechanisms in vascular tone regulation and the temporary or stable nature of the changes must be determined specifically, and provoking factors (asthenic states, prodromal period of illness, various sorts of intoxication, presence of somatic diseases, cerebrocranial injuries in the past, and so on) must be revealed. Presence of repeated cases of lower resistance to functional hypoxia tests among persons with an artifact corneoretinal rhythm in the EEG having a frequency of 4-7 oscillations per second may serve as grounds for restricting such individuals from flying.

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PERSPECTIVES OF MEDICAL AND PSYCHOLOGICAL SELECTION IN AVIATION

Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 5, 1977 pp 95-96

[Article by Cand Med Sci N. I. Frolov and Cand Med Sci, Lt Col Med Serv Yu. A. Maksimov]

[Text] Specialists in aviation medicine attended meetings at the end of November 1976 in Moscow devoted to the problems of improving medical and psychological selection in aviation. In his introductory remarks, Prof, Major General Medical Service M. Rudnyy dwelled on the psychophysiological features of the activity of pilots flying modern airplanes. He emphasized the need for improving the resources and methods of medical and psychological selection of flight crews, noting the important significance of the latter from the standpoint of the economy and the influence of such selection on flight safety.

Reports given summarized work in selection and noted the perspectives of its future development. Colonel Medical Service A. N. Stanchinskiy analyzed the causes behind disqualification of flight crews for reason of various classes of illnesses depending on time of service in flying, age, and flying qualification. He also examined the basic ways for improving the methods of medical selection. In his opinion, the diagnostic apparatus must undergo further improvement and the conditions of the occupational activity of flight crews aboard modern aviation equipment must be studied more deeply. It would also be important to reveal the causes behind illnesses leading to premature retirement from flying and to develop measures directed at preventing such illnesses and treating them promptly.

Colonel Medical Service B. L. Pokrovskiy described the state of psychological selection in aviation, which is a component of general professional selection of flight crews. Selection of applicants to flight schools is especially necessary, since not every healthy, physically well developed person can master the pilot's occupation and become a dependable air warrier. Improvement of psychological selection must follow the lines of further work on new prognostic methods, use of automated group examination systems, application of personal and electrophysiological methods, and introduction of prolonged selection. Problems in manning the crews with a consideration for their psychological compatibility also have important significance.

A report by Doctor of Medical Sciences V. B. Malkin presented data on the use of electroencephalography for the purposes of selecting applicants to flight schools. The author proposes dividing all EEG into three groups--normal, which make up about 95 percent of all recordings; conditionally normal, with deviations from the adopted norm and making up 5.5-5.7 percent of all recordings; pathological, recorded in 0.3-0.5 percent of the cases.

In turn, normal EEG recordings would best be divided into four types. The first type is observed among about 70 percent of the pilots and students. The second type includes curves with a labile rhythm of low amplitude and distinctly pronounced beta oscillations. They are recorded among 14-15 percent of those examined. EEG with a pronounced but immature alpha rhythm are typical of the third type. In this case theta activity is represented in electroencephalograms. The fourth type includes "flat" EEG. They are typified by extremely low biocurrent amplitude on the order of 10-15 μv and absence or insignificant expression of the alpha rhythm.

The speaker presented information indicating that pilots with the first type of EEG have the most stable occupational skills. At the same time students with conditionally normal and especially pathological curves are distinguished relatively more frequently. In the author's opinion, the electroencephalogram is an important element of the individual's "psychophysiological portrait." Dynamic observation of the nature of the EEG permits us not only to diagnose diffuse illnesses of the central nervous system but also to reveal some functional deviations of importance to flying.

Candidate of Psychological Sciences N. F. Luk'yanova described use of personality analysis methods in psychological research on flight crews. She emphasized the pressing need for developing the diagnostic direction in psychology on the basis of integrated study of human personality qualities. A set of psychological methods is in use today, application of which permits us to illuminate the personality of the subject from various aspects. The complex of methods, which permits quantitative assessment of psychological and other features, involves about 40 characteristics such as the structure of motives, the level of motivation, leadership qualities, and so on. These methods afford a possibility for a more objective approach to manning collectives and crews with a consideration for their psychological compatibility.

Colonel Medical Service M. G. Papkov dwelled on the causes behind pilot blackout and its prevention. He had analyzed a large number of disease histories of pilots who had undergone hospital examination at the Central Scientific Research Aviation Hospital. The author believes it suitable to distinguish two groups of factors which can lead to blackout--predisposing and triggering. The former, which promote development of blackout, include consumption of alcohol, colds, insufficient sleep, overtiring, and so on. Triggering factors are those which are a direct cause of blackout. They include medical manipulations associated with painful sensations and emotional tension, excessive time at work, the "influence" of flight factors

(altitude chamber tests as an example), and so on. In conclusion the author dwelled on some measures by which to prevent blackouts among flight crews.

Lieutenant Colonel Medical Service V. G. Voloshin and his coauthors examined the results of functional tests involving decompression of the lower half of the body with the purpose of revealing predisposition to blackout and autonomic vascular instability. It was noted that this test is two to six times more informative than tests such as "orthostasis," altitude chamber tests, and centrifuge tests.

A number of reports were devoted to the prospects of development of methods permitting us to reveal certain pathologies of the visual (Yu. P. Petrov) and vestibular analyzers (I. A. Sidel'nikov). These reports emphasized the need for improving and unifying apparatus employed in ophthalmological and vestibular certification.

Colonel Medical Service P. M. Suvorov and his coauthors described a method for assessing radial acceleration endurance of a flying pilot. In their opinion a drastic decline and even disappearance of oscillations, recorded during measurement of pulse from the earlobe, is the most informative index of endurance to accelerations operating on the "Y" axis.

After the reports were thoroughly discussed, a decision was adopted in which the basic paths of improvement of the resources and methods of medical and psychological selection in aviation were noted.

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BIOACOUSTICS

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PROBLEMS IN BIOLOGICAL TELEMETRY UNDER WATER

Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 5, 1977 pp 66-70

[Article by USSR Academy of Medical Sciences Corresponding Member, Prof, Lt Gen Med Serv F. I. Komarov, USSR State Prize Laureate, Prof, Maj Gen Med Serv I. A. Sapov, Dr Med Sci, Lt Col Med Serv S. D. Polezhentsev, and Cand Tech Sci, Engr-Capt 2d Rank Yu. F. Tarasyuk: Communication Two: "Modern Underwater Biotelemetric Systems and Their Classification"; see VMZH, No 8, 1974 for Communication One]

[Text] Swift development of the riches of the world ocean is leading to a situation in which its floor is becoming not only an object of multifaceted research but also a place of intensive human productive activity, insuring the safety of which requires operational control over the health of the working individuals. This is why development and creation of underwater biotelemetric systems (PBTS) differing in nature, purpose, and technical data is expanding.

We attempted to work out a classification of existing PBTS (see table) with the goal of improving them. We based this classification on the following PBTS characteristics--purpose, measurement conditions, form of information signals (fields), number of channels, modulation method, encoding method, temporal operating conditions, range of action, type of data compression, nature of information scaling, specific features of the communication channel, telemetric measurement precision, overall dimensions, power source parameters, and so on.

The purpose of a PBTS depends on the object of analysis and the type of information required. The objects of underwater analysis may be an individual (an underwater swimmer, a SCUBA diver, a helmet diver, a crewmember of a deepsea craft, an inhabitant of an undersea habitat), marine animals (dolphins, whales, fish, and so on), and the environment (air beneath the SCUBA diver's mask, the atmosphere of a deepsea craft or a submersible habitat, sea water). The type of information required is also associated directly or indirectly with the object of research. Usually the scientist is interested in data on the location of the object (the spatial coordinates and the nature of the changes they experience), its behavior (phases of activity), physiological state, and parameters of environmental physical and chemical factors.

Depending on the type of oscillations--carriers of information--PBTS are subdivided into those employing hydroacoustic communication channels, electromagnetic oscillations, electric signals, and combined communication links. Systems in which an electromagnetic field is the carrier of information can make use of radio waves, the electrical conductivity of sea water, inductance, and light oscillations (laser). Electric signals are transmitted through water by cables and by double- and single-conductor wire links.

An example of a combined communication link would be the communication system between the Chernomor underwater laboratory and its support vessel (5), which makes use of a wire link and a radio channel. Electric signals transmitted by cable from the sea-bed are received by a buoy on the surface of the sea. Here they are converted into radio signals and transmitted by ultrashort waves over a significant distance.

Systems may be stationary and mobile (dynamic and transported) depending on the conditions under which underwater measurements are made. The most typical example of stationary systems is the apparatus used to make measurements in submersible habitats (5). The object of research (man or the environment) remains motionless while this apparatus is working, the measurements are transmitted from transducers to a converting unit by a wire link, after which the measurements are transmitted to the coastal (or ship) laboratory by a hydroacoustic channel (or by a cable).

Underwater dynamic systems are intended to determine the physiological state, location, and behavior of a freely swimming SCUBA diver, mammals, or fish in their natural conditions. The transmitting unit of such systems makes use of miniaturized self-contained transducers (attached or implanted) emitting hydroacoustic signals or radio signals (6,8). Such systems are used to maintain medical control over divers, to analyze the behavior of Acipenserid fishes in the vicinity of major hydroelectric power plants, and to determine Salmonid migration routes.

Transported systems can include, as an example, systems in which the object of research (the diver) moves together with an undersea craft (submarine), and the research results are stored aboard or transmitted (continually or periodically) to a support ship or an undersea or coastal laboratory (1). Another example of a transported system used by Jacques-Yves Cousteau's laboratory is a portable unit which records electroencephalograms (EEG) on magnetic tape using 16 channels. The tape recorder is secured to the SCUBA diver's body. The EEG is analyzed ashore. This system is used only for research purposes and cannot be recommended for operational medical control over a SCUBA diver's state. Similar apparatus is being used to record dolphin signals, using a tape recorder attached to the animal's body throughout the entire time of the experiment (8).

Implanted systems are used to acquire physiological information. The need for introducing them into the practice of underwater biotelemetry is associated first of all with deeper research on the influence of the

Modern Underwater Biotelemetric Systems

Country	Purpose of System	Main Parameters Measured	Type of Information Carrier Signals
USSR	Transmission of biomedical information	Physiological parameters	Electromagnetic oscillations
USSR	Analysis of routes of fish movement	Direction of movement	Hydroacoustic
USA	Analysis of fish behavior	Direction of movement, depth, distance	Hydroacoustic
USA	Analysis of marine animal behavior	Direction and speed of movement	Hydroacoustic
USA	Analysis of fish physiology	Direction and depth of habitat, speed of movement	Hydroacoustic
USA	Analysis of routes of fish movement	Direction	Hydroacoustic
England	Analysis of fish behavior	Direction of movement, location of habitat	Hydroacoustic
USA	Analysis of human physiology, etc.	Practically all parameters measured	Electric
USA	Medical research	Body temperature, electrocardiogram	Hydroacoustic
USA	Physiological control	Pulse, body and environmental temperature, cardiogram, diving depth, oxygen tension, carbon dioxide concentration	Hydroacoustic

Carrier Frequency	Range of Action	Emitted Power and Emitting Unit Weight	Author, Year
20-148 kHz	25 m	-	V. M. Akhutin, 1974
45 kHz	200-300 m	20 mw / 150 gm	Yu. I. Spektor, 1968
132 kHz	600 m	45 mw / 29 gm	Trefeihen, 1957
37 kHz	2,300 m	8 w / 400 gm	USA, 1962
50 kHz	2,500 m	10 w / 62 gm	Yuen, 1970
65 kHz	300 m	50 mw / 6 gm	Hasler, 1969
305 kHz	500 m	/ 8.3 gm	Milson, 1971
1-50 kHz	10 km	mw / 1,000- -4,000 gm	Hottel, 1971
55 kHz	200-1,800 m	1	Slater, 1968
-	1,000 m	1	Pfeiffer, 1970

environment on the state of and changes in functions of human and animal internal organs. Such systems often enjoy entirely unexpected use. Thus telemetric environmental pH transducers implanted in the stomach of a shark made it possible to determine, on the basis of the state of gastric secretion, where this predator is not dangerous (rest zone) and where it is aggressive (hunting zone). This afforded a possibility for insuring the safety of divers in one of the areas of the Caribbean Sea (12). Implanted systems may have combined communication channels--radio and hydroacoustic or wire and hydroacoustic. Knowing the purpose of the system and the measurement conditions we can determine, with sufficient clarity, the type of oscillations of the information carriers (signals) satisfying the requirements of information transmission range, carrying capacity (number of information symbols per unit time), and accuracy (probability of error).

Radio waves and light rays are used to transmit biotelemetric information. An inductive communication system has been proposed to study an individual in a swimming pool (3). This system is based on mutual inductance of windings separated in space, as well as the electrical conductivity of sea water (2). Electromagnetic signals enjoy the greatest application in transported and implanted systems. Radio waves are also used in dynamic systems to transmit biotelemetric information. Romanenko (8) describes a system to study dolphin behavior which operates only during the active phase of respiration, when the dolphin surfaces. The depth to which radio communication could be maintained was not more than 30 cm in sea water and about 2.5 meters in fresh water. The main advantage of underwater radio telemetric systems is the large frequency band. However, it is very difficult to achieve high accuracy in data transmission using these systems.

Cable and wire links offer greater accuracy of transmission, even of weak signals produced by physiological transducers. But because of the great weight and cumbersomeness of cable communication lines, they have been used until recently basically for stationary measurements or with transported and implanted systems as an element of a combined communication link. Wire links have also enjoyed application in dynamic systems in recent years. This has become possible owing to development of special two- and three-strand expendable microcables (10) with a diameter of 0.2 mm. A 1,000 meter length of such cable weighs 133.3 gm. A SCUBA diver can carry spools of such wire up to 10 km long. An effort of only a few grams is needed to unwind the wire from the spools. Its buoyancy in sea water is practically zero. At the same time, simultaneous unwinding of wire from two spools (one carried by the object under analysis and the other by a vessel with recording apparatus aboard) permits independent movement of the two spools. Sea water plays the role of the third conductor when a two-stranded microcable is used. Wire communication links employing a microcable can enjoy broad application in underwater biological telemetry. However, these links can be used in dynamic systems only for a relatively short interval of time. A speed of only 50-60 meters/sec can be attained by the object.

Hydroacoustic signals propagate in water better than others. The range of hydroacoustic telemetric systems is hundreds and thousands of kilometers. However, the features of propagation of hydroacoustic signals in seas and oceans are such that biological information can be transmitted over such distances only in the presence of a superficial (20-30 meter depth) or underwater acoustic channel (at a depth of 200-1,600 meters). Placement of emitters and receivers for use with deep underwater acoustic channels elicits a need for developing deepsea acoustic antennas (9). The traffic capacity of such systems and the information transmission rate turn out to be insignificant, being capable of supporting transmission of data only on the lowest-frequency processes. Such systems produce design difficulties in creating underwater antennas of very large size. Moreover their broad introduction is being retarded due to absence of small power sources and microminiaturized converters, and due to other technical causes.

Hydroacoustic tags, which are used to study only the migration routes and behavior of large fish and mammals, have recently enjoyed extensive application in dynamic biotelemetry. However, they may also be used for orientation, for safety purposes, and to determine the physiological state of aquanauts doing various jobs. The hydroacoustic tag plays the role of a beacon continually emitting acoustic signals, or the role of a hydroacoustic responder beacon which emits responding signals on demand of the observer vessel (11). It consists of a sealed body with pins or other resources with which to secure it to the object under analysis, a hydroacoustic converter which the plays the role of the emitter, a signal receiver, electronic circuits, and a power source. The entire instrument is a plastic capsule a few centimeters long and weighing about 4 gm in air. Such tags can work independently for 4-6 days, and working depth reaches 300 meters.

Recording just one physiological parameter is not enough for the purposes of medical control. To transmit and receive information on several physiological indices, multichannel systems are required. Presently hydroacoustic systems exist capable of transmitting information under water in 18 channels (9); these systems are intended for stationary work.

In order that we can transmit various infralow-frequency processes, which are typical of most physiological parameters, we must convert their frequency spectrum into a higher frequency range. For this reason selection of the optimum method for modulating signals in order to achieve a given probability of correct reception of the signal and the required range of the biotelemetric system is an important problem in transmitting physiological information by means of a communication channel. For this reason PBTS must also be subdivided with respect to nature of modulation, the method of message encoding, working time, range, accuracy, the information processing method, overall dimensions, the frequency of the main signal, type of power source, and the data recording method.

It is very difficult to select a PBTS satisfying these requirements. For example if we need to insure a high biotelemetric range, we must choose

a hydroacoustic channel. However, such a channel affords long range only when transmitting a narrow-band signal, and it can insure high accuracy only with the use of frequency modulation or encoded messages. But in this case the traffic capacity and the message transmission rate are found to be low. To select the best PBTS, we must make a compromise: Preference is given to that which perhaps may not be optimum in relation to any of these particular criteria but one which is acceptable for the particular task in relation to a large number of parameters.

The classification of underwater biotelemetric systems must promote improvement of mutual understanding between physicians, biologists, sonar experts, and specialists in telemetry, and creation and broader introduction of such apparatus into the practice of underwater research and medical support of underwater operations.

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MICROBIOLOGY

USING ENZYMES TO COMBAT VIRUSES

Moscow NEDELYA in Russian 21-27 Mar 77 p 4

[Article by D. Beliaev, academician: "Taking Aim on Viruses"]

[Text] The 20th anniversary of the Siberian branch of the Academy of Sciences of the Soviet Union will be celebrated in May of this year. The history of world science knows no examples of such a wide range of fundamental and applied research achieved in the last 2 decades alone, and of their extreme effectiveness.

At NEDELYA's request, the leading scientists of the Siberian branch of the Academy of Sciences of the Soviet Union talk about the work of their scientific collectives, and about the specific resolutions for the problem of "theory and practice."

Towards the end of the fifties, a relatively simple but attractive idea began to be checked out, based on facts known at that time, in the Institute of Cytology and Genetics. Virus, specifically, the inherited essence of the virus--nucleic acid--is released from the protein coating before infecting the cell-victim. The naked viral nucleic acid begins to quickly replicate itself, giving rise to hundreds of new viral particles. Perhaps it would be possible to use this moment to attack the nucleic acid inside the cell with the aid of enzymes, the so-called nucleases. These enzymes could possibly destroy the connections between the genetic "building blocks" which make up nucleic acid, which will then be unable to harm the organism. This was in essence the idea of the quite young at that time researcher, currently professor and assistant to the director of our institute, R. Salganic.

Numerous experiments carried out in the institute have shown that nuclease really does inhibit the synthesis of viral nucleic acid and interrupts the reproduction of various viruses without damage to the organism.

Thus, scientists have acquired a new weapon against numerous agents of dangerous diseases. Clinical tests have shown that nuclease is a new

effective aid in treating severe viral diseases of the eyes, the skin and the nervous system.

It is necessary to speak about viral encephalitis separately. Recently, long term tests of ribonuclease have been completed by experienced specialists of many clinics in the country, in Western Siberia, in Urals, and in the Far East. Their conclusions were that application of ribonuclease reduces the tragic outcomes of the disease by a factor of 3 or 4, and significantly relieves the course of the disease. And there are no side effects!

In the large taiga land masses today, thousands of people are working to better utilize the riches of the eastern regions of the country. It should not be necessary to point out how timely the achievements of scientists were in bringing to life the simple and clever idea of using enzymes to combat viruses.

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MICROBIOLOGY

BRIEFS

DIET IN SPACE--Alma-Ata, 9. (PRAVDA correspondent U. Shpakov). Thanks to science fiction writers' usage of the word, the microscopic seaweed chlorella is looked on as a "culture for use in space," which will provide the crews of future starships and space stations with nourishment and oxygen. But even today chlorella is of great use to cattle breeders. In some Kazakhstan farms, special shops have been built for cultivating this new form of nourishment for cattle. In the "Lenin" socialist farm of the Northern Kazakhstan region, the daily yield of "green bouillon," used as a supplement to hay and silage, is 30-40 tons. Pools of chlorella have also appeared in Chimkent, Turgai and other regions. [Text] [Moscow PRAVDA in Russian 10 Mar 77 p 6] 8861

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NEUROPHYSIOLOGY

LURIYA CRITICIZES ARTICLE ON BRAIN MECHANISMS IN 'AMERICA'

Moscow LITERATURNAYA GAZETA in Russian 6 Apr 77 p 13

/Article by A. Luriya, academician of the USSR Academy of Pedagogical Sciences: "On Brain Without Mysticism"/

/Text/ In its first issue in 1977 the journal AMERICA decided to acquaint Soviet readers with the achievements of modern science in the study of "brain mechanisms," the knowledge of which is so important when solving the problem of the relationship between the brain and man's mental activity. In order to realize this commendable intention, the journal reprinted a selection of materials from the popular American journal HARPER'S, which a certain Michael Aron prepared and furnished with comments.

The journal AMERICA describes this journalist as follows: "Michael is 30 years old. In his youth he was a basketball player. In 1964 he played on the Philadelphia scratch team and later on the students' team of Harvard University, from which he graduated with honors in 1968." After that he worked as an assistant editor and literary worker in a number of provincial journals and then turned to the subject of our selection. "To select the materials for the feature on the brain," the journal AMERICA cited Aron's own words, "we needed 2 months, but already after 5 weeks I began to think: Should I not give up journalism and switch to neurosurgery?"

What was this highly educated author able to say about the brain?

"The last 100 years," M. Aron begins his foreword, "produced a whole pleiad of geniuses in the field of the study of the brain. The following are the most famous: I. P. Pavlov, Sir Charles Sherrington, Sir John Eccles, A. R. Luriya, Wilder Penfield and Karl Pribram. These people, in addition to an outstanding intellect, possessed a striking characteristic. Each man after 40 or 50 years devoted to experiments and a close study of the human brain arrived at a religious or mystical view of life."

One can leave open the question as to whether these phrases were dictated by the author's ignorance (he "needed 2 months" to select materials on the brain), or by a conscious desire to discredit the scientists and to misinform the readers. It is not ruled out that both are equally true.

First of all, the author made a list of scientists including completely uncomparable names--from I. P. Pavlov, the greatest representative of modern science to rank-and-file workers in the field of neuropsychology. Indeed, all of them have something in common. All the people mentioned devoted 40 to 50 years of their life to the study of the work of the brain. However, something much more important distinguishes them. They approached the analysis of the work of the brain from totally different theoretical and philosophical positions.

There is every reason to state that the fight between idealism and materialism, between religious mystical views and a truly scientific world outlook, appears with special sharpness and distinction in the investigations of brain mechanisms. An analysis shows the different ways in which the different scientists enumerated by the journal arrived at their views.

Let us begin from Sir Charles Sherrington, undoubtedly the most outstanding foreign physiologist at the end of the 19th and beginning of the 20th century. He devoted many years to the study of the brain. However, at the end of his life--at the age of 80--he gave up experimental work and began to engage in philosophical problems concerning the relationship between body and soul. The appearance of two books by the aged Charles Sherrington--"Brain and Its Mechanisms" (1934) and "Man on His Nature" (1941)--was the result of that period. Having completely fallen captive to idealistic philosophy, which strictly separated "spirit" from "body," he arrived at the conclusion that no search for the place where "consciousness enters the brain," or for "those nerve formations that generate consciousness" leads to results. He attempted to solve the problem of the "brain and psyche" from the old dualistic positions advanced as far back as the 17th Century by the French philosopher Descartes.

Ch. Sherrington's fate is very typical of many Western researchers. F. Engels noted that naturalists avoid philosophy, but when they proceed to solve general problems, they inevitably fall under the power of bad philosophy and become advocates of religious and mystical views, which place them outside objective science.

Prof W. Penfield is an outstanding neurosurgeon and experimenter. However, he too proved to be a helpless philosopher. Regarding man's consciousness as a physiological state of wakefulness, not as the reflection of objective reality, he discovered that this state depends on a "centrencephalic system" located deep in the brain, which through a special "netlike formation" ("reticular formation") increases the tone of cortex work. He proved to be unable to scientifically approach the solution of the problem of the brain

mechanisms of intelligent thinking and in his book "The Secret of the Brain," which he published at the age of 85, he found nothing better than to go back to the impotent positions of his teacher Sherrington.

The fate of Sir John Eccles was somewhat different. From the very beginning of his scientific work he was a zealous Catholic. However, when he performed brilliant work on the tiniest formations of the nerve tissue--synapses--and on electrochemical processes of the transmission of nerve excitation, his religious views did not affect his research. As it often happens in such cases, the scientist followed the positions of spontaneous materialism. The situation changed completely when he attempted to solve the general problems of the relationship between "spirit" and "body." He headed the symposium on "Brain and Conscious Experience" convened by the Catholic Academy in 1964. This symposium was opened with a speech by Pope Paul VI, who declared that the church "is not afraid of science," that the problem of "man's consciousness and his role in the world occupies the central place" and that the "scientist's soul is now more than ever open to religious values." However, citing a number of specific materials of indisputable scientific importance in his report, Sir John Eccles did not limit himself to them. Exceeding their confines, he made an attempt to show the existence of a "spiritual world" independent of matter, whose "detectors" allegedly are certain nerve structures.

In his later books he further develops this thought, believing (following the famous physicist idealist E. Mach) that man's inner world, his self-consciousness, not the external world, is the only "direct reality." He arrives at the conclusion that the appearance of consciousness cannot be explained by the laws of evolution, that man is a "spiritual being" and that "soul expressed in religious concepts represents the only reality." J. Eccles remains a scientist only within specific investigations, but becomes a militant idealist as soon as he turns to philosophy.

Finally, a few words about the talented American psychologist K. Pribram, who devoted many years to an analysis of brain mechanisms, including the mechanisms of intelligent behavior of animals. Soviet readers can become acquainted with his views in two of his books translated into Russian--"Plans and the Structure of Behavior" (1965) and "Languages of the Brain" (1975). From these works it is evident that the author is perhaps excessively carried away by concepts of modern cybernetics and physics (holography), but there is no basis to attribute to him a mystical or religious view of the problem. As far as I know him personally, in general, he is very removed from religiosity and mysticism.

Now let us turn to the investigations of brain mechanisms in the Soviet Union.

The whole world knows that I. P. Pavlov, the greatest physiologist, whom the International Physiological Congress called "the elder of the world's physiologists," from the very beginning set for himself the task of scientifically and materialistically examining the brain mechanisms forming the

basis for the higher nervous activity (behavior) of animals. Following his predecessor, the great Russian physiologist I. M. Sechenov, from the very beginning I. P. Pavlov regarded voluntary movements and conscious acts as reflexes with which the organism responds to external effects, not as the manifestations of "subjective spirit." Such reflexes can be comparatively simple and very complex. An objective study of these complex reflexes is the way to a scientific analysis of the behavior of animals and man's consciousness.

Great credit for the discovery of an objective method of studying reflexes and describing the laws according to which animal brain analyzes and synthesizes the effects obtained belongs to I. P. Pavlov. Credit for determining the role that conditioned reflexes play in various forms of animal activity belong to him. Only during the very last years of his life did I. P. Pavlov make an attempt to approach the physiological analysis of man's conscious activity, advancing the thought that a "second signal system"--the speech of those around him and his own speech--affects man. This new formation social in its nature opens up new possibilities for man's conscious activity.

Can one detect in all this even the smallest grains of the "religious and mystical view of life" discussed by the ill-starred commentator of AMERICA?

With regard to the author of these lines, it is not clear how his work in the field of neuropsychology can give any reason to suspect him of slipping to "religious and mystical views."

As far back as 50 years ago the remarkable Soviet psychologist L. S. Vygotskiy first raised the question of how one could depict the brain organization of mental processes and what brain zones formed the basis for complex forms of mental activity. At that time some scientists limited themselves to statements that the processes of spiritual life are "parallel" with the processes occurring in the brain, or "interact with them." Others believed that both elementary functions (sensations and movements) and complex processes (perception, memory, speech, writing and reading) are indivisible "functions" or "capabilities," each of which is directly connected with an individual section in the brain cortex, and that the most complex "psychic functions" are directly "localized" in limited brain sections. Neither the first, nor the second approach to the solution of the very difficult problem of "brain foundations for man's mental activity" could be considered satisfactory. Each of them led to an impasse.

Almost half a century of work by Soviet scientist physiologists and psychologists was needed to show that it would seem that simple mental "functions" are, in fact, the most complex "functional systems" formed in the process of social history, including object activity (the use of tools and signs) and, finally, speech. All these processes enable man to consciously reflect reality and to regulate his activity.

Instead of attempting to "localize" complex mental processes in individual nerve cells ("neurons"), or in isolated brain sections (as was done by mechanistically thinking scientists), the new science--neuropsychology--set for itself another task: To answer the question as to how the complex functional systems that appeared in the process of social history are located throughout the cerebral cortex. This made it possible to better understand the structure of complex mental processes.

A study of the changes in the psyche during local brain injuries (wounds, tumors and hemorrhages), in which the writer of these lines took a direct part, led to an analysis of the brain organization of such complex mental processes as perception, speech, reading, counting and writing. The results of this work are reflected in a number of books by the author of these lines.

It is self-evident that all these investigations can be considered only the beginning of work equally important for the theory of materialistic psychology and for the practice of medicine. However, it is easily seen how this path is removed from the "religious or mystical view of life" discussed in the materials of the journal AMERICA devoted to brain mechanisms.

M. Aron's selection gives unobjective information on the problems of science and thereby in no way contributes to a better mutual understanding between our nations. The journal AMERICA should not consider Soviet readers so naive as to easily fall for any false information attempting to discredit both progressive foreign and Soviet scientists. One would also wish that articles on serious scientific subjects would not be entrusted to a man with quite substantial experience as a basketball player, but to a more competent journalist.

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PSYCHOLOGY

SYSTEMIC DESCRIPTIONS IN PSYCHOLOGY

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA in Russian No 5, 1977 pp 86-91

[Article by V. A. Ganzen]

[Text] The systems approach and systems analysis have been enjoying continually broader application in psychology in recent years. The experience of making systemic descriptions of objects under analysis is accumulating. Psychology has known systemic descriptions almost since the time it materialized as an independent science, but the need for such descriptions is especially great today, now that the volume of psychological knowledge has increased considerably. Use of the systems approach in psychology is also stimulated by successes enjoyed by particular systems theories in other areas of knowledge and by development of cybernetics and general systems conceptions. This article examines some fundamental issues in making systemic descriptions in psychology.

Systemic descriptions are not a goal of the systems approach in themselves; They are a way to solve many theoretical and applied problems psychology faces today. From the theoretical aspect, these include integrating and systematizing psychological knowledge, eliminating surpluses in the accumulated information and, consequently, reducing description volume, revealing the invariants of psychological knowledge, surmounting the shortcomings of the narrow approach, and reducing subjectivism in our interpretation of mental phenomena. From the applied aspect, these include psychodiagnosis, planning and controlling automated systems, heightening the effectiveness of teaching, and improving psychological education.

Systemic descriptions are applicable not only to integral dynamic systems (the cell, the body, man) but also to sets of objects or their properties (associations of plants and animals, the set of personality properties, nosological lists of diseases). For this reason the methods for making systemic descriptions cannot be borrowed from some particular systems theory; instead, they must rest upon all experience science has accumulated in systems analysis. In the general case, a systemic description is a description of an entire object (a system), its parts (subsystems), sets of objects, or their denominations.

As far as the object-description-subject triad is concerned, the description must, on the one hand, adequately reflect certain aspects of the object as a system and, on the other hand, be consistent with the human capabilities reflected by the system. For this reason when we make systemic descriptions we must take account of not only certain concepts of systems analysis but also psychological data on the capabilities and limits of human perception, memory, and thinking. For this same reason, we can make use of experience not only in science but also in art for this purpose. The complexity of many objects of psychological analysis is such that information on an object cannot be exhausted with just one description of one form or another. Hence the same object must be characterized by numerous descriptions. The subjective forms in which the object is reflected (its descriptions) are images, concepts, and judgments; therefore different languages--natural, synthetic, graphic, acoustic, and others--can be used in systemic descriptions. It is only through a number of descriptions of the same object and through the use of different languages that we can gain the fullest impression of the object.

Anan'yev* persuasively showed that man is the principal object of psychological analysis. Lomov** suggests the same idea. Thus it would be natural to assume that man in his various manifestations must be the principal object of systemic descriptions. But man is a highly complex object of biosocial nature. This complexity is reflected by the long-established levels of the descriptions of man--his soma, his mind, and his personality. Man's soma, mind, and personality can be described in both static and dynamic form. Static systemic descriptions combine those characteristics of the object which remain constant (or ones which change insignificantly) over a selected interval of time. Dynamic systemic descriptions characterize the processes of regulation, movement, activity, and development.

Numerical experimental data, psychological measuring scales, properties, psychological categories, principles, and more-particular systemic descriptions can serve as the raw material from which to make systemic descriptions. Both the level of abstraction and the methods of systemic description depend on the sort of raw material available. Procedures for making systemic descriptions can consist of numerous steps including a number of intermediate descriptions and a final systemic description. As an example the intermediate forms of factor analysis are the correlation matrix, the factor matrix, and the factor matrix graph, while the final form is represented by an interpretation of the set of isolated factors. It is precisely the final description which must be consistent with the system reflecting man. For this purpose the principal types of topological and metric structures in graphic form, concepts and systems of concepts, statements and systems of statements, formulas, and numerical constants are the most suitable.

*Anan'yev, B. G., "Chelovek kak predmet poznaniya" (Man as a Subject of Cognition), Leningrad, 1969.
**Lomov, B. F., "The Systems Approach in Psychology," VOPROSY PSIKHOLOGII, No 2, 1975, p 34.

Correct selection of the final form of a systemic description attests to completion of systems analysis. In this sense the MMPI system is at a higher level of completion than is Cattell's system, inasmuch as the product of the former is specific scales while that of the latter is only a somewhat indistinct interpretation of factors. Systemic descriptions are one of the principal results of systems analysis; therefore the effectiveness of the entire analysis depends on correct selection of the final form of the description, and this choice must be made right at the planning stage of the research. Correct selection of the final form of the description also permits us to correlate the results of the particular analysis with results of other analyses of the same object.

Systems analysis presupposes a certain choice of the object of analysis, and wording of the tasks of analysis using the terms of the systems approach. Selection of the object of the particular research project is not an easy matter, since a separate subsystem characterized by relative functional and structural independence must be isolated from the complex organization of man. This is a necessary condition for obtaining a systemic description of the object. As examples we can cite the body's homeostatic regulatory systems,* human sensory organization (F. R. Gil'manova's candidate dissertation), psychomotor organization (L. A. Golovey's candidate dissertation), auditory perception,** intelligence (L. N. Granovskaya's candidate dissertation), and so on. The larger constructs (the soma, the mind, the personality) are difficult objects of individual experimental analysis, and they can serve as objects of either integrated or theoretical analysis.

However, selection of a functionally and structurally independent object is a necessary but insufficient condition for obtaining a good systemic description. We must choose a particular "cross section" of analysis for the selected object for which we can delineate and experimentally analyze the complete set of characteristics. The description would inevitably become narrow were we not to do so.

Presentation of the task in the terms of the systems approach presupposes finding answers to questions concerning the composition of the object (the component approach), the functions of the object (the functional approach), and its structure (the structural approach). A system is defined by its composition, structure, and function, and for this reason the systems approach presupposes unification of these particular approaches. Special emphasis should be laid on the concept "integral approach," which is often used as a synonym of "systems approach." We believe that certain differences can be pointed out between these concepts. First of all we have

*Grodinz, F., "Teoriya regulirovaniya i biologicheskiye sistemy" (Regulation Theory and Biological Systems), Moscow, 1966.
**Gippenreyter, Yu. B., "Analysis of the Systemic Structure of Perception," DOKLADY APN RSFSR, No 4, 1957; No 1, 1958.

a terminological difference. In the systems approach, the principal terms are "system" and "subsystem," while in the integral approach the principal terms are "whole" and "part." Any system can be viewed as a subsystem of a larger system. Though correct in essence, this premise leaves in the dark the fact that the succession of systems is not homogeneous: Different objects (systems) are characterized by different functional and structural independence and integrity. As an example we can interpret a cell, an organ, and the body as systems. But the cell and the body have a considerably greater capability for independent function than an organ. Thus we believe that the integral approach is not applicable to all systems (objects), but rather only to those characterized by a high degree of functional independence. The second difference between the integral approach and the systems approach is, in our opinion, that the whole and its parts are continually subjected to comparison.

At the very moment we define the parts of the whole we account for their similarity to the whole in relation to one of its characteristics. Then we take account of the relationships not only between parts but also between the parts and the whole. Not a single particular systems theory examines such relationships. These and some other features of the integral approach permit its interpretation as an independent and the most sophisticated method for describing objects of analysis. Different levels of the systems approach can also be applied to the properties, or the integral characteristics, of an object. Every property, or integral characteristic, is described by the appropriate concepts, and the task of systematizing the properties is equivalent to the task of systematizing the concepts.

A rather large number of articles and monographs have been devoted to discussion of the problem of systematizing psychological concepts. However, the question as to the methods for solving such problems is hardly examined anywhere. Apparently it is vaguely implied that the relationships of formal logic are enough to combine concepts into a system. However, in this case the formal logical approach is entirely inadequate because such a system of concepts reflects (describes) an integral object and its dialectic relationship, and it must also be made consistent with the possibilities the system reflecting man has. We believe that these two important circumstances force us to think about the methods by which to systematize psychological (and not only psychological) concepts.

We can suggest as one of the approaches using the idea of expanding the object in terms of its base; this idea has been borrowed from mathematics. The base is defined as a certain minimum alpabet of symbols with which we can describe any object, taken from a sufficiently large class, in a standard way. The principle requirement imposed upon the base is that its components must be complete, such that any object in the given class can be described. Different bases can be used to represent objects of the same class.

We can also use different bases to systematize concepts. One such base which has been in use for a long time is the dialectic diad of opposite, mutually

supplementary concepts. This is the way we form the simplest systems of concepts, for example tendencies and potentials, conscious and unconscious, and so on. We can also use, for the same purposes, a dialectic triad containing, in addition to the opposite components, a neutral component (+, 0, -). Such bases can be called dialectic.

Another base helps us to delineate practical descriptions of different mental phenomena. Their principal characteristics are temporal, spatial, energetic, and informational. The space-time-information-energy tetrad can be used as a physical base for describing mental phenomena and for systematizing concepts. While the completeness of these dialectic bases cited above is obvious, the completeness of the physical base and all bases examined subsequently rests only on empirical grounds.

Let us now examine a base structured out of systemic categories. These categories did not arise simultaneously in psychological descriptions. The categories of properties and processes came into use the earliest. This is not surprising, since properties are precisely what we use to separate the given mental phenomena from all others, and since the dynamic nature of mental phenomena, their existence as processes, had been revealed very long ago. Relatively recently, N. D. Levitov introduced the category of mental state into usage, B. G. Anan'yev introduced the category of mental function, and K. K. Platonov introduced the category of mental act. The systems approach permits us to reveal the structure of mental phenomena. Introduction of these categories has also allowed us to gain an understanding of something else: No single mental phenomenon can be viewed solely as a process, an act, or a state. Each phenomenon has its own function and structure, it is characterized by its own properties, it has its own dynamic (process) and static (state) characteristics, and it is associated with manifestations of certain activity (act).

Let us examine the perception phenomenon as an example. It has an entirely definite function, it has a polymodal structure, phases can be delineated within it, and in certain conditions it can be interpreted as a state (contemplation). Perception can also be interpreted as a property of the mind. It stands to reason that these systems characteristics may be expressed with differing distinctness in different phenomena. However, the aggregate of systemic categories--function, structure, property, process, act, state--can be interpreted as a systemic base for describing many (if not all) mental phenomena.

The author of the present article used a system of compositional principles and resources to systematize psychological concepts.* This system can be

*Ganzen, V. A., "One Method for Systematizing Psychological Concepts," VESTN. LENINGR. UN-TA, No 17, 1974; Ganzen, V. A., and Yurchenko, V. N., "Systemic-Conceptual Description of Human Mental States," VESTN. LENINGR. UN-TA, No 5, 1976; Vigner, Ye., "Etyudy o simmetrii" (Essays on Symmetry), Moscow, 1971.

called the compositional base in this context. It differs from the bases examined above in that it contains a relatively large number (15) of concepts, which makes use of geometric reference points necessary for convenience of perception. All of the bases we have examined do not contradict one another; instead, they supplement one another to a certain extent. We should note that all of these bases contain more than one component; they are sets. The history of psychology in the 19th and 20th centuries shows that no single specifically psychological concept (category) or one borrowed from another area of knowledge can serve as adequate grounds for an exhaustive description of all mental phenomena. Nevertheless the attraction scholars have for single grounds remains very strong. We must at this point mention another attempt of this sort.

The scientific process is characterized by several levels of abstraction. Vigner delineates the levels of phenomena, particular laws, and invariants. Other names can also be given to the levels of abstraction. Description of mental phenomena in the categories of the systems approach is one such level. It would be interesting to note that there exists the mathematical category of a "relationship" of a high degree of generality in relation to which all categories of the systemic base (as interpreted from a mathematical point of view) are particular cases of the relationship. Being a category of a higher level of abstraction, it is not a component of the categories of the systemic base. How can we fail to recall, in this connection, V. N. Myasishchev, who attempted to construct the psychology of relationships defining a relationship in the broad psychological (but not the mathematical) sense!

The principal types of topological and metric structures, physical (color and acoustic) scales, sets of psychological scales, and so on can be used successfully as natural and adequate "supporting structures" of systemic descriptions of the human soma, mind, and personality. Use of such resources may help us to reduce or entirely eliminate the gap present today between systemic descriptions made inductively, on the basis of empirical material, and descriptions made deductively. The principal tool used today in inductive research is factor analysis. But its possibilities are limited. The difficulties of interpreting factors have already been mentioned. The factor matrix (factor graph) does not reflect the psychological structure of the object in constant relationships. In the best case we can use it to assess the correlated nature of the factor pattern and trace its dynamics in time. But this result does not at all compensate for the outlays on the research. Neither the factor matrix nor the factor graph is a suitable form of a final systemic description. The factor pattern depends considerably on the experimental raw material selected. Establishment of the fact of statistical dependence between characteristics of an object does not in most cases allow us to make conclusions on the physical and psychological nature of the given dependence. The assertion that correlations exist between variables itself adds little to the well-known philosophical premise that "everything in the world is interrelated."

There are other serious difficulties in making systemic descriptions of human psychophysiological organization. We still do not have a theory of systems characterized by a multiplicity of regulatory associations, a theory which could reveal the pattern behind dynamic associations in systems having a large number of mutually associated variables. Some psychological terms are "fuzzy." Relationships between some basic psychological concepts have not been fully defined. But even under these conditions we can achieve a great deal on the basis of the premises touched upon in this article. Nor can we doubt that we should devote the most serious attention to developing the methods for making systemic descriptions, doing so on the basis of the end result desired.

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11004
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PSYCHOLOGY

REFLEXOMETERS CAUSE REVOLUTION IN NEUROPHYSIOLOGICAL RESEARCH

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Mar 77 p 4

[Article by Dr Chem Sci Yu. Chirkov: "Reflexes Under Control: Can An Instrument Analyze the Course of Intellectual Processes?"]

[Text] Red stripes alternate with green stripes on the instrument's screen. My task is simple--to be as attentive as possible: When I see green, I do nothing, and when I see red, I press a button as quickly as possible. Immediately after I respond a column of numbers lights up to my side, in another unit--the experimenter's block. These numbers indicate my reaction time to the red color.

Thus I played the role of an "experimental rabbit." My examiner was a radioreflexometer, a remarkable instrument designed at the Ivanovo State Medical Institute (IGMI). This device thoroughly and naggingly evaluated my reflexes, my ability to react quickly and precisely to various signals.

A radioreflexometer is an entire "combine" of five blocks. It can be used with any, even the most refined method which a physiologist or psychologist could imagine. It can measure the time it takes an individual to react to all sorts of stimuli--auditory, tactile (touch), color, thermal, electric, vibrational, and even gustatory: The device does this with an outfit of sensing elements capable of recording respiratory, motor, blinking, and other reflexes.

Until quite recently we had concentrated our research basically upon human motor reactions: It was precisely such reactions which dominated our activity. However, today it is much more important to analyze the verbal responses of a subject. The experimenter pronounces some word, and simultaneously a VIU--a time measuring unit--turns on. The VIU can turn on at the beginning or end of any word, and it can turn off on "hearing" a key word pronounced by the subject.

"Human reaction time has been studied for a long time," explains Candidate of Medical Sciences Oskar Yakovlevich Bokser, one of the designers of the radioreflexometer and an assistant professor at the IGMI. "Various laws

have been discovered: We react more quickly to the color red or a salty pill than, for example, to the color blue or a bitter pill. Boys and men of all ages react more quickly than girls or women. The shortest reaction time is observed between ages of 20 and 30. It should not be thought that such research is academic; it has always been stimulated by the immediate requirements of practice: For medical practice, neurosurgeons have established a distinct difference (of several milliseconds) between the reaction times of the right and left hands when a tumor develops in one of the cerebral hemispheres; pedagogical practice has been afforded information indicating that the nervous system of a student is not at all indifferent as to the shift in which he goes to school. The reaction time of a trained swimmer to the starting gun is much shorter than that of a novice taking his first swim. Consider advertisements: In the last 30-40 years the time it takes to perceive posters, displays, and signs has decreased from 20-30 to 1-2 seconds.

Aviation has added a special impetus to the research. The reaction time of a pilot has clear limits, beyond which even an experienced pilot finds himself to be helpless. A pilot flying at Mach 3 (Mach 1 is equivalent to the speed of sound) experiences a unique illusion. It appears to him that objects he sees are next to the airplane, but in fact they are already 100 meters or so behind his craft. One hundred meters is the so-called "blind" distance: Objects at such a range simply do not exist for the pilot, they cannot be perceived. The causes of such "blindness"? The rate of perception lags behind the speed of the airplane. Research on reactions of an individual operating under such conditions is directed at guaranteeing his safety. Here is another example: A pilot flying on instruments needs 1.5 seconds to orient himself by means of his instruments--not very much, but during this time the airplane would fly a few kilometers. Thus there is a lot of work to do by many specialists.

The simplest instrument used to measure reaction time is the conventional stopwatch. But this instrument is imperfect, and its precision--0.1 seconds--does not do the scientists any good. We know that the reaction time to a tactile stimulus (the shortest reaction time) is on the order of 90 milliseconds on the average, while reactions to sound and light are longer--120 and 150 milliseconds.

In former times, clocks used to study reaction time were crafted on an individual basis: Each scientists had his own "unique" device. However, practice persistently called for creation of series-produced domestic instruments (there are still no reflexometers abroad), specially intended for research on human reaction time, instruments that could be called "human analyzers."

O. Ya. Bokser received an inventor's certificate for the first reflexometer as long ago as in the 1950's: At that time he was a teacher in aviation and, for the first time in world practice, examined pilots with his instrument right while they were flying, and not before takeoff or after landing. Bokser's first apparatus had a long name--telechronoreflexometer, which was demonstrated in Moscow at the Exhibition of the Achievements of the USSR National Economy.

Much has been done since that time: The chronomyoreflexometer, the neurotachometer, the radioreflexometer, and other remarkable devices were designed. Moreover they were, in essence, an entirely new and unique direction in medical instrument making. In just the last 5 years 20 inventor's certificates have been granted and eight new instruments have been placed into series production. Of course O. Ya. Bokser is not the only one that deserves credit. There are also his co-inventors as well as the laborers and engineers of many enterprises. Reflexometers are popular abroad, where they are readily purchased: They have been awarded honorary diplomas and medals at international exhibitions in the USA, Japan, the FRG, France, and Canada.

Reflexometers are undergoing continual improvement, they are being updated, and today's instruments can be called the third generation: Tubes have been replaced by semiconductors and integrated circuits, and the measuring accuracy is mind-blowing by human standards--ten-thousandths of a second. Everything has been taken into account, even the fact that a test subject may blink at not exactly the right time when undergoing research on reactions to visual stimuli. The "trained" instrument now produces a signal only when the subject's eyelid is in its upper position: The reflexometer automatically tunes itself to the person.

I learned and saw many interesting things at the IGMI. A worthy feature of this medical institute is that more than two dozen schools and over 100 professors, instructors, and students are working on inventions in this place. Many of them have been introduced into practice, and a number of instruments and apparatus--not just reflexometers--have been placed into series production. I spoke with Vasili Andreyevich Vasilenko, the vice-rector for science at the IGMI.

"This is an area of textile industry: One out of every 4 meters of fabric produced in the country is from Ivanovo. During the present five-year plan our institute is working chiefly on the working conditions and health of workers in textile industry. We have situated laboratories right in the factories. There are many problems, occupational selection for example. Not every women is fit to be a cosmonaut--that is clear to all, but no one had ever thought that not every girl entering a vocational-technical institution can become a good weaver. Experiments showed that vision, hearing, and attention worsen when an individual tires. To monitor the extent of tiring our inventors have designed special instruments; reflexometers are especially important in this regard."

But reflexometers are needed not only in textile industry: Neurophysiology, research on higher nervous activity, aerospace medicine, engineering psychology, occupational selection, and production of teaching machines are all within the scope of activity of reflexometers.

Reflexometers are useful in determining the way an individual handles time-related problems and in how quickly he can respond to instructions: The instrument is turned on at the end of an instruction and stops only after it is executed.

Reflexometers will help us to analyze the course of intellectual processes: The speed of operations in arithmetic, of translating foreign texts, of reading notes and instrument readings, and of decoding stenographic and topographic symbols. Reflexometers are capable of sensing the most delicate nuances; for example they can establish the precision and comparability of gestures and facial expressions of an actor performing on stage, as well as the harmony of a singer and his accompanist. However, reflexometers will doubtlessly be most important in relation to industrial production.

We live in a century of automation. The man at the console is becoming one of the central figures. The work of an operator is not easy; his work requires great mental effort: The "slightest" error--pressing the wrong button or not pressing a button at the right time--could lead to serious consequences. One of the most important prerequisites for successful work by an operator is swiftness and precision of his reactions. Reflexometers will help to make an operator's work harmless to health and most highly productive. This is yet another of the innumerable examples (reaction time is a fundamental characteristic of all forms of human activity!) of the usefulness of instruments designed by Soviet scientists and inventors in the city of Ivanovo. In our century of technological abundance, these projects will permit us to adequately apportion that which is mechanical to the automaton and that which is human to the individual, and they will help to keep reflexes under control.

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PSYCHOPHYSIOLOGY

STRESS DEVICE MEASURES EMOTION OF MINERS

Moscow TEKHNIKA I NAUKA in Russian No 3, 1977, p 29

[Text] Working in the mines, the miner wastes not only physical powers, but also undergoes emotional stress. Doctors have established that in the special conditions of underground labor, this stress can provoke great tension in the nervous system. Therefore, the evaluation of emotional stability has a very practical meaning for safe prognosis of a person's behavior underground in the course of responsible participation in production.

In the Donetsk Institute of Labor Hygiene and Professional Diseases, the "stress" device was created, allowing the objective determination of the state of the organism's psychophysiological functions. The doctors received for their use an instrument which simulates a complex of specific stimulants, so-called emotiogenic factors, or stressors. The subject is exposed to noise (sirens), light (flashes) and gravitational pull, sitting in a special chair.

A person is seated in the chair before a table and is told, for instance, to sketch something, to analyze maps of underground sectors, or to read a specialized article. In the course of intense work, suddenly an alarm sounds, a pulsating light source is turned on, the chair turns over and lowers, together with the table top.

The "stress" device registers the organism's functions before and after the stressors' affect. The doctor looks at the instrument readings registering pulse and breathing, analyzes electrocardiograms and visually observes the person's behavior. The succession of all the emotional influences is assured automatically. At the same time, we also get a complete picture of the level of emotional tension, and the individual characteristics of miners are determined.

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PUBLIC HEALTH

MEASURES FOR IMPROVING HEALTH CARE

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 5, May 77 pp 137-139

[Article by A. Zhukov, deputy division chief USSR Gosplan, and V. Churakov, deputy subdivision chief USSR Gosplan: "Improving Public Medical Assistance"]

[Text] The social program of the Tenth Five-Year Plan accords a special place to measures designed to further develop and improve health care. Thanks to the party's and the government's constant concern, our country has made substantial successes in the matter of protecting and strengthening the health of the Soviet people. These accomplishments have become possible as a result of the creation of a broad network of health care establishments, the training of highly-qualified medical cadres, and progress in medical science.

An important stage in the development of health care was the Ninth Five-Year Plan, during which a qualitatively different approach was implemented toward the resolution of tasks designed to improve specialized medical assistance and more fully provide the population with all types of assistance. The groundwork was laid for the construction of large multi-profile and specialized hospitals. Outpatient and polyclinic establishments were developed intensively. Existing establishments were enlarged and outfitted with modern equipment on a large scale.

With respect to many indicators, Soviet health care now occupies a leading place in the world. It possesses a powerful material-technical base which makes it possible to comply with the basic principles of socialist health care--free and universal medical assistance to the entire population.

By late 1975 the country had more than 24,000 hospital establishments with more than three million beds; there were about 36,000 outpatient-polyclinic establishments in operation. A broad network of higher and secondary medical schools is expanding the numerous army of medical workers every year. In 1975 the USSR had 835,200 physicians and more than 2.5 million mid-level medical personnel.

It must be admitted, however, that medical cadres and the health care material-technical base are not being utilized with full effectiveness everywhere. Thus, in a number of places the indicators of annual hospital bed use are too low; there is not enough continuity between the polyclinic and the stationary hospital in the examination of patients, so that as a result the patients are spending too long in the stationary hospitals. Only by eliminating these shortcomings will it be possible to substantially boost the number of patients being treated.

The 1976-1980 5-year plan calls for further developing health care, for the widespread practical adoption of the achievements of science and technology, for expanding efforts in disease prevention, for improving the material base of health care, and for more fully meeting the population's and the health care establishments' needs for medicines. The number of hospital beds is scheduled to be increased to about 3.3 million. Substantial capital investments are allocated for health care development.

In the successful resolution of the task of improving public medical assistance, great importance attaches to the December 1976 decree of the CC CPSU, the USSR Council of Ministers, and the AUCCTU on raising the minimum wages paid to workers and employees, simultaneously increasing wage rates and salaries paid to middle-level categories of workers engaged in the nonproductive sectors of the national economy, including health care.

In accordance with this decree, post salaries and wage rates are to be raised for 31 million workers. Among them are more than 2.5 million mid-level and 1.3 million junior medical workers. The new post salaries tie in more closely than before with the difficulty, hazards, and intensiveness of the work of individual categories of workers, the social significance of the work, and the level of qualification of the personnel.

In order to increase the motivation of the latter to expand the volume of work performed (with a smaller number of employees), boost labor productivity, raise the level of its norming, and improve the quality of services, health care establishment managers are authorized to introduce supplementary payments in the amount of up to 30 percent of the wage rates or salaries to workers, engineering-technical personnel, and other specialists, employees, and junior maintenance personnel for the combining of jobs (posts), expanding the service zone, and increasing the volume of work performed.

Also designed to improve the quality of public medical assistance and the effectiveness of the work of health care establishments is a decree adopted late last year by the USSR Council of Ministers on expanding the rights of health care establishment managers supported by the state budget.

The adoption of this decree was preceded by an experiment carried out over several years in 54 health care establishments on expanding the rights of health care establishment managers with respect to the utilization of labor, material, and financial resources and the application of the principles of economic incentive in these establishments.

During the time of the experiment, in a number of health care establishments more rational use was made of the cadres, the level of organization of the work of the medical workers rose, they showed greater motivation to improve the quality of the work, and managers took on increased responsibility for the status of financial-economic activity.

At the same time, the experiment showed that in many establishments their fund was created almost entirely from savings in the wage fund in connection with personnel understaffing and giving vacations without pay. Yet not enough attention was paid to the formation of the establishment fund as was stipulated in the conditions of the experiment.

In some of the facilities taking part in the experiment the establishment fund was formed from unutilized appropriations earmarked for the acquisition of implements and equipment, also from funds formed as a result of the failure to fulfill capital repair plans.

On the basis of accumulated experience it has become possible to determine the most rational regulations of the experiment in order to extend them to all health care establishments supported by the state budget. Managers of health care establishments supported by the state budget have been given the right to disburse part of the established wage fund within the limits of wage savings for paying bonuses to workers for achieving the best results in the work and for improving the quality of medical assistance to the public on condition that all indicators of the plan are fulfilled.

Control is exercised over the appropriate health care organs for the proper utilization of bonus funds. If the quality of medical assistance declines, these organs are authorized to halt the payment of such bonuses. The introduction of material incentives in the operational practice of health care establishments will undoubtedly have a positive effect on the quality of public health assistance.

The success of such a measure will be largely determined by the procedure for the payment of bonuses to workers in health care establishments, a procedure to be established by the USSR Ministry of Health in consultation with the USSR Council of Ministers State Committee for Labor and Social Problems, the USSR Ministry of Finance, and the AUCCTU. The procedure should stipulate the payment of bonuses to those workers who have achieved excellent results in production activity.

At the same time, health care establishment managers are given the right, if necessary, at the end of the first quarter, to increase or decrease annual and quarterly budget appropriations within the limits of the total amount of annual appropriations within the limits of the total amount of annual appropriations throughout the establishment as a whole with respect to many items of estimated expenditures, and to utilize funds earned from the sale (in the established procedure) of surplus and unused equipment and instruments in order to acquire equipment and instruments above budget

appropriations allocated for this purpose. It is established, at the same time, that in health care establishments supported by the state budget appropriations that are not used in the first, second, and third quarters of the current year are not to be counted in the opening of credits for the corresponding quarter, with the exception of funds allocated for the support of health care facilities that are newly commissioned.

Expansion of the rights of health care establishment managers will help to improve their activity and upgrade the quality of public health assistance.

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VETERINARY SCIENCE CONFERENCE IN MOSCOW

Moscow SEL'SKAYA ZHIZN' in Russian 24 Mar 77 p 2

/Article by V. Shishkov, Member of the Academy of VASKhNIL/

/Text/ Executives of the All-Union Conference of Executives of Veterinary Agencies and "Zoovetsnab" Associations met in Moscow 23-24 March. Conference participants discussed problems of improving the work of the veterinary service of the country under the conditions of specialization and concentration of production. In connection with this, the editorial staff asked academician and secretary of the Department of Veterinary of VASKhNIL /All-Union Academy of Agricultural Sciences imeni V.I. Lenin/ V.P. Shishkov to discuss the role of veterinary science in the development of animal husbandry.

One of the potentials for increasing production of farms, for improving its quality and biological value is the prevention and elimination of diseases in farm animals. The steady development of animal husbandry under conditions of epizootic well-being and maximum quantity of inexpensive and, what is especially important, highest quality of output is possible only among healthy animals.

The introduction into general practice of the achievements of veterinary science will permit the solution of basic problems involved in the industrialization of animal husbandry. A major achievement is the development by scientists of the All-Union Institute of Experimental Veterinary of the world's first highly-effective LTF-130 /expansion unknown/ vaccine against ringworm in cattle, which inflicted significant losses in animal husbandry. Its introduction into production permitted a 15-fold reduction of the disease in cattle and provided protection against the disease in many regions. It is possible to eliminate this dangerous disease in the country as a whole.

The VNII /All-Union Scientific Research Institute/ of Veterinary Sanitation and the Zoological Institute of the Academy of Sciences of the USSR developed and introduced on a national scale new methods of control of Hypodermatidae in cattle. There is no other program of control of this pest on this scale anywhere else in the world. The method is extremely effective. Morbidity in animals was reduced from 29.6 percent to 2.3 percent. Hypodermatosis was eliminated completely in the Estonian SSR and in 8 oblasts of the Ukraine. Vulnerability of cattle to Hypodermatidae was reduced to a minimum (less than 1 percent) for the entire Ukraine, in Belorussia, Latvia, Moldavia, Turkmen and 20 oblasts of the RSFSR. The economic impact of introduction of the new method is nearly 470 million rubles.

Production of new, more effective vaccines against foot and mouth diseases was proposed and introduced. Timely organization of these measures will permit the prevention of significant yearly losses which the disease inflicts upon animal husbandry.

Methods and means of sanitation of farms at which brucellosis and tuberculosis are a threat were improved. A scientifically based system of prophylaxis and control of these diseases greatly reduced the losses which these diseases inflicted on animal husbandry. In particular, new vaccines against brucellosis in cattle were developed. In the Ninth Five-Year Plan this disease was eliminated in the Ukrainian SSR and the Belorussian SSR, the Baltic republics, the Moldavian SSR, many regions of the Russian Federation and other Union Republics. The use of a system of measures including the use of new vaccines against brucellosis in sheep led to a 50 percent reduction of points at which this disease is a hazard.

In connection with specialization, concentration of animal husbandry and the transfer of it to an industrial basis by development of inter-farm cooperation, the role of veterinary sciences is growing immeasurably. It can be said boldly that not only the high economic effectiveness but also the very existence of farms with high concentrations of animals depend upon the development and introduction of scientifically based veterinary-sanitation rules. Veterinary-prophylactic measures should be organically included in the technology of production and be reflected in designs of animal husbandry complexes and major specialized farms just being constructed.

Systems of measures which ensure stable safety of animal husbandry complexes from the most dangerous diseases are being developed by veterinary science. In solving these problems, scientists developed, for the first time, systems of veterinary-prophylactic measures with the use of new vaccines and methods of their complex use. This ensured the steady safety of newly created animal husbandry complexes and major specialized farms and poultry plants from such extremely dangerous virus and bacterial infections as

plague, erysipelas, Aeski swine disease and Newcastle disease in poultry. In pig farming alone, there is an economic effect of 4 million rubles from the transition to complex vaccination against several infectious diseases.

Labor productivity increases 27-fold and permits the immunization of 10's of 1000's of birds simultaneously by an aerosol vaccination against Newcastle disease. The introduction into production of pharmaceutical coccid into industrial poultry raising for meat purposes made possible the gain of 31.6 million rubles per year due to additional gains in weight alone.

There was developed a vaccine against rhinotracheitis in cattle which is a great danger in complexes for fattening young cattle. There was developed an associated vaccine against plague and wild fire and also colibacteriosis in lambs.

There were developed recommendations for the prevention of helminthiasis in farm animals under conditions of large, specialized farms and animal husbandry complexes. Application of these recommendations permits raising worm-free animals and greatly increases their productivity. Prescriptions for prophylactic and therapeutic premixes with anthelminths have been compiled and proposed for introduction. A complex of measures of control of fascioliasis and dicroceliosis in animals permits preventions of hundreds of millions of rubles in losses annually.

However, the struggle against parasitic diseases would be much more effective through complete provision of chemico-pharmaceutical preparations to animal husbandry. The Ministry of Agriculture of the USSR does not have its own institutes for synthesis of such preparations nor the industry for their production. Even the medical and chemical industry cannot satisfy the demand for the preparations. The system of providing chemical preparations to animal husbandry and veterinary requires radical improvement.

Highly-effective preparations are proposed for prevention of sterility and infertility in cattle. These, in combination with other measures, ensure high fertility of cows and the survival of new-born calves. Progressive farms of L'vov Oblast annually obtain about 95-100 calves from 100 cows with 98-99 percent of the young stock surviving with the help of these preparations. Equally favorable results were achieved in the Tatar ASSR and some other regions of the country.

Actual studies were conducted by veterinary science in the area of veterinary sanitation, the increase of quality of production and environmental protection. Thus, new means and methods of disinfecting animal husbandry premises were introduced. An aerosol disinfection method was developed and special apparatus contrived. The annual economic effect is 2000 rubles

for each complex. There is proposed a method of disinfection of soil, hides and fodder grain, infected by especially dangerous microorganisms with the use of a mixture of gases.

This is far from all of the methods proposed by veterinary science for introduction on farms and complexes. Forward with the great work!

2791
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BILLIONS FOR DEVELOPMENT OF NURSING HOMES

Moscow TRUD in Russian 13 Apr 77 p 3

/Text/ An expanded session of the Central Soviet on Management of Trade-Union Health Resorts convened yesterday and was dedicated to results of the 16th Congress of Trade Unions of the USSR and tasks delineated in the speech by Secretary General of the Central Committee of the CPSU Comrade L.I. Brezhnev at the congress. Chairman of the Central Soviet on Management of Health Resorts I.I. Kozlov addressed the session.

Conference participants noted that, during the years since the 15th Congress of Trade Unions, the network of Trade Union Nursing Homes was extended greatly. Within 5 years, the number of places in sanatoria, boarding and lodging homes and rest homes increased by 80,000. More than a billion rubles were expended in this period on their construction and organization of public facilities and amenities.

The establishment of year-round specialized sanatorium pioneer camps was noted in the last years. They have been opened in Anape, Yevpatoriya, Belorussia, Armenia, Bashkiria, Karelia and other regions of the country. The fact that children not only undergo therapy but also continue their education is an important feature of them.

The centralization of diagnostic and therapeutic service has greatly improved the quality of the Trade-Union Health Resorts. This service and balneo-mud therapy has operated every day. Family recreation has been developed extensively. In the past year, 269 improved boarding houses and rest homes with 76,000 rooms for parents and children, boarding and lodging houses and rest homes with 75,000 rooms were produced.

Noting the definite successes in the development of the sanitation and health resort therapy and rest, the debating speakers concentrated their attention on unsolved problems. The tempo of development of the network

of health resorts, they noted, is still inadequate. There are systematic interruptions of construction plans for new sanitation units, especially in the Ukraine, in Uzbekistan, Azerbaydzhan, in Krasnodar Kray and Stavropol' Kray and in Rostov and Moscow oblasts.

Basic contractors of organizations of the Ministry of Construction, the Ministry of Heavy Construction and the Ministry of Agricultural Construction disrupt their schedules. This caused the loss of 70,000 accomodations last year.

Builders, disrupting the provision of new units, promise compensation for the shortcomings and promise to remedy the situation. However, the situation is unchanged and the culpits deny any responsibility.

The same thing occurred again this year. The results of the first quarter show this eloquently. The annual plan of sanatorium and health resort construction of trade-union units for the first 3 months was only 17 percent fulfilled. The Ministry of Construction USSR did not place in operation the first line of the Kobulet Rest Home for 465 rooms which were scheduled for start-up last year.

The debating speakers noted that there are significant unused reserves in trade-unions for increasing the numbers undergoing therapy or resting. Some of the rest homes are closed every year for overhaul. Performance of repair operation in briefer periods of time without reduction of quality permits accomodation of thousands of additional rural and urban workers to rest and therapy. Unfortunately, the overhaul plan for this year, for which 37.3 million rubles were appropriated, was only 12.6 percent fulfilled.

This is not the first year the Soviet trade unions are constructing new sanatorium-health results on cooperative principles, including contracts with departments and enterprises. In the last Five-Year Plan, builders erected and put into service sleeping units with 14,000 rooms and they added 4,000 more last year. However, far from all that was possible was done. Perhaps it is normal that such health-resort councils as Volgograd, Gorki, Dagestan, Ivanov, Kaliningrad, Mary, Rostov and Chelyabinsk did not conclude one such contract. Moreover, all of these councils operate in the vicinity where there are major industrial enterprises, where funds for health-resort construction could surely be found.

It is scarcely necessary to prove that, together with those who are sent annually to rest or undergo treatment with a pass to the Crimea, to the Caucasus shore of the Black Sea, to the Baltic and other regions, there are also many hundreds of thousands of so-called "shy fellows." However, perhaps they have no right to count on maximum assistance? In recent years,

at some health-resort regions self-supporting organizations for servicing these categories of persons were established. Not all of these organizations achieved definite, uninterrupted operations but the advantages of their activity are obvious. The number of such institutions obviously are inadequate and they serve a comparatively small part of the unorganized patients and persons resting.

Recently in Krasnodar, a water-therapy health resort was put into operation. It immediately became very popular. This therapeutic center is a new type of health-resort institution which serves the patients, so to say, without them leaving their jobs or homes. Such institutes already are operating in many industrial centers and will be operating in Kiev, Minsk, Perm, Gorki, Lipetsk, Nizhniy Tagil, Magnitogorsk, Saransk, Cheboksarakh, Kostrom and Yakutsk in the near future. In short, not only does the person go to the health resort but also the health resort meets the persons who need therapy halfway. This is a very valuable initiative and the extension of such services must be supported.

Problems of rational use of natural health-resort resources were discussed hotly and sharply with lively interest. Nearly 70 million rubles were spent on the regulation of the hydromineral base and the balneotechnical economy lately. However, far from all therapeutic springs are protected completely from pollution, from disorderly waste of the valuable waters. At the meeting, serious grievances were proposed by directors of the Pyatigorsk Council and the Zheleznovodsk Council which do not always put a halt to those who react with barbarity toward natural spa resources

Conference participants gave special attention to cultivation of services. It is our duty to surround all patients and convalescents with care and meet them with cordial joy. Formalism and callousness should be banished from health resort practice. Health resort workers who are doing their work properly should not cause a single complaint from the patients. At Sochi health resorts, as at some other spas, additional privileges are granted to invalids and World War II veterans. There has been much talk about improving family holidays. There is much to regulate and many decisions to make in this area.

Previously, the menus at many health resorts left much to be desired. Patrons had too much idle time and could not always use it favorably and with satisfaction. Some club workers of health resorts operate in an old-fashion way and have not changed with the times.

These and other problems of further improvement of operation of trade union health resorts were raised in addresses of chairmen and representatives of health-resort councils, B. Shal'kevich (Belorussia) I.Shalkovskiy (Ukraine), I. Mel'nik (Odessa), R. Selikhova (Pyatigorsk), F. Kuznetsov (Chelyabinsk) and others.

AUCCTU Secretary S.A. Shalayev spoke at the conference.

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