NASA SP-7011 (96)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 96)

DECEMBER 1971

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges:

STAR (N-10000 Series)	N71-34001 -N71-36397
IAA (A-10000 Series)	A71-39969 -A71-42888

NASA SP-7011 (96)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 96)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Scientific and Technical Information System during November 1971.

Scientific and Technical Information Office
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. DECEMBER 1971

NASA SP-7011 and its supplements are available from the National Technical Information Service (NTIS). Questions on the availability of the predecessor publications, *Aerospace Medicine and Biology* (Volumes I - XI) should be directed to NTIS.

This Supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22151 for $3.00.

INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 441 reports, articles, and other documents announced during November 1971 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, irregular supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations and abstracts are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes—subject and personal author—are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1971 Supplements.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A71-10000 Series)

All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc., (AIAA), as follows: Paper copies are available at $5.00 per document up to a maximum of 20 pages. The charge for each additional page is 25 cents. Microfiche[1] are available at the rate of $1.00 per microfiche for documents identified by the # symbol following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum airmail postage to foreign countries is $1.00. Please refer to the accession number, e.g., A71-10613, when requesting publications.

STAR ENTRIES (N71-10000 Series)

A source from which a publication abstracted in this Section is available to the public is ordinarily given on the last line of the citation, e.g., Avail: NTIS. The following are the most commonly indicated sources (full addresses of these organizations are listed at the end of this introduction):

Avail: NTIS. Sold by the National Technical Information Service at a standard price of $3.00 for hard copy (printed, facsimile, or reproduced from microcopy) of 300 pages or less. Documents in the 301 to 600 page range are sold for $6.00 in hard copy, and those in the 601 to 900 page range are sold at $9.00. Documents exceeding 900 pages are priced by NTIS on an individual basis. These prices apply retroactively to all documents in the NTIS collection, but in addition, documents of 300 pages or less that are over two years old (from date of announcement in *Government Reports Announcements,* or *STAR* for those items announced only in *STAR*) will have a surcharge of $3.00 added for a total price of $6.00. No additional surcharge will be added for documents over 300 pages.

Microfiche is available from NTIS at a standard price of 95 cents (regardless of age) for those documents identified by the # sign following the accession number (e.g., N71-10411#) and having an NTIS availability shown in the citation.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The price is given following the availability line. (An order received by NTIS for one of these documents will be filed at the SOD price if hard copy is requested. NTIS will also fill microfiche requests, at the standard 95 cent price, for those documents identified by a # symbol.)

Avail: NASA Scientific and Technical Information Office. Documents with this availability are usually news releases or informational brochures available without charge in paper copy.

Avail: AEC Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of U.S. Atomic Energy Commission reports, usually in microfiche form, are listed in *Nuclear Science Abstracts.* Services available from the USAEC and its depositories are described in a booklet, *Science Information Available from the Atomic Energy Commission* (TID-4550), which may be obtained without charge from the USAEC Division of Technical Information.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts,* and are sold by University Microfilms as xerographic copy (HC) at $10.00 each and microfilm at $4.00 each, regardless of the length of the manuscript. Handling and shipping charges are additional. All requests should cite the author and the Order Number as they appear in the citation.

(1) A microfiche is a transparent sheet of film, 105 x 148 mm in size, containing up to 72 pages of information reduced to micro images (not to exceed 20:1 reduction)

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by British Information Services (BIS), New York City. The U.S. price (including a service charge) is given, or a conversion table may be obtained from BIS.

Avail: National Lending Library, Boston Spa, England. Sold by this organization at the price shown. (If none is given, an inquiry should be addressed to NLL.)

Avail: ZLDI. Sold by the Zentralstelle für Luftfahrtdokumentation und -Information, Munich, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: Issuing Activity, or Corporate Author, or no indication of availability: Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: U.S. Patent Office. Sold by Commissioner of Patents, U.S. Patent Office, at the standard price of $.50 each, postage free.

Other availabilities: If the publication is available from a source other than the above, the publisher and his address will be displayed entirely on the availability line or in combination with the corporate author line.

GENERAL AVAILABILITY

All publications abstracted in this bibliography are available to the public through the sources as indicated in the *STAR Entries* and *IAA Entries* sections. It is suggested that the bibliography user contact his own library or other local libraries prior to ordering any publication inasmuch as many of the documents have been widely distributed by the issuing agencies, especially NASA. A listing of public collections of NASA documents is included on the inside back cover.

SUBSCRIPTION AVAILABILITY

This publication is available on subscription from the National Technical Information Service (NTIS). The annual subscription rate for the monthly supplements, excluding the annual cumulative index, is $10.00. All questions relating to the subscriptions should be referred to the NTIS.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics
and Astronautics
Technical Information Service
750 Third Ave.
New York, N.Y. 10017

British Information Service
845 Third Ave.
New York, N.Y. 10022

Commissioner of Patents
U.S. Patent Office
Washington, D.C. 20231

ESRO/ELDO Space Documentation Service
European Space Research Organization
114, av de Neuilly
92-Neuilly-sur-Seine, France

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information
Facility
P.O. Box 33
College Park, Maryland 20740

National Aeronautics and Space
Administration
Scientific and Technical Information
Office (KSI)
Washington, D.C. 20546

National Lending Library for Science
and Technology
Boston Spa, Yorkshire, England

National Technical Information Service
Springfield, Virginia 22151

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

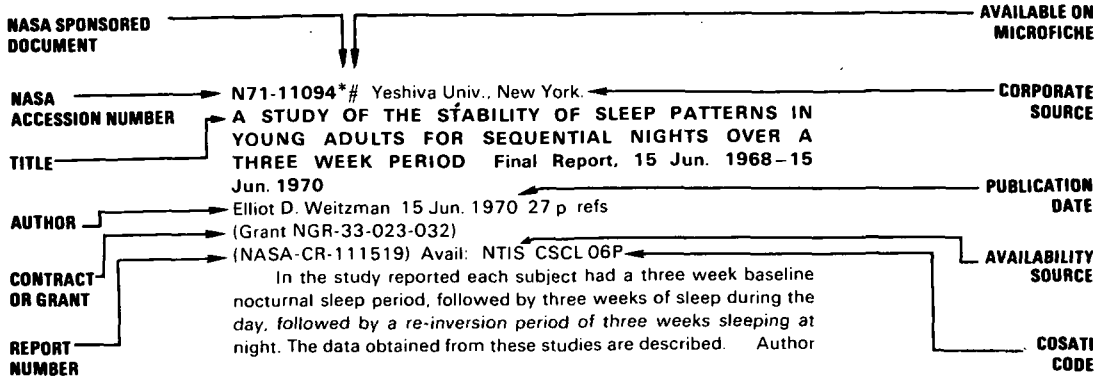
University Microfilms, Ltd.
Tylers Green
London, England

U.S. Atomic Energy Commission
Division of Technical Information
P.O. Box 62
Oak Ridge, Tennessee 37830

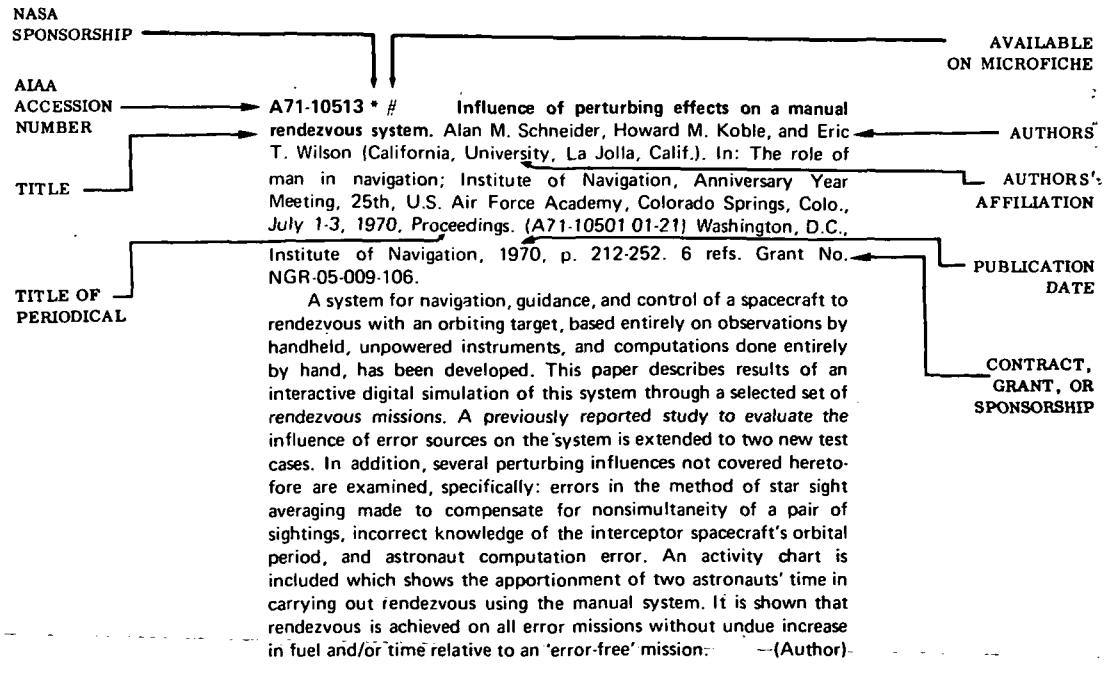
Zentralstelle für Luftfahrtdoku-
mentation und -Information
8 München 86
Postfach 880
Federal Republic of Germany

TABLE OF CONTENTS

TYPICAL CITATION AND ABSTRACT FROM STAR



TYPICAL CITATION AND ABSTRACT FROM IAA



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 96) DECEMBER 1971

IAA ENTRIES

A71-39969 ***Gravity and the organism.*** *Edited by* S. A. Gordon (Argonne National Laboratory, Argonne, Ill.) and M. J. Cohen (Yale University, New Haven, Conn.). Chicago, University of Chicago Press, 1971. 453 p. $14.

Effects of gravitation on the properties and behavior of living matter. Among the topics dealt with are physical and physiological phenomena associated with geotropism; the responses of invertebrates and vertebrates to gravitation; gravimorphism in plants and animals; and the effects on organisms of 'weightlessness,' both simulated and actual. G.R.

A71-39970 **The organism and gravity - An introduction.** Allan H. Brown (Pennsylvania, University, Philadelphia, Pa.). In: *Gravity and the organism.* Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 1-9.

In favorable examples it has been shown that the test organisms sense an accelerating force, loosely called g, as a vector, whether acceleration arises from gravitational, centrifugal, or other inertial forces, separately or in combination. The experimental evidence strongly supports the conclusion that the intensity of g can be the organism's guide to function and to development. A widely distributed ubiquitous g-sensing device of animals is the statocyst. The sensing devices which plants use for gravity perception are not well understood. A number of questions to be investigated by means of biological researches in space are pointed out. G.R.

A71-39971 **The physics of gravity and equilibrium in growing plants.** G. D. Freier and F. J. Anderson (Minnesota, University, Minneapolis, Minn.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 13-23; Discussion, p. 23, 24. 5 refs.

In studying geotropic responses in a satellite experiment attention should be directed toward the forces which normally hold the system in equilibrium, as the gravitational force will change very little from its value at the surface of the earth. The forces which normally produce equilibrium tend to be reduced to zero in satellite motion. Even in the weightless environment of a satellite a finite-sized system will have to sense very small stresses to hold its geometric configuration so that threshold values of stimuli should be considered. In an experiment it was found that plants have a lower limit to their ability to sense gravity. G.R.

A71-39972 **Physical determinants of receptor mechanisms.** Ernest C. Pollard (Pennsylvania State University, University Park, Pa.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 25-31; Discussion, p. 31-34. 6 refs.

It is shown by mathematical analysis that it would be pointless to expect any effect of gravity to introduce perturbations in the action of diffusion unless the cell exceeded about 10 micron in diameter. The theoretical conclusions are confirmed by experiments on bacteria at 50,000 g. Physical considerations regarding a 'gravity receptor' are discussed together with effects of stress on membranes and the influence of gravity on the enzymatic transport. G.R.

A71-39973 **Oscillatory movements in plants under gravitational stimulation.** Anders Johnsson (Lund Institute of Technology, Lund, Sweden). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 35-39. 8 refs.

In living organisms the detectable response to a gravitational stimulation often lags behind the stimulus. This time lag must be introduced into the equations describing gravitational compensating movements in plants. In the sunflower plant, Helianthus, large oscillatory movements occur. These movements can be described satisfactorily by a differential equation. Experimental findings are found to be in good accordance with the theory after a 'memory' function with respect to gravitational stimulation is introduced. G.R.

A71-39974 **Aspects of the geotropic stimulus in plants.** Rainer Hertel (Michigan State University, East Lansing, Mich.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 41-47. 20 refs. AEC Contract No. AT (11-1)-1338.

To discuss the physical forces involved in graviperception, several assumptions about the nature of the sensor are made. Accepting the hypothesis of a cellular statolith particle mechanism, a subdivision of the geostimulation is proposed. A method is described to test correlations between microscopically visible cell particles and the direction of geotropic bending. Within the framework of the starch statolith hypothesis, evidence is presented that the sensor does

not stimulate by mere presence at the lower membrane but by some 'mechanical' action dependent on gravitational force. Features of auxin transport in corn coleoptiles are discussed. G.R.

A71-39975 **Gravity receptors in lower plants.** Andreas Sievers (Bonn, Universität, Bonn, West Germany). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 51-61; Discussion, p. 61-63. 10 refs. Research supported by the Deutsche Forschungsgemeinschaft.

The gravity receptors of lower plants have been analyzed in detail only in two cases involving the sporangiophores of phycomyces and the rhizoids of Chara. The negatively orthogeotropic sporangiophores possess two different kinds of georeceptors. Their specific nature is still unknown. The rhizoids of Chara foetida are positively orthogeotropic. In their tips they contain statoliths whose chemical composition deviates from normal cell particles. In the Chara rhizoid the Golgi apparatus and the statoliths function as a self-regulating cell system. G.R.

A71-39976 **Gravity receptors in phycomyces.** David S. Dennison (Dartmouth College, Hanover, N.H.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 65-71; Discussion, p. 71, 72. NSF Grants No. G-8719; No. G-18889.

The sporangiophore responds to gravity in two distinct ways. In the transient response, the physical distortion of the cell causes a brief but rapid bending in the opposite direction. In the long-term response, some intracellular mechanism, not related to mechanical distortion of the cell surface, responds to lateral acceleration and triggers a steady but slow bending that continues until the cell axis is lined up with the resultant acceleration vector. The cell surface distortion could be largely removed in experiments in which the sporangiophores were centrifuged while immersed in a fluid whose density is equal to that of the sporangium. G.R.

A71-39977 **The susception of gravity by higher plants.** Poul Larsen (Bergen, Universitetet, Bergen, Norway). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 73-87; Discussion, p. 102-104. 37 refs.

On the basis of their behavior in geotropically sensitive organs it appears that the movable amyloplasts in certain cells are the particles whose interaction with gravity initiates the geotropic reaction chain. Experiments conducted with Lepidium roots furnish strong support for the starch statolith hypothesis. Most of the existing evidence can be reconciled with the view that amyloplasts function as statoliths. The susception of gravity, however, can evidently also take place in the absence of statolith starch, at least in certain organs as shown by the results of Pickard and Thimann (1966) on wheat coleoptiles. Starch-free, but still elongating, Lepidium roots, on the other hand, did not respond even to several hours of gravitational stimulation. G.R.

A71-39978 **The susception of gravity by higher plants - Analysis of geotonic data for theories of georeception.** Barbara Gillespie Pickard (Washington University, St. Louis, Mo.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 89-96; Discussion, p. 102-104. 14 refs. PHS Grant No. ES-00139.

Current evidence suggests that different georeceptive tissues may transduce acceleration in different ways. Based on starch depletion, a strong case can be made in favor of the function of amyloplasts as statoliths in the roots of Lepidium. It is pointed out that, nevertheless, the kinetics of the Lepidium root response can probably be explained without reference to statolith behavior, though they seem also to be compatible with it. Current kinetic evidence must thus be viewed as contributing a great deal to the knowledge of geotropism without providing proof for a functional role for statoliths in roots. G.R.

A71-39979 **A case against statoliths.** Arthur H. Westing (Windham College, Putney, Vt.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 97-101; Discussion, p. 102-104. 39 refs.

Some objections are raised regarding conclusions drawn by Larsen (1962, 1965) that his research findings support a statolith theory of gravitational perception. It is pointed out that of the various cell organelles and inclusions only starch grains (or amyloplasts) seem capable of serving the statolithic function. A list of cases is presented in which plant organs perceive gravity apparently without the benefit of mobile starch. Certain additional lines of evidence that speak against statoliths are also mentioned. The question is raised of whether it is likely that more than one means of gravitational perception exists within a single plant. G.R.

A71-39980 **Hormone movement in geotropism.** Malcolm B. Wilkins (East Anglia, University, Norwich, England). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 107-124; Discussion, p. 124-126. 67 refs. Agricultural Research Council of England Grant No. 83/6.

The relationship between auxin transport and the geotropic response of roots and shoots is analyzed on the basis of a broad review of theoretical and experimental results. Geotropic responses are examined in three broad mechanistic categories, depending on whether curvature is brought about by the development of different rates of growth of the upper and lower halves of an organ which is already growing by irreversible expansion of cells in its subapical region (root and shoot); or by initiation of growth on one side of an essentially nongrowing region of an organ (glass node); or by differential increase in turgidity of cells in the upper and lower halves of an organ which is nongrowing and has no potential for further growth (pulvinus of Phaseolus). V.P.

A71-39981 **On hormone movement in geotropism.** Henry Rufelt (Uppsala, Universitet, Uppsala, Sweden). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 127-129; Discussion, p. 130. 7 refs.

The notions that the Cholodny-Went theory, which implies a supraoptimal content of auxin in roots, is not valid, and that indoleacetic acid is not the growth regulator functioning in roots, are critically examined. Experimental evidence obtained with wheat roots is presented to support the concept of a supraoptimal auxin content as well as the presence of indoleacetic acid in roots. V.P.

A71-39982 **Hormone movement in geotropism - Additional aspects.** A. C. Leopold and R. K. de la Fuente (Purdue University, West Lafayette, Ind.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 131-133; Discussion, p. 134, 135. 8 refs.

It is shown that the classical type of explanation of geotropic curvature may well occur in many cases, and that lateral auxin distribution may occur through the gravity alteration of lateral auxin

transport. On the other hand, there exist several alternatives for geotropic mechanisms, including redistribution of auxin following alterations in the polar transport system and involving other growth substances, such as ethylene, or even by qualitative changes which do not require differential cell enlargement on one side of the stem. V.P.

A71-39983 **Linkage between detection and the mechanisms establishing differential growth factor concentrations.** L. J. Audus (Bedford College, London, England). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 137-149; Discussion, p. 149, 150. 33 refs.

In view of the diversity of structure in organs which detect and respond to gravity, the probability that different linkage mechanisms may operate for different organs is considered. In the root, it may be accepted as reasonably certain that amyloplast statoliths in the root cap are the gravity sensors. Evidence is presented to support the theory that the lateral redistribution of these amyloplasts sedimenting under gravity, coupled with an intrinsic radial polarity of some ultrastructural/biochemical organization of the root cap cells, causes the differential production of a 'message' from the upper and lower halves of the root cap. The message, which may be electrical or hormonal in nature, could induce the production of a greater amount of a growth inhibitor in the lower tissues of the growth zone, thus causing positive geotropic response. The coupling mechanism between gravity sensing and hormone distribution in the tip is likely to be induction of a lateral polarity in the statocyte cells themselves, resulting in a lateral transport of auxin and a differential release into the growth zone. Auxin redistribution seems to result from both a lateral movement and an augmented longitudinal transport on the lower side. Here, the linkage mechanism will depend strongly on what the gravity sensor proves to be in those organs. V.P.

A71-39984 **Bioelectric phenomena in graviperception.** C. H. Hertz (Lund Institute of Technology, Lund, Sweden). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 151-156; Discussion, p. 156-158. 31 refs.

The older theories on the origin of the geoelectric effect (GEE) are reviewed, and its role in the geotropic reaction of plants is considered. It has long been known that an electrical potential develops across a plant shoot which is placed horizontally. Since the validity of the older theories was questioned by many physiologists, the GEE has been investigated in detail during the last few years. New measuring techniques have been developed without the drawbacks of earlier methods. With these techniques it was found that theories of the generation of the GEE and its role in the geotropic reaction chain were incorrect, and that the GEE was not a primary result of the action of gravity on the plant. Instead, it derives from the asymmetric distribution of plant hormone which takes place as a consequence of the effect of gravity on the plant. The precise reactions leading the GEE are not yet known. M.V.E.

A71-39986 **Geotropic curvature of Avena coleoptiles as affected by exogeneous auxins.** A. R. Schrank (Texas, University, Austin, Tex.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 163-165. 8 refs. NSF Grant No. GB-5683.

Data are presented that reveal some of the effects of externally applied indole-3-acetic acid (IAA) on elongation and geotropic bending of Avena coleoptiles which relate to auxin-induced electrical responses. The data presented suggest that, contrary to the belief held by some researchers that the action of auxin elicits a geoelectric effect, it is somewhat premature to relate auxin-induced electrical responses to the geoelectric effect. M.V.E.

A71-39987 **Stabilizing mechanisms in insect flight.** Donald M. Wilson (Stanford University, Stanford, Calif.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 169-175; Discussion, p. 175, 176. 22 refs. NIH Grant No. NB-07631; Grant No. AF AFOSR 1246-67.

Some of the known reflex mechanisms by which insects maintain stable flight are discussed, and an explanation of how these reflexes interact with the preprogrammed flight command is attempted. The most nearly pure gravity receptor organs in insects are shown to be the neck proprioceptors involved in the optomotor reaction that corrects both yawing and rolling errors and probably helps to control pitch, too. Other discussed flight orientation organs include wind-sensing hairs, companiform sensillae, and halteres. All of these organs are believed to interact with a central nervous program both by contributing to its overall state of excitation and by modulating details of its output pattern when such modulation is necessitated by organismal or environmental irregularities. M.V.E.

A71-39988 **Flying insects and gravity.** Torkel Weis-Fogh (Cambridge University, Cambridge, England). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 177-183; Discussion, p. 183, 184. 16 refs.

The effect of gravity on flying animals is considered, and their gravity and lift perception is examined. Except for very small insects, flying animals make use of ordinary airfoil action and are constructed so that the aerodynamic cross forces balance the pull of gravity. When the pull of gravity is compensated for, the animal is accelerated in a direction perpendicular to its normal path, the adjustment of the angles of attack may then seem upset and the wings unusable as airfoils. Effective aerial locomotion in the 'weightless' state would require a symmetrical construction which resembles a fish more than a winged animal. Some unpublished experiments have shown that the detection of lift in flying desert locusts seems to depend on a forward movement of the hindwings during the first two-thirds of the downstroke. In contrast to the movement of the forewings, this forward movement is a passive consequence of the aerodynamic lifting force, making it possible for the insect to differentiate between wind and mass forces. M.V.E.

A71-39989 **Proprioceptive gravity perception in hymenoptera.** Hubert Markl (Darmstadt, Technische Hochschule, Darmstadt, West Germany). In: Gravity and the organism. 39969 21-04) Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 185-194. 32 refs.

Proprioceptive hair plates on several joints are shown to act as gravity receptors in ants and bees. The experimentally determined relative importance of different joints for graviception is found to be correlated with the development of hair plates at the respective joints. Owing to gravity, the positions of an ant's body are altered relative to each other when the animal's position in space is changed. Although these deflections are large enough to be measured, they are still kept under feedback control by the ant. Ants and bees can be trained to run a constant-angle course with regard to gravity and thus to find their way in the dark on a vertical or inclined surface. M.V.E.

A71-39990 **Gravity orientation in insects - The role of different mechanoreceptors.** Gernot Wendler (Max-Planck-Institut für Verhaltensphysiologie, Seewiesen, West Germany). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 195-199; Discussion, p. 199-201. 13 refs.

Two alternative interpretations, differing in the signal used for gravity orientation, are proposed to explain the observation that the elimination of proprioceptive hair plates in several joints of bees and ants reduces their gravity orientation capability. In view of their connection through a feedback loop, both hair plates and strain receptors are accepted as possible gravity receptors. The experiments with stick insects show that the linear component of the body pressure on the legs is an adequate stimulus for gravity receptors in the legs. V.Z.

A71-39991 Primitive examples of gravity receptors and their evolution. G. A. Horridge (St. Andrews University, St. Andrews, Scotland). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 203-219; Discussion, p. 219-221. 18 refs.

Discussion of gravity receptor evolution in invertebrates with special attention to the role of cilia in gravity reception and transduction into responses. It is shown that motile cilia are mechanically sensitive and that many lower animals have specialized nonmotile cilia on mechanoreceptor cells which may act as underwater vibration receptors. In all cases accessible to studies the mechanical sensitivity of the sensory cilium was directed at right angles to the line joining the central pair of fibrils. It was also found that the rootlets, ciliary shafts and stereocilia were not essential in mechanical transduction. V.Z.

A71-39992 Gravity receptors and gravity orientation in Crustacea. Hermann Schöne (Max-Planck-Institut für Verhaltensphysiologie, Seewiesen, West Germany). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 223-235; Discussion, p. 247-250. 16 refs.

The relations between the statocyst function and the motor activity of Crustacea are discussed at various levels of complexity, covering basic anatomy of the statocyst and the mechanism of stimulation, statocyst input and compensatory eye movements, integration of the statocyst and proprioceptor information, and locomotion orientation of intact animals with respect to the gravitational field. Sensory hairs are found to be stimulated when they are bent by the shear component of statolith weight. Electrophysiological tests indicate that the conversion of a mechanical input *into nervous activity in the receptor system is linear* and that the equilibrium reactions and the compensatory eye movements depend on the statocyst input. Spiny lobsters are used to study the compensatory eye movements during the interaction between the statocyst and a proprioceptor. It is also found that orientation in shrimps under various g is controlled by a feedback loop in which the statocysts are the recording devices. V.Z.

A71-39993 The integrative action of the nervous system in crustacean equilibrium reactions. William J. Davis (Oregon, University, Eugene, Ore.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 237-247; Discussion, p. 247-250. 21 refs. PHS Grants No. 5 RO1 NB 01624; No. NS-09050.

The integrative role of the central nervous system of Homarus americanus in converting the gravity sensation into equilibrium reactions is discussed on the basis of published studies. Covered among the reactions are compensatory responses by which the animal adapts to tilted positions and righting responses seeking to restore the upright position. Details are given on the righting responses of abdominal swimmerets and uropods which are controlled exclusively by statocyst receptors. It is indicated that either the right or the left statocyst can alone control the righting responses of the appendages of both sides, even though the afferent responses of the two statocysts to roll in one direction are opposite. Neutral models based on the bilaterally reciprocal organization of statocyst influences are proposed to account for these findings. It is contended that these results may be applicable to higher animals. V.Z.

A71-39994 Functional anatomy of the vertebrate gravity receptor system. O. Lowenstein (Birmingham, University, Birmingham, England). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 253-261. 22 refs.

Discussion of the otolith function in spatial orientation in the light of various studies and theories. The anatomy of the otolith organs and sensory cells and the hair cell topography and function in the elasmobranch labyrinth are considered. Details are given on work by the author et al. (1968) on the labyrinth of lamprey Lampetra fluviatilis. It is concluded that the otolith organs of the vertebrate labyrinth respond to linear accelerations in general and, consequently, may be viewed as potential gravity receptors. They may also respond to linear translation, centrifugal stimuli, and rotating linear vectors at constant speed as well as to linear oscillatory accelerations in the form of vibrational and acoustic stimulation. V.Z.

A71-39995 The gravity sensing mechanism of the inner ear. Torquato Gualtierotti (Milano, Università, Milan, Italy). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 263-281; Discussion, p. 281. 64 refs.

Discussion of the existence of true statoceptors in the vestibule. *The main index for receptors responding to gravity is indicated as* lack of accommodation of the evoked activity, or at least as the presence of only a partial accommodation over an indefinite period of time of constant linear acceleration. Various observations show that true statoceptors are found in the vestibule according to the accommodation standard. The basic characteristics of the statoceptors do not seem to vary significantly in mammals in comparison with lower vertebrates. The sensory coding by which the statoceptors send information to the primary analyzers is also discussed. The origin of the randomness of firing is classified as due to two factors, one intrinsic to the cell, and one extrinsic. It is pointed out that one of the most important extrinsic factors is the vibration of the head following the heart beat (head ballistocardiogram). M.M.

A71-39996 Semicircular canal and otolithic organ function in free-swimming fish. Howard C. Howland (Cornell University, Ithaca, N.Y.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 283-291. 13 refs. Grant No. AF EOAR 64-44.

Discussion of four different types of fish angular orientation behavior: the dorsal light reaction, the gravity reaction, the maintenance of an internally commanded position, and the semiconductor canal reaction. It is shown how these behaviors may be plausibly, but not unambiguously, interpreted in terms of their underlying sensory structures. Mittelstaedt's bicompetent theory is criticized, and the search for alternative models and new tests for that theory are advocated. It is stressed that the experiments made reflect an attempt to establish the semicircular canal response alongside the gravity response as an essential feedback loop in the orientation of fish. M.M.

A71-39997 * Central nervous responses to gravitational stimuli. W. R. Adey (California, University, Los Angeles, Calif.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 293-310. 51 refs. NIH Grants No. NB-01883; No. NB-2503; Contracts No. AF 49(638)-1387; No. Nonr-233(91); Grants No. NsG-237-62; No. NsG-502; No. NsG-505; No. NsG-1970.

Discussion of an additional uncertain area of sensitivity in central nervous tissue involving the possibility of a direct sensing of certain accelerational stimuli when these have a vibratory character. It is pointed out that orientation in the weightless state requires consideration not merely of vestibular mechanisms and closely related ocular coordination but of the whole hierarchy of functions in focusing of attention and visual discrimination. The former constitute the basic platform in a pyramid of increasingly complex central integration. The latter involve the interplay between cortical

sensory systems and subcortical structures that are profoundly influenced by limbic activity. Limbic controls, particularly in the hippocampal system, appear essential to the fine focusing of attention necessary for laying down memory traces about spatially organized stimuli. Interference with such controls leads to degradation of spatial discriminative abilities in subtle but important ways that have particular relevance to problems of space flight, where gravitational cues no longer provide a key segment of environmental information and where compensatory mechanisms for this loss might evolve in prolonged space flight. M.M.

A71-39998 Vestibular influences on the brain stem. Hiroshi Shimazu (Tokyo, University, Tokyo, Japan). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 311-313. 10 refs.

Discussion concerning the function of the vestibular apparatus and related neuronal activities in the central nervous system. The influence of the vestibular apparatus on the core of the brain, such as the reticular formation, is considered, and certain findings concerning the possibility of vestibular inhibition of brainstem activities are evaluated, showing that a postsynaptic commissural inhibition may act as a compensatory mechanism for vestibular-induced oculomotor or postural adjustment. It is also shown that, together with the vestibular influences on the somatic activity in the brainstem, inhibitory and excitatory effects on the autonomic functions mediated through the medulla may occur. A.B.K.

A71-39999 Gravimorphism in higher plants. Leszek S. Jankiewicz (Instytut Sadownictwa, Skierniewice, Poland). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 317-331. 90 refs.

Description of research on the influence of gravity on linear growth, lateral bud and shoot development, apical dominance, the initiation of flower buds, orientation of plant organs, and flower morphology. Some of the generalizations made are: (1) unramified shoots, coleoptiles, or roots inclined from the vertical toward the horizontal grow at a slower rate; (2) buds on a horizontally oriented shoot develop asymmetrically. Those located on the upper side form vigorous laterals, whereas those on the underside form only short shoots or do not develop at all; (3) apical dominance depends on a position of a shoot in relation to gravity; (4) fruit bud-set is often enhanced by inclination of a tree or branch toward the horizontal position; (5) there is a direct effect of gravity on the initiation of flower bud formation; and (6) the form (habit) of a plant depends on the orientation of its parts in relation to gravity. M.M.

A71-40000 Geoepinasty, an example of gravimorphism. Harald Kaldewey (Saarland, Universität, Saarbrücken, West Germany). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 333-339. 15 refs.

Analysis of the geoepinastic bending of Fritillaria axes as a prototype of geoinduced plagiotropic growth, since plagiogeotropism appears to be a characteristic example of gravimorphism. Within the curved region of the axis a straightening zone is found below a zone of bending. Both of these zones move acropetally, along with the acropetal displacement of the zone of main elongation, during the development of the axis. The gravimorphotic process should be distinguished from the negative geotropic reaction induced by a brief geostimulation, which appears in a region below the curved part of the axis in older but still elongating cells. F.R.L.

A71-40001 * Plant responses to chronic acceleration. Stephen W. Gray and Betty F. Edwards (Emory University, Atlanta, Ga.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 341-366; Discussion, p. 367-369. 49 refs. Research supported by the Carnegie Foundation and NIH; Grants No. NsG-521; No. NsG-529.

Investigation of wheat seedling responses to chronic acceleration between 1 and 500 times gravity and of the factors which influence these responses. Chronic acceleration between 10 and 500 g produces effects on wheat seedlings grown in the dark at 25 plus or minus 1 C, such as: (1) the total height attained by the coleoptile in the four days of its development decreases proportionally to the accelerative force employed; (2) with higher accelerative force, the coleoptile diameter increases and the cross section becomes more circular; (3) as the accelerative force increases, total root length decreases both absolutely and relatively in relation to coleoptile height; (4) the work done by the seedling in erecting its shoot increases proportionally to the increased accelerative force up to about 100 g, beyond which the work increases but is no longer compensatory; (5) continuous accelerative forces retard growth more effectively at the temperature optimal for gravity than at lower temperatures; and (6) continuous accelerative force of 150 g following single-dose X-radiation reduces the sensitivity of seedlings to growth retardation produced by the radiation. M.M.

A71-40002 * Chronic acceleration of animals. A. H. Smith and R. R. Burton (California. University, Davis, Calif.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 371-378; Discussion, p. 388. 48 refs. Contract No. NR-102-448; Grant No. NGR-05-004-008.

Discussion of the effects and significance of chronic accelerative forces on terrestrial animals. The following findings are pointed out: (1) over the range of observations, changes induced by chronic acceleration are covariant with, and appear to be dependent on, the intensity of the ambient accelerative force; (2) there are relatively little pertinent data for hypo- and hyperdynamic environments; (3) if the relationships developed at normal gravity and in greater, tolerable fields do not apply in the region from 0 to 1 g, there must be different and discontinuous (nonlinear) regulatory processes for accelerative forces above and below earth gravity; and (4) whether or not the chronic acceleration 'predictions' of weightlessness effects describe the real situation, they are useful. They provide a logical basis for designing satellite experiments with organisms which reflexively would substantiate or disprove the continuity of hypo- and hyperdynamic effects. M.M.

A71-40003 * The effects of chronic acceleration of animals - A commentary. C. C. Wunder (Iowa, University, Iowa City, Iowa). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 389-410; Discussion, p. 410, 411. 48 refs. Research supported by the University of Iowa, the American Cancer Society, NIH, and NASA.

Chronic centrifugation is a new area of investigation confined to a relatively few laboratories working with several different species of animals. Studies at the University of Iowa have established that such g fields: (1) influence the growth rate of animals, progressively decreasing the rate at sufficiently high fields but sometimes stimulating growth at moderate intensities in a manner dependent on temperature and size but largely independent of the nongravitational artifacts of centrifugation; (2) can sometimes provoke a temporary reduction in food intake, which is a partial cause of the initial decrement in growth observed with mammals; (3) results in eventual adjustments, which can include enhanced caloric intake, increased efficiency of oxygen metabolism, relatively larger supporting bones and muscles, enhanced circulatory pressure reflexes, together with altered circulatory resistance and altered fluid balance; and (4) influence life expectancy in a manner dependent on field strength. M.M.

A71-40004 * Simulated weightlessness studies by compensation. S. A. Gordon and J. Shen-Miller (Argonne National Laboratory, Argonne, Ill.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 415-424; Discussion, p. 424-426. 28 refs. NASA-NSF-supported research.

Examination of the properties of plants subjected to continuous reorientation of field direction by clinostat, with discussion of two of the areas investigated: the effects of gravity compensation on tropism and the forces required for geotropic response. It was found that oat seedlings can perceive accelerations of the order of one ten-thousandth that of gravity, which indicates that any postulate as to the identity of the sensor must be compatible with sensitivities of this order. It may be inferred that the displacements induced in the geosensor by unidirectional continuous accelerations of such minute magnitude are not nullified by thermal motion or by protoplasmic movements such as streaming or localized sol-gel transitions. F.R.L.

A71-40005 * Growth responses of plants to gravity. Charles J. Lyon (Dartmouth College, Hanover, N.H.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 427-437; Discussion, p. 437. 9 refs. NASA-supported research.

The horizontal clinostat was used in studies of auxin transport and distribution for the purpose of gaining information on the evolutionary mechanisms by which the typical terrestrial plant grew tall and spread its foliage for efficient capture of radiation. Clinostat speed was kept low enough to avoid the introduction of stress and vibrational factors. The reduction of basipetal transport reported by Shen-Miller and Gordon for coleoptiles is in agreement with the stunning effect on internodal length that appears when plants are made to grow for weeks without the additive effect of gravity on such transport. Gravity is found to equalize the downward movement of auxin in the stems of plants which are held erect by negative geotropism that depends on a lateral, downward transport of auxin. T.M.

A71-40006 Effect of net zero gravity on the circadian leaf movements of pinto beans. Takashi Hoshizaki (California, University, Los Angeles, Calif.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 439-442; Discussion, p. 442.

Experimental research on the effects of simulated weightlessness on the circadian rhythms of leaf movements in pinto beans shows that the time at which the rotational treatment is started (in relation to the phase of the circadian rhythm) has a profound effect on leaf movements. Initiation of the simulated weightless environment during one phase of the rhythm has little effect on the leaf movements. If simulated weightlessness is initiated in another phase, the leaf movements cease; they do not resume until two or three days have passed. The results have significance for the performance and analysis of biological experiments in space. T.M.

A71-40007 * The experiments of Biosatellite II. J. F. Saunders, O. E. Reynolds (NASA, Office of Space Science and Applications, Washington, D.C.), and F. J. deSerres (Oak Ridge National Laboratory, Oak Ridge, Tenn.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 443-450. 30 refs. NASA-AEC-sponsored research.

Thirteen experiments performed on board Biosatellite II were designed to study (1) the influence of weightlessness on various biological processes and (2) the interaction of weightlessness with radiation produced by an on-board strontium-85 gamma ray source. Additional post-flight tests were performed to distinguish the effects of gravity from other flight factors. Findings which are considered to be indicative of weightlessness effects include abnormal chromosome translocations in larvae, death of Tradescantia microspores, and cellular changes in wheat seedlings. T.M.

A71-40008 Responses to gravity in plants - A summary. A. W. Galston (Yale University, New Haven, Conn.). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 453-467. 23 refs. Research supported by the Whitehall Foundation and NSF.

The varied responses of plant organs to the gravitational stimulus are examined from the viewpoint of the main functions and strategy of the higher green plant, and the patterns of response are discussed for specific ontogenetic stages. The geotropic response is broken down into components of sensing, transduction, amplification, and growth regulation. Experimental results obtained in an analysis of the movement of pea tendrils in response to mechanical stimulation are described, and a hypothesis of tendril movement is related to geotropism. T.M.

A71-40009 Gravity and the animal - A summary. O. Lowenstein (Birmingham, University, Birmingham, England). In: Gravity and the organism. Edited by S. A. Gordon and M. J. Cohen. Chicago, University of Chicago Press, 1971, p. 469-471.

Discussion of current trends in the study of mechanisms responsible for gravity perception in animals. The advisability of considering animal phenomena in terms of only molecular mechanisms is debated, and recent results on gravity sensor cells and intracellular conduction mechanisms are reviewed. Contradictory hypotheses about the function and construction of the hair cell in the labyrinth are delineated. T.M.

A71-40073 # A fifth modality of taste. H. T. Andersen and Å. O. Hartmann (Oslo, University, Oslo, Norway). *Acta Physiologica Scandinavica*, vol. 82, Aug. 1971, p. 447-452. 13 refs.

The possibility is investigated of identifying specific taste modalities - e.g., the four basic modalities of bitter, salty, sour, and sweet - by applying a factor analysis technique to a suitable set of data. The technique is based on a correlation matrix between independent stimuli calculated from data recorded from chorda timpani single fibers in rats and on the assumption that specific taste sensation may be explained by an 'across-fiber pattern' input into gustatory primary afferents. The analysis procedure used strongly supports the idea that there are specific and independent taste modalities. M.V.E.

A71-40098 Expiratory pO2 and pCO2 curves during breathing of gas mixtures of N2-O2, He-O2, and Ar-O2 (Exspiratorische pO2- und pCO2-Kurven bei Atmung von N2-, He- und Ar-O2-Gemischen). W. Liese, U. Smidt, P. Lotz, and K. Muysers (Bonn, Universität, Bonn; Krankenhaus Bethanien, Moers, West Germany). *Pflügers Archiv*, vol. 328, no. 1, 1971, p. 72-83. 16 refs. In German. Research supported by the Europäische Gemeinschaft für Kohle und Stahl.

To investigate intrapulmonary gas mixing, the expiratory pO2 and pCO2 curves have been followed simultaneously and continuously by mass spectrometry in 10 subjects. The curves were plotted against tidal volume during breathing of the following gas mixtures: 79%N-21%O2, 79%He-21%O2, and 79%Ar-21%O2. The results indicate that the differences in the volume of gas expired for a given change in partial pressure may be attributed to variations in diffusion and convection in the central parts of the lung, whereas the differences in the alveolar plateaus of the partial pressure curves can be explained by diffusion in the peripheral parts of the lung and by the shape of the dissociation curves of O2 and CO2. M.V.E.

A71-40099 The significance of alpha-glycerophosphate and 2,3-diphosphoglycerate in human extraocular muscle metabolism (Die Bedeutung von alpha-Glycerophosphat und 2,3-Diphosphoglycerat im Augenmuskelstoffwechsel des Menschen). G. Partsch, H. Altmann (Reaktorzentrum, Seibersdorf, Austria), and H. Aichmair (Wien, Universität, Vienna, Austria). *Pflügers Archiv,* vol. 328, no. 1, 1971, p. 84-90. 12 refs. In German.

A neosynthesis of alpha-glycerophosphate and 2,3-diphosphoglycerate was found in a human extraocular muscle. The mechanism of action of these substances as regulators of muscular metabolism is discussed. While with alpha-glycerophosphate no differences were found in the neosynthesis of muscles of patients with normal muscular equilibrium, a significant increase in 2,3-diphosphoglycerate radioactivity was observable in the extraocular muscle of squinting persons. A possible connection between ATPase deficiency and a stimulated 2,3-diphosphoglycerate synthesis is shown. M.V.E.

A71-40136 Computer-generated displays for psychological research. V. D. Hopkin and J. F. Parsons (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: Displays; Institution of Electrical Engineers, Conference, Loughborough University of Technology, Loughborough, Leics., England, September 7-10, 1971, Proceedings London, Institution of Electrical Engineers (IEE Conference Publication No. 80), 1971, p. 331-338.

The type-338 programmed buffered display consists of an 8K PDP8 computer and a display subsystem controlling a 16-in. diameter CRT. The display can provide almost any combination of points, lines, or symbols, with control of intensity and scale. The picture can be static, moving, or steerable in the sense that the entire display area can appear to be steered over a larger potential display area. Lightpen and keyboard controls are provided, and joystick and rolling ball controls can be adapted. The operation of the system is explained for psychological experiments involving interception tasks, tracking tasks, steering exercises, climbing arrows tasks, and memory and calculation tasks. T.M.

A71-40145 How does the nervous system function (Comment fonctionne le système nerveux). Jacques Taxi. *La Recherche,* vol. 2, Jan. 1971, p. 41-58. 8 refs. In French.

Study of the structure of the nerve cell (the neuron) and the electrical phenomena of which it is the seat. Much knowledge has been gained by electronic microscopy and refinements of electrophysiology. Biochemical analytical methods have penetrated to the heart of the most complex molecular mechanisms. The simultaneous use of these three approaches has made it possible better to understand the transmission of nervous influx, a functional characteristic of the nervous system. This phenomenon sets chemical substances in play, the study of which has opened a new chapter of pharmacology. F.R.L.

A71-40147 The human body and vibrations (Le corps humain et les vibrations). Alain Berthoz. *La Recherche,* vol. 2, Feb. 1971, p. 121-129. 5 refs. In French.

The results of neurophysiological studies of the effects of vibration on the human body are briefly reviewed, along with the status of attempts to determine safe limits of human exposure to vibration, to formulate specific preventive or prophylactic measures, and to devise therapeutic applications of vibrations. The vestibular origin of motion sickness is discussed, and some of the techniques are outlined that make it possible to determine the threshold of vestibular effects induced by low-frequency oscillations. Following an explanation of the worst deleterious biomechanical effects produced by oscillations close to frequencies of 4 or 5 Hz, muscular responses to vibrations are considered, and human safety requirements are examined. In conclusion, the perception of high-frequency vibrations and the possibilities of therapeutic vibration utilization are discussed. M.V.E.

A71-40149 Chronobiology (La chronobiologie). Alain Reinberg. *La Recherche,* vol. 2, Mar. 1971, p. 242-250. In French.

Demonstration of the purposes and techniques of chronobiology, revealing certain interesting possibilities resulting from its application. Chronobiology is defined as a scientific discipline having as its purpose the study of the time structure of organisms. The possibility of obtaining approximate values of various parameters of a rhythmic or cyclic variation is demonstrated. The determination of the spectra of biological rhythms and the classification of the rhythms into frequency groups are discussed. It is shown that biological rhythms are a part of the genetic patrimony, but can be affected by certain periodic variations of the ambient medium. Desynchronization effects due to transmeriodional flights are investigated, noting some findings concerning the time required to reestablish certain circadian rhythms. The relation between the effects of medicines and the time at which they are administered is explored, and the possibility of altering the time structure of the organism is considered. A.B.K.

A71-40174 * Effect of prefrontal lesions on trained anticipatory visual attending in cats. M. Schlag-Rey and D. B. Lindsley (California, University, Los Angeles, Calif.). *Physiology and Behavior,* vol. 5, 1970, p. 1033-1041. 23 refs. PHS Grant No. NB-8552; Contract No. N 00014-69-19-0200; Grant No. NGL-05-007-049.

Five cats were trained to look at a left and at a right target on alternate trials and, while looking, to keep fixating the correct target for a criterion duration necessary to receive a visual stimulus, signalling a milk reward. Four cats showed a clear performance deficit in this task, after bilateral removal of the anterior sigmoid and dorsal proreus gyri. The fifth cat, although temporarily impaired following a similar unilateral lesion, did not show any deficit after a second contralateral lesion, more laterally placed in the frontal pole. A quantitative analysis of various biases underlying overt responses showed that the cats were impaired on specific dimensions of oculomotor responses. These results agree with recent stimulation studies localizing a frontal eyefield in the cat and support the hypothesis that in carnivores, as well as in primates, the frontal eyefields control voluntary eye movements. Some performance deficits in tasks requiring use of directional cues and selective attention, observed in carnivores following frontal lobe lesion, may be due to invasion of such frontal eyefields. (Author)

A71-40176 The corneo-retinal potential as the generator of alpha rhythm in the human electroencephalogram. Jean A. Ennever, O. C. J. Lippold, and G. E. K. Novotny (University College, London; Graylingwell Hospital, Chichester, Sussex, England). *Acta Psychologica,* vol. 35, Aug. 1971, p. 269-285. 15 refs. Research supported by the Medical Research Council.

The amplitude of the waves of the occipital alpha-rhythm is significantly related to the value of the corneo-retinal potential. If the latter is zero, alpha rhythm is absent. The corneo-retinal potential can be experimentally changed by a factor of about three in each eye independently. Simultaneous recording, on the two sides of the occiput, of alpha waves, shows that their amplitude is directly proportional to the value of the corneo-retinal potential from the eye on the same side. This finding rules out the possibility that nervous connections from the retina are responsible for the concordance, since optic nerve fibers are distributed equally to both hemispheres. A new theory to account for alpha rhythm is proposed on the basis of this and other evidence. It is postulated that the source of alpha waves is the corneo-retinal potential, which is modulated at 10 Hz by tremor in the extraocular muscles. As a result of the anatomical arrangements of these muscles in the orbit, the 10 Hz waves are picked up mainly over the occipital regions. (Author)

A71-40177 Psychophysiological reactions to understimulation and overstimulation. Marianne Frankenhaeuser, Bo Nordheden,

Anna-Lisa Myrsten, and Birgitta Post (Stockholm, Universitet, Stockholm, Sweden). *Acta Psychologica,* vol. 35, Aug. 1971, p. 298-308. 9 refs. Research supported by the Bank of Sweden Tercentenary Fund, the Swedish Medical Research Council, and the Swedish Council for Social Science Research.

Catecholamine output, heart rate, and performance efficiency were examined in 28 Ss during two contrasting stimulus conditions, one of understimulation, and one of overstimulation. During understimulation the subject spent 3 hr performing a vigilance task, and during overstimulation he was exposed for the same time period to a complex sensorimotor test. Both understimulation and overstimulation produced a significant increase of adrenaline and noradrenaline release as compared with a control condition involving a medium amount of stimulation. Subjects who excreted relatively more adrenaline performed significantly better during understimulation, whereas subjects with relatively lower excretion rates of adrenaline tended to perform better under overstimulation. When performance efficiency was related to heart rate it was shown that high-heart rate subjects performed better during understimulation, while low-heart rate subjects performed better during overstimulation. (Author)

A71-40184 A miniature transmitter suitable for telemetry of a wide range of biopotentials. M. W. Brown, G. M. Edge, and G. Horn (Cambridge University, Cambridge, England). *Electroencephalography and Clinical Neurophysiology,* vol. 31, Sept. 1971, p. 274-276. Research supported by the Science Research Council and the Medical Research Council.

A simple, compact and inexpensive biopotential transmitter suitable for telemetry is described. The transmitter has a low noise figure, a wide frequency response, a weight of 5 g and operability over a very wide range of electrode impedances. The circuit and performance characteristics, and representative EEG and single unit potential recordings obtained with the transmitter are given. V.Z.

A71-40185 Arterial pressure changes during spontaneous sleep in man. G. Coccagna, M. Mantovani, F. Brignani, A. Manzini, and E. Lugaresi (Bologna, Università, Bologna, Italy). *Electroencephalography and Clinical Neurophysiology,* vol. 31, Sept. 1971, p. 277-281. 9 refs. Consiglio Nazionale delle Ricerche Grant No. 69.02078-115.0817.

An R 35F Galileo polyphysiograph with a catheter was used for continuous measurement of blood pressure in the brachial artery during spontaneous night sleep in 8 normotensive subjects 38 to 68 years old. EEGs, horizontal eye movements, electromyograms, EKGs, pneumograms, cardiotachograms, and digital photoplethysmograms were also recorded simultaneously. The arterial pressure was lower during the first period of sleep, increased gradually during the later hours and tended to be slightly higher during rapid eye motions. V.Z.

A71-40213 * Bicarbonate requirement for elimination of the lag period of Hydrogenomonas eutropha. Roy Repaske, Carol A. Ambrose, Anne C. Repaske, and Margaret L. De Lacy (National Institutes of Health, National Institute of Allergy and Infectious Diseases, Bethesda, Md.; Catholic University of America, Washington, D.C.). *Journal of Bacteriology,* vol. 107, Sept. 1971, p. 712-717. 11 refs. NASA Contract No. R-21-081-001; Grant No. NGR-09-005-022.

Study of the effect of carbon dioxide and oxygen on the lag period of chemoautotrophically grown Hydrogenomonas eutropha. Minimum lag periods and high growth rates were obtained in shaken flask cultures with a prepared gas mixture containing 70% H2, 20% O2, and 10% CO2. However, excessively long lag periods resulted when the same gas mixture was sparged through the culture. The lag period was shortened in sparged cultures by decreasing both the O2 and CO2 partial pressures, indicating that gas medium equilibration had not occurred in shaken cultures. The lag period was completely eliminated at certain concentrations of O2 and CO2. The optimum O2 partial pressure was 0.05 atm, but the optimum CO2 partial pressure varied according to the pH of the medium and the physiological age of the inoculum. The changes in CO2 partial pressure required to compensate for the pH changes of the medium had the net effect of maintaining a constant bicarbonate ion concentration. Initial growth of H. eutropha was therefore indirectly related to the CO2 partial pressure and was directly dependent on a constant bicarbonate ion concentration. A.B.K.

A71-40225 * Perceptual masking - Peripheral vs central factors. Mitchell L. Kietzman, Robert C. Boyle, and Donald B. Lindsley (California, University, Los Angeles, Calif.). *Perception and Psychophysics,* vol. 9, no. 4, 1971, p. 350-352. 25 refs. PHS Grant No. NB-8552; Grant No. NGL-05-007-049; Contract No. N 00014-69-A-0200-4024.

Perceptual masking was studied under binocular and dichoptic conditions in order to separate peripheral and central interference effects. Under binocular conditions, when the test flash (TF) and the blanking flash (BF) fell on both retinas, both retroactive and proactive masking were demonstrated. Under dichoptic conditions, when the TF fell on one eye and the BF on the other eye, thus eliminating opportunity for intraretinal interference, there was partial retroactive perceptual masking and no proactive masking. These results suggest that binocular proactive masking is due to peripheral light adaptation, that binocular retroactive masking is due to both peripheral and central effects, and that dichoptic masking is due solely to central retrochiasmal interference. It is proposed that dichoptic retroactive perceptual masking affords a method of investigating central perception time, i.e., the time to consolidate a perceptual experience. (Author)

A71-40247 * The role of nonspecific reticulo-thalamo-cortical systems in emotion. Donald B. Lindsley. In: Physiological correlates of emotion. Edited by Perry Black. New York, Academic Press, Inc., 1970, p. 147-188. 79 refs. PHS Grant No. NS 08552-01; Grant No. NGL-05-007-049; Contract No. Nonr-4756.

Study of mechanisms of arousal and activation which involve reticulo-thalamo-cortical systems. Thought, worry, and anxiety reflect emotional arousal at the cortical level; weeping, sweating, intestinal and other visceral activities regulated by the autonomic nervous system reflect cortical, diencephalic, and brain stem arousal; facial expression, muscle tension, and tremors manifest somatomotor arousal. Mechanisms of arousal and activation are especially identified with the reticular formation of the lower brainstem. Upward extensions, including the ascending reticular activating system and its subsystems are closely related to, and interactive with, diencephalic and limbic systems which control emotional expression and emotional-motivational behavior. The concept of an activation theory of emotion is discussed in the light of early and more recent supporting evidence. F.R.L.

A71-40250 Automaticity and automatic rhythms. Mario Vassalle (New York, State University, Brooklyn, N.Y.). *American Journal of Cardiology,* vol. 28, Sept. 1971, p. 245-252. 32 refs. Research supported by the American Heart Association, the New York Heart Association, and PHS.

The nature of the automatic process in cardiac pacemakers is discussed with special reference to the mechanism of diastolic depolarization in cardiac Purkinje fibers as investigated by the use of the voltage clamp technique. The major factors controlling cardiac automaticity - the sympathetic nerves, the vagi and overdrive suppression - are analyzed. Under different conditions, both sympathetic and vagus nerve stimulation can lead to a slowing or acceleration of cardiac pacemakers. The mechanism by which the sympathetic nerves can slow and the vagus nerve accelerate the

pacemaker rate is reported. The inhibition exerted by the sinus node on idioventricular pacemakers through overdrive suppression is described: overdrive suppression is a form of inhibition that operates when a pacemaker is driven at a rate faster than its own. The mechanism of overdrive suppression is indicated by a frequency-dependent electrogenic sodium extrusion. Automatic rhythms are classified according to different mechanisms of production; they can result from an exaggeration of the normal automatic process or from mechanisms absent under normal conditions. Examples of different arrhythmias are given, and it is noted that some types of tachycardias can occur while automaticity is depressed. (Author)

A71-40255 * ***Centrifugally obtained artificial gravity.*** Robert E. McGaughy (Bellcomm, Inc., Washington, D.C.) and Donald B. Hoffman (McKinsey and Co., Inc., Washington, D.C.). *Journal of the Astronautical Sciences,* vol. 18, May-June 1971, p. 323-354. 17 refs. Contract No. NASw-417.

The physical nature of the artificial gravity field produced by rotating a spacecraft in earth orbit is examined from the point of view of an astronaut living inside. He will experience an unusual environment which is caused by (1) a much larger Coriolis force, relative to the nominal gravity strength, than on earth, and (2) a larger head-to-toe gravity gradient. We examine the detailed kinematics of freely-falling particles and the dynamics of typical tasks performed by men inside the spacecraft. The results are discussed in terms of the ratio h/R, where h is the height above the floor at which the activity occurs and R is the radius of spacecraft rotation. It is found that if h/R exceeds about 0.1, the rotation effects become noticeable. Objects falling downward drift away from the rotation direction, and objects thrown upward drift in the opposite direction. Tasks requiring dynamic manipulative skill, such as hammering nails and walking, will require a significant amount of relearning if h/R is greater than 0.1. These unusual phenomena are particularly important inside the hub of a rotating space station, since its effective radius is small. (Author)

A71-40259 **Some results of the flight of the Soyuz-9 spacecraft.** A. G. Nikolaev. *(International Astronautical Federation, International Astronautical Congress, 21st, Konstanz, West Germany, Oct. 4-10, 1970, Paper.) Journal of the Astronautical Sciences,* vol. 18, May-June 1971, p. 390-396. Translation.

Discussion of the flight of the space vehicle 'Soiuz-9,' which had a duration of 18 days and was undertaken in connection with the program for solving problems of manned orbital space stations. One objective of the flight was the investigation of changes regarding the astronauts and their ability to perform work upon long term exposure to conditions of weightlessness. It was found that the human organism adapts itself to space conditions within a certain time. This time varies individually from a few hours to several days. However, difficulties in a readaptation to normal gravity after the flight are reported, and the preparation of special measures for solving this problem in case of flights of a duration of several months are recommended including a provision of artificial gravity for interplanetary flights. A number of scientific tests conducted by the astronauts during the flight are discussed. G.R.

A71-40341 # **Field study of transport aircrew workload and rest.** Bryce O. Hartman (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 817-821. 7 refs.

Study of transport aircrew sleep patterns in relation to fatigue and sleep disturbances. Sleep data were obtained from selected transport crewmembers flying 100 logistics missions and maintaining a log on work and rest on an around-the-clock basis starting 12 hours prior to each mission and ending after 3 days of post-mission rest. These sleep data indicate that a mission constitutes a significant physiologic load and that during the course of a mission a physiologic debt develops, despite the fact that regular periods are provided for sleep and rest. The various 'stressors' acting upon crewmembers are discussed, and their implications are reviewed. M.V.E.

A71-40342 **Pulmonary capacity for dissipation of venous gas emboli.** Merrill P. Spencer and Yohtaro Oyama (Virginia Mason Research Center, Seattle, Wash.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 822-827. 24 refs. Research supported by the Boeing Employees Good Neighbors Fund; NIH Grant No. HE-10258.

Description of an experiment in which nine unanesthetized sheep with chronically implanted ultrasonic Doppler flow probes on pulmonary and brachiocephalic arteries were subjected to experimental intravenous injections of oxygen, nitrogen, and carbon dioxide. Three different rates of injection (0.03, 0.09, and 0.15 cc/Kg/min) were used for 30 min each. Findings included transient and moderate elevation of right ventricular pressure, decrease in pulmonary blood flow, and diminished arterial O2 partial pressure. The degree of these vascular and respiratory changes was dependent on the kind and dosage of gas used. Bubble signals on the brachiocephalic artery were detected in 1 out of 5 O2 and 3 out of 5 N2 injections at the 0.15 rate. CO2 had the least effect and did not embolize the systemic circulation. Because of absence of clinical signs and plateauing of effects, it was concluded that the effects of continuous venous gas embolization at these doses can be tolerated and are reversible. (Author)

A71-40343 * **Bone density changes in a Macaca nemestrina monkey during the Biosatellite III project.** Pauline Beery Mack (Texas Woman's University, Denton, Tex.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 828-833. 19 refs. Contract No. NAS 2-2711.

The method of evaluating bone density in the flight monkey of Biosatellite III is described, with changes in density in 17 anatomic sites given during the period of the mission, both for the flight animal and the back-up animal which served as a ground-based control during the same period, with the former markedly surpassing the latter. A discussion is given concerning possible causes of losses in skeletal density in some anatomic areas of both animals, with losses generally more extensive in the primate which experienced 8.8 days of weightlessness than in the control monkey. (Author)

A71-40344 **Decompression sickness - A fundamental study of 'surface excursion' diving and the selection of limb bends versus C.N.S. symptoms.** B. A. Hills (Duke University, Durham, N.C.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 833-836. 16 refs. Contract No. N 00014-67-A-0251-0015.

The total decompression time of goats has been titrated using the standard Naval schedule both with and without interposing an excursion towards the surface between the exposure and the decompression. For a dive of 30 min. to 170 ft it was found that a surface interval of 1 min had no significant effect. For greater exposures it was found that there was a threshold depth for the excursion interval separating C.N.S. from limb bends as the symptoms arising during subsequent titration of the decompression. The results are discussed in relation to emphasizing the fundamental inadequacies of conventional supersaturation theories of decompression sickness. The surface excursion is suggested as a very useful model for studying the treatment of C.N.S. symptoms. (Author)

A71-40345 ***Study of reactivity of the organism exposed to transverse accelerations and radioprotectants.*** V. V. Antipov, M. V. Vasin, B. I. Davydov, E. F. Panchenkova, and P. P. Saksonov (Akademiia Nauk SSSR, Moscow, USSR). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 837-839. 26 refs.

Description of the results of a study of the effect of drugs protecting against ionizing radiation on mice and the tolerance to back-to-chest accelerations. The investigations have demonstrated that radio-protectants may reduce the tolerance of the animal body

to accelerations, whereas stress effects may increase the toxicity of aminothiols. This emphasizes the importance of studying the response of the human body to space flight factors in order to develop indications of taking certain drugs in these circumstances.
M.M.

A71-40346 Electrophysiological changes in humans during sensory isolation. E. A. Serafetinides, J. T. Shurley, R. Brooks, and W. P. Gideon (Oklahoma, University; U.S. Veterans Administration Hospital, Oklahoma City, Okla.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 840-842. 9 refs. Research supported by the U.S. Veterans Administration.

EEG, EMG, EOG, EKG and Electrodermal Measures were obtained from 16 normal volunteer female subjects during a 4-hour period of sensory isolation of the water-tank variety. The results showed significant decrease of EEG voltage and frequency, of ECG rate and an increase in some of the electrodermal measures. The findings are discussed in terms of progressive reduction of cortical activities as distinct from sleep and diverse autonomic reactivity resulting from an overall reduction of sensory input. (Author)

A71-40347 Effect of increased pressures of normoxic helium, nitrogen and neon on EEG and reaction time in man. R. E. Townsend, L. W. Thompson, and Ilmar Sulg (Duke University, Durham, N.C.; University Hospital, Lund, Sweden). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 843-847. 22 refs. NIH Grants No. HE-07896; No. HE-5662; Contracts No. NR-10-758; No. N 00014-67-A-0251-0016; PHS Grant No. HD-00668.

The paper examined the effects of hyperbaric, normoxic breathing gas mixtures of helium, nitrogen and neon on the electroencephalogram (EEG) and simple reaction time (RT) in man during a chamber saturation dive. Subjects breathed helium-oxygen at One, 4.02, 7.05, and 8.57 Ata; nitrogen-oxygen at One, 4.05, and 7.05 Ata; and neon-oxygen at 7.05 Ata. The only meaningful changes on any of the dependent variables occurred with increased pressures of the nitrogen breathing gas. There was a linear increase in RT, a suggestion of increased mean alpha frequency and an increase in failures to respond during the RT task with increased pressures of nitrogen-oxygen. Clearly defined EEG alpha block was observed at all pressures and with all breathing gases studied. The relationship of this finding to previous reports of a decrease in alpha block with increased pressures of gases containing a high partial pressure of nitrogen is discussed. (Author)

A71-40348 Variables associated with split-period sleep regimes. Wilse B. Webb and Harman W. Agnew, Jr. (Florida, University, Gainesville, Fla.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 847-850. 5 refs. Contract No. AF 41(609)-67-C-0028.

Eight young adult males had their daily sleep period split into two periods of 4 hours in length. Different lengths of intervening wakefulness were introduced between the two periods; 1 hour, 4 hours, and 12 hours. One of the two sleep periods began at 2300 each day. It was found that the total amount of the various sleep stages in the two periods did not differ from baseline sleep in the 1 hour and 4 hour split conditions; there was an increase in waking and light sleep and a decrease in REM sleep in the 12 hour condition. An internal examination of the sleep within the two periods for the three conditions indicates that the particular outcome of split periods of sleep will be dependent upon three factors: the time interval between periods, the length of the periods, and the sidereal time of onset. (Author)

A71-40349 Effect of acclimatization to altitude and cold on basal heart rate, blood pressure, respiration and breath-holding in man. C. S. Nair, M. S. Malhotra, P. M. Gopinath, and Lazar Mathew (Defence Institute of Physiology and Allied Sciences, Delhi, India). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 851-855. 20 refs.

Basal heart rate, blood pressure, respiration and maximum breath-holding time were studied in 20 healthy subjects of age group 22-28 years at an altitude of 11,000 ft. They were divided into two groups. One group was subjected to hypoxia, while the other group was exposed to hypoxia and cold simultaneously. The results indicate that simultaneous exposure to hypoxia and cold brought about a return of heart rate to near sea-level values and elevated basal minute ventilation. Basal blood pressure and respiratory rate did not show any significant change. Maximum breath-holding time showed a trend towards a rise after 10 days, while the other group (hypoxia alone) lagged behind in this response. (Author)

A71-40350 Measurement of tremor in the Makai Range 520-foot saturation dive. Arthur J. Bachrach, David R. Thorne, and Kenneth J. Conda (National Naval Medical Center, Bethesda, Md.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 856-860. 16 refs.

Muscle tremor was measured on three aquanauts using a muscle force transducer developed to measure response variation within a specified force band. Tests were made during the 12-hour compression to 520 feet at 40 feet per hour, and during the 5-day decompression. Analysis of the power spectra revealed significant and stable differences among individuals, but in all cases tremor magnitude was within normal surface limits. Although there was a tendency for high frequency tremor components to drop out with higher pressures, neither total tremor nor the amount of tremor within particular frequency bands showed a significant systematic change with pressure. The stability of the differences among the divers may allow for the establishment of individual tremor 'signatures' as a monitoring standard. (Author)

A71-40351 Noise and aircrew effectiveness. William R. Pierson (Lockheed-California Co., Burbank, Calif.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 861-864. 15 refs.

Aircrew effectiveness was equated with the ability to interpret display data (perceptual judgments) and to make correct decisions when the choices are few in number (intellectual judgments). Eight hours' exposure to 100 dB(A) aircraft cabin noise had no effect on perceptual judgment ability or on the time required for intellectual judgment. During the second 4 hr of the 8-hr exposure there was a significant increase in the number of errors committed in the intellectual judgment task. A significant shift in hearing acuity threshold occurred, but normal hearing was recovered within 48 hr.
M.M.

A71-40352 Studies on dysbarism. IV - Production and prevention of decompression sickness in 'non-susceptible' animals. Chryssanthos Chryssanthou, Fritz Teichner, and William Antopol (New York, City University; Beth Israel Medical Center, New York, N.Y.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 864-867. 12 refs. Research supported by the Saul Singer Foundation and the Lenore Weinstein Fund; Contract No. N 00014-68-A-0393.

Thin mice subjected to 90 psi absolute air pressure for 5 hr and then decompressed to sea level within 1 min do not develop decompression sickness. A relatively small incidence of the syndrome is observed when the animals, after a short surface interval, are further decompressed to a simulated altitude of 26,000 ft, SMAF (a smooth muscle-acting factor) markedly increases the incidence if administered prior to exposure to altitude. When, however, 2-(4-phenyl-1-piperazinylmethyl) cyclohexanone is given before exposure to 90 psi none of the animals develops the disease. The findings support the postulated implication of humoral smooth muscle-stimulating factors in the pathogenesis of decompression sickness, thus providing a new pharmacological approach for the prevention or amelioration of the syndrome. M.M.

A71-40353 Changes in human urine and blood chemistry during a simulated oxygen-helium dive to 1,500 feet. P. B. Bennett

and S. P. Gray (Royal Naval Physiological Laboratory, Alverstoke, Hants., England). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 868-874. 25 refs.

Description of experiments in which two subjects simulated saturation oxygen-helium dives to 100, 300, 450 and 1,500 ft. Blood was collected before and after the dives and analyzed for hemoglobin, white cell count and differential, hematocrit, platelets, lactic dehydrogenae, LDH/HBD ratio, total protein, urea, bilirubin, serum aspartate aminotransferase, alkaline phosphatase and electrolytes. Urine was also analyzed. In the experiments at 100 to 450 ft, due to lack of heating, there was a cold diuresis with urine electrolyte excretion following the increased glomerular filtration rate (GFR). At 1,500 ft, with no cold diuresis, there was retention of sodium, calcium, magnesium and chloride and a diuresis of potassium and phosphorus with a high corticosteroid excretion. No changes were noted in the blood except in the 1,500-ft experiment when post-dive there was a rise in leucocytes and a fall in platelets. The results are discussed in relation to the possible mechanisms involved and correlated with the results of previous experiments. M.M.

A71-40354 * Vascular and extravascular fluid changes during six days of bedrest. Philip C. Johnson, T. B. Driscoll, and William R. Carpentier (Methodist Hospital; NASA, Manned Spacecraft Center, Houston, Tex.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 875-878. 10 refs. PHS Grant No. HE-05435-11; Contract No. NAS 9-7280.

Body fluid spaces were determined before and after one and six days of bedrest. All fluid spaces were calculated and compared on the basis of fluid volume per kilogram body weight. The nine male subjects who participated in the study were divided into two groups according to their deviation from an ideal body weight as determined from individual heights. The subjects below ideal weight had a statistically greater mean ml/kg red cell mass, extracellular fluid volume and total body water than the respective means from the group whose weights were above ideal. During bedrest a decrease of statistical significance was found in the plasma volume but not in the red cell mass, total body water and extracellular fluid volumes. The data do not support the often stated theory of fluid and electrolyte diuresis as the cause of the slowly decreasing plasma volume loss found after the first 24 hours of bedrest. (Author)

A71-40355 Heat acclimatization by the prevention of evaporative cooling. E. Shvartz and D. Benor (Negev Institute for Arid Zone Research, Beer-Sheba, Israel). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 879-881. 11 refs.

The effect of a heat-acclimatization program was assessed in 5 male subjects by a work-heat test (5 km/hr; 50 C; 20% relative humidity). The acclimatization program included 4 exposures to 40 C, over a period of 2 weeks, during which the men walked on a treadmill at a speed of 3.5 km/hr while wearing vapor-barrier suits. Acclimatization resulted in final mean heart rate, rectal temperature, skin temperature, and sweat rate of 125 beats/min, 37.8 C, 37.7 C, and .918 kg/hr respectively. Three of the subjects, whose pre-acclimatization values were compared, showed mean heart rate, rectal temperature, skin temperature and sweat rate decrease of 21 beats/min, 1.0 C, 0.1 C and .113 kg/hr respectively. Sweat rate, expressed as per degree rise in rectal temperature, about doubled. These results suggest that preventing evaporative cooling presents a major factor in heat acclimatization. (Author)

A71-40356 # Physiological responses to cooling the head and neck versus the trunk and leg areas in severe hyperthermic exposure. Abbott T. Kissen, John F. Hall, Jr., and Fritz K. Klemm (USAF, Environmental Medicine Div., Wright-Patterson AFB, Ohio). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 882-888. 10 refs.

Comparison of physiologic responses to an hour of hyperthermic stress (66 C ambient air, 10 mm Hg ambient vapor pressure), where the head was maintained in comfort, with those obtained under unventilated and air-cooled undergarment (MA-3) conditions. Head and MA-3 ventilation temperature was 15.5 C. Airflow to the head and one MA-3 subcondition was 5 cu ft/min. For the remaining MA-3 subcondition it was 12 cu ft/min. Head ventilation, involving merely 8% of total body surface area, more effectively reduces physiologic strain (in terms of cardiovascular and sudomotor responses) than ventilation of 60% (MA-3) of total body surface area under equivalent (5 cu ft/min) or even operational (12 cu ft/min) conditions. The premise is advanced that inclusion of the cold sensitive facial area in the cooling system design inhibits the otherwise active discharge of neural impulses from thermoreceptors. Depression of this neurogenic activity significantly attenuates the response of heat-compensatory mechanisms. (Author)

A71-40357 Epilepsy and medical examinations of flight personnel - Importance and difficulty of diagnosis. J. Lavernhe, C. Blanc, and E. Lafontaine (Compagnie Nationale Air France, Paris, France). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 889, 890. 8 refs.

Three cases of epileptic conditions of flight personnel with unconsciousness during flight are described. The nonexistence at the present time of techniques for detecting potential epilepsy is indicated. Careful examinations of the personal histories, with particular attention to head trauma and impairment of consciousness, and systematic EEG with hyperventilation and photic stimulation tests, are suggested to minimize epileptic fit hazards in the air. V.Z.

A71-40358 # Vertiginous flyer - A review of 6 years' experience of the aeromedical consultation service. Frederic M. Brown (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 891-893. 5 refs.

In this article the population of patients referred to the USAF School of Aerospace Medicine Consultation Service for vertigo, symptoms suggestive of vertigo, or vertigo-related diseases during a six-year period is described. Of the 96 cases studied 21 were found to have symptoms other than vertigo. Vertigo, cause undetermined, was the diagnosis in 42 of the remaining 75 vertigo cases. Such a large proportion of cases which could not be specifically diagnosed was probably due in part to an incomplete acute evaluation. A rigorous acute evaluation of all cases of vertigo is recommended in order to institute proper treatment, predict the likelihood of recurrence, and make the appropriate aeromedical disposition. (Author)

A71-40359 Epidemiology of USAF spatial disorientation aircraft accidents, 1 Jan 1958-31 Dec 1968. Ferdinand Barnum and Robert H. Bonner (USAF, Directorate of Aerospace Safety, Norton AFB, Calif.). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 896-898. 6 refs.

Demonstration that spatial disorientation is still a significant flight safety problem. It is indicated that 192 mostly highly qualified USAF pilots lost their lives because of disorientation during the decade from 1958 to 1968 and that age, experience and phase of flight contributed little to these accidents. Operational analysis of training, of flight environment and of indoctrination programs is suggested to remedy this situation. V.Z.

A71-40360 * Rotating vivarium concept for earth-like habitation in space. Vernon H. Gray (NASA, Lewis Research Center, Cleveland, Ohio). *Aerospace Medicine,* vol. 42, Aug. 1971, p. 899, 900. 5 refs.

An earth-like, 'back to nature' ecology for space colonies is advocated, in contrast to present highly complex, machinery-filled space base designs. Submitted here for general evaluation is the concept of a hollow, sunlit rotating space chamber in which human,

plant and animal life cycles are sustained in a controlled weather environment. (Author)

A71-40406 **Resting and postexercise apexcardiogram correlated with maximal treadmill stress test in normal subjects.** Wilbert S. Aronow, John Cassidy, and Ronald R. Uyeyama (U.S. Veterans Administration Hospital, Long Beach; California, University, Irvine, Calif.). *Circulation,* vol. 44, Sept. 1971, p. 397-402. 9 refs.

Ninety-eight normal subjects (mean age 51 years) who had a maximal treadmill stress test were found to have a satisfactory apexcardiogram at rest and after a double Master's test. The mean resting a-wave ratio was 11.6% in 13 normal subjects with an abnormal maximal treadmill test, and 7.8% in 85 normal subjects with a normal treadmill test (P smaller than 0.001). The mean postexercise a-wave ratio was 19.7% in 13 normal subjects with an abnormal treadmill test, and 12.8% in 85 normal subjects (2%) who had a normal treadmill test. Seven of 13 normal subjects (54%) with an abnormal treadmill test had a postexcercise a-wave ratio of greater than or equal to 20% compared to eight of 85 normal subjects (9%) who had a normal treadmill test. V.P.

A71-40407 **Role of parasympathetic inhibition in the hyperkinetic type of borderline hypertension.** Stevo Julius, Arturo V. Pascual, and Richard London (Michigan, University, Ann Arbor, Mich.). *Circulation,* vol. 44, Sept. 1971, p. 413-418. 19 refs. Research supported by the University of Michigan.

Eleven patients with borderline hypertension and high cardiac output were compared to 16 paid healthy volunteers. Cardiac output, heart rate, and intraarterial blood pressure were determined at rest, after administration of 0.2 mg/kg of propranolol i.v., and after administration of an additional 0.04 mg/kg of atropine. In four additional patients, response to infusion of isoproterenol before and after administration of 0.2 mg/kg of propranolol i.v. was evaluated. Resting heart rate and cardiac output in patients with borderline hypertension were elevated. After propranolol infusion, the values decreased more in the patients with borderline hypertension, but remained significantly elevated. After atropine administration, the difference in cardiac output and heart rate between the two groups disappeared. Consequently, patients with borderline hypertension and hyperkinetic circulation simultaneously exhibit an increase of sympathetic and a decrease of parasympathetic tone. (Author)

A71-40551 **Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings.** Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971. 195 p. $12.

The papers are divided into four main sections: ecology of microorganisms in manned space flight; biological studies in space; sterilization and quarantine; and exobiology and origin of life. Much attention is given to questions of immunity and of microbial flora, and to problems of contamination in space flight. V.P.

A71-40552 # **Immune states in long-term space flights.** H. S. Ginsberg (Pennsylvania, University, Philadelphia, Pa.). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 1-9.

State-of-the-art knowledge on the development of specific active immunity, the factors responsible for 'natural' and nonspecific resistance, and how prolonged space flight may hamper these highly complex mechanisms is summarized. Viruses which classically may be induced to cause recurrent infections, such as herpes simplex and herpes zoster are described. The effects that altered host defenses might have on slow virus infections, such as kuru and virus-induced malignancies are examined. V.P.

A71-40553 # **Microbiological and immunological aspects of extended manned space flights.** Iu. G. Nefedov, V. M. Shilov, I. V. Konstantinova, and S. N. Zaloguev (Ministry of Public Health, Institute of Biomedical Problems, Moscow, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 11-16. 24 refs.

Alterations in microbial flora and immunologic response of man which may occur during long-term confinement in a sealed cabin are examined. These changes depend on the environmental parameters, the duration of the exposure to various environmental factors, and on work-rest schedules. It is shown that under these conditions, some significant shifts in intestinal microflora, including a reduction of the number of species, can occur. It was found that in animals subject to such shifts, the immunocompetent lymphoid tissue was strongly underdeveloped. Means and ways of stimulating the immunocompetent systems of astronauts during prolonged space flights are discussed. Particular attention is given to the microbiological examination included in the physical qualification test for astronauts. V.P.

A71-40554 # **Normalization of the immune status of the human body during prolonged space flight.** I. V. Konstantinova, Iu. G. Nefedov, and V. M. Shilov (Ministry of Public Health, Institute of Biomedical Problems, Moscow, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 17-21. 17 refs.

Methods of affecting protein synthesis in immune responsive cells are studied as a step toward the development of procedures that can be used to normalize human resistance to infections resulting from changes in endogenous microflora and immunologic reactivity of the human organism during prolonged space flights. It is found that ribonucleic acids stimulate antibody formation. Ribonucleotides accelerate the proliferation of immunocompetent cells. A single parenteral injection of a stimulant of this type is sufficient to sustain capacity for accelerated antibody formation for a long time. Methods of maintaining antigen balance are examined. V.P.

A71-40555 # **Shifts in the immunocompetence of lymphoid tissue in guinea pigs containing a limited microflora.** K. A. Lebedev and O. V. Chakhava (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 23-26. 5 refs.

The effect of a reduction in the normal number of species in the microflora of animals, owing to prolonged confinement in a closed environment, on the immunocompetent system. Three months old germ-free, monocontaminated (Staph. albus) guinea pigs, and guinea pigs with reduced fecal microflora, were used in the experiments. The lymphoid tissue in microflora-reduced animals, and especially in monocontaminated animals, was found to be underdeveloped. These changes were, however, less pronounced than in germ-free animals. It is suggested that a decrease in the number of microflora species in a macroorganism reduces the lymphoid tissue; the macroorganism may develop severe reactions of the microbial shock, when occurring in a normal microbial environment. V.P.

A71-40556 # **Specific immune responses in changed gaseous environments.** I. V. Konstantinova, K. A. Lebedev, V. M. Zemskov, V. D. Zazhirei, and V. I. Ganina (Ministry of Public Health, Institute of Biomedical Problems, Moscow, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 27-33. 15 refs.

The capacity of lymphoid cells to participate in immunity reactions is evaluated by blast transformation of lymphocytes under the influence of phytohemagglutinin, blast transformation being measured by cytologic analysis and autoradiographic investigation of the rate of RNA synthesis in cells (using tritiated uridin as label). An experiment performed with three test subjects over a period of one year showed that the blast transformation level of lymphocytes was significantly affected by various situations (changes in physical loads), and particularly by changes in the atmosphere. V.P.

A71-40557 # **Changes in the microflora of man during long-term confinement.** V. M. Shilov, N. N. Lizko, O. K. Borisova, and V. Ia. Prokhorov (Ministry of Public Health, Institute of Biomedical Problems, Moscow, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 43-49. 8 refs.

Eighty-three microbiological tests of feces of 27 subjects were carried out with the object of obtaining detailed information on the composition of the normal human microflora, including the intestinal flora. It is found that sporeless anaerobic bacteria predominate (90%) in the fecal microflora. Aerobic microorganisms (lactobacilli, E. coli, streptococci) amounted to less than 6% of the total microorganisms. Clostridia, staphylococci, yeast, and protozoa are always present in the normal fecal microflora, but in insignificant amounts (0.01% of the total). Changes in the microflora due to prolonged isolation are also studied. The data are discussed from the point of view of immunological responses of the human body. V.P.

A71-40558 # **Changes in the colicinogenic and hemolytic activities of Escherichia isolated from man during long-term confinement.** D. G. Kudlai, V. M. Shilov, N. P. Bragina, and N. V. Anikeicheva (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 51-54.

The paper presents data obtained during the year-long medico-engineering experiment (in which three test subjects participated) with respect to changes in the Escherichia composition as judged by colicinogenic and hemolytic activity. At the beginning of the experiment, colicinogenic E. coli (col/D and col/B) was found in one of the three test subjects (U-85%); he also showed the highest stability of intestinal microflora throughout the experiment. The two other test subjects displayed colicinogenic microorganisms of the same type plus an unidentified type only during and immediately after emergency situations. Hemolytically active E. coli was isolated from the subjects with unstable microflora under emergency situations and at the end of the experiment. Periodicity in the predominance of Escherichia with antagonistic and hemolytic activity is related to the changes in the physiological state of the macro-organism and the rate of mechanical and possibly genetic exchange within the microbial associations in the human intestine. (Author)

A71-40559 # **The microflora of the human integument during prolonged confinement.** S. N. Zaloguev, T. G. Utkina, and M. M. Shinkareva (Ministry of Public Health, Institute of Biomedical Problems, Moscow, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 55-59.

Under conditions of long-term isolation in a sealed environment the microbial contamination of the skin and upper respiratory tract of man was much more pronounced than under normal conditions. This intensification of the contamination went on in a series of periodic increases in the amount of micro-organisms. Every such increase in micro-organisms was much more prominent than the preceding one. The harmful nature of the rise of the level of microbial contamination of human epidermal tissues was expressed by the development of bacterial population shifts and periodic increases in the number of pathogenic microbial forms. (Author)

A71-40560 # **Bacterial contamination of confined, sealed space during long-term human occupation.** V. I. Vashkov, E. N. Nikiforova, N. V. Ramkova, L. N. Rogatina, and G. V. Shcheglova (All-Union Research Institute of Disinfection and Sterilization, Moscow, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 61-64.

One to three persons were confined for 5 to 40 days in rooms measuring from 5 to 21 cu m, and the dynamics of the spreading of common and hemolytic microflora on bodies, clothes, walls, and in the air were studied. After 30 to 40 days, the skin was found to be covered with several thousand microbes per sq cm, of which hemolytic staphylococci amount to about 500 cells per sq cm. Linen contained tens of thousands of bacteria per sq cm, including up to 7000 hemolytic staphylococci per sq cm. Contamination of the air increased during the experiments. Bacteria were found to accumulate steadily on floors and horizontal working areas, whereas accumulation on ceilings and walls were appreciably lower. The results suggest the need for special precautions to prevent the outbreak of various diseases among crew members. V.P.

A71-40561 # **Microbiological problems of manned space flight.** J. Spizizen (Scripps Clinic and Research Foundation, La Jolla, Calif.). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR,

May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 65-68.

The hazard of infectious disease during prolonged space flight is discussed, where such conditions as confinement in the cabin, zero gravity, and high oxygen content, together with personal hygiene and waste disposal problems favor transmission of microorganisms. Preflight assessment of immune status is recommended. A graduated preflight isolation period to permit exchange in flora, to protect astronauts from new agents, and to allow most infections to emerge is suggested. V.P.

A71-40562 * # The ecology of micro-organisms in a closed environment. L. Fox (NASA, Office of Advanced Research and Technology, Washington, D.C.). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 69-74. 9 refs.

Experimental data are presented which have a bearing on the susceptibility of astronauts to infectious diseases. These experiments include the observation of growth by two bacteria in Biosatellite 2, in which higher mean densities were attained than in earth-based controls. In addition, weightlessness combined with the special environment of a space vessel may affect the physiology of the astronauts. Earth-based studies in closed chambers were carried out under a variety of conditions with regard to pressure and oxygen content. One notable result was the transfer of micro-organisms from subject to subject. Comparative experiments were carried out in Antarctica and it was shown that the tests in closed chambers differed markedly from the Antarctica experience. The objectives and procedures of microbiological tests of the Gemini and Apollo programs are outlined. (Author)

A71-40563 # Theoretical and experimental decisions in the creation of an artificial ecosystem for human life support in space. L. V. Kirenskii, I. I. Gitelson, I. A. Terskov, B. G. Kovrov, G. M. Lisovskii, and Iu. N. Okladnikov (Akademiia Nauk SSSR, Institut Fiziki, Krasnoyarsk, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 75-80. 14 refs.

It is shown that the approach to the creation of a regenerative life-support system for future space endeavors should not be based on attempting an analogy with the earth's environment (which after all is of a purely historical basis and need not be optimal) but rather on the selection of species which will become components of a small recycling closed ecological system. The specific biotechnological properties of small man-made ecological systems are analyzed, and the possibility of their use in prolonged space flights is examined. V.P.

A71-40564 # Biosatellite 3 - A physiological interpretation. J. P. Meehan (Southern California, University, Los Angeles, Calif.). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 83-98. 6 refs.

An attempt is made to explain the unexpected demise of a monkey 16 hr after it was aborted on the ninth day of a projected 30-day orbital flight in June, 1969. An analysis of collected data indicates that weightlessness and the hypothermia acted to shift blood volume centrally, thus providing a strong drive for the reduction of blood volume. Restraint, unusual vestibular sensations, and the continuing polydipsia all acted to disturb the central mechanisms affecting salt and water metabolism; it is probable that the function of the kidney was significantly affected and that an excessive amount of salt was lost. Indications are that a serious electrolyte disturbance was superposed on growing dehydration. Unpleasant vestibular sensations may have contributed to the high evaporative loss by automatic disturbance, the whole problem being compounded and reinforced by the unnatural restraint to which the monkey was subjected. V.P.

A71-40565 # Experiments with micro-organisms and human cell cultures in the Zond 5 and Zond 7 flights. N. N. Zhukov-Verezhnikov, M. N. Volkov, I. N. Maiskii, N. I. Rybakov, M. A. Guberniev, I. I. Podoplelov, A. N. Kulagin, E. D. Aniskin, K. D. Rybakova, N. I. Sharyi, I. P. Voronkova, P. P. Saksonov, V. Ia. Kopyev, V. V. Antipov, V. A. Kozlov, G. P. Parfionov, and V. I. Orlovskii. In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 99-103. 26 refs.

Lysogenic strains of Escherichia coli were exposed to space conditions aboard the flight of Zond 5 and Zond 7. Space flight factors appeared to affect the state of episome systems of bacteria, as judged by data obtained with F-Lac+ donor cells which also carried genetic markers for threonine and leucine. Observations on phage induction are discussed and compared with results obtained aboard Biosatellite 2. A number of monolayer cultures of human cells (HeLa cells, fibroblasts, and A-1 cells) were repeadly exposed to the space environment. In one instance, HeLa 19 cells increased in size after exposure to space conditions, a change which appeared to be genetically stable. HeLa 19 cells which were carried on six separate space flights showed a higher viability than corresponding cultures which were exposed only once aboard Zond 5. (Author)

A71-40566 # Survival and mutability of Chlorella aboard the Zond vehicles. E. N. Vaulina, I. D. Anikeeva, I. G. Gubareva, and G. A. Strauch. In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 105-110. 7 refs.

Space effects on the viability and heredity of the unicellular green alga Chlorella were studied during the Soyuz 5 flight in earth orbit and in Zond 5, 6 and 7 on their earth-moon-earth flight. A culture of strain LARG-1 was exposed aboard the ship on mineral agar medium in the dark. The flight in earth orbit aboard the Soyuz 5 brought about a significant falloff in cell survival and a gain in their mutability. There was a trend toward the percent growth of anomalies in autosporulation. The results obtained in experiments aboard the automatic stations of the Zond series were rather contradictory. The flight aboard Zond 6, like the earlier Zond 5, led to a statistically significant falloff in cell survival. The cell mutability remained unchanged. Space had no effect on cell viability in the experiment aboard Zond 7, but there was a trend toward anti-mutagenic action of the space factors. M.M.

A71-40567 # **Survival of bacterial spores under some simulated lunar surface conditions.** G. Horneck, H. Bücker, and H. Wollenhaupt (Frankfurt, Universität, Frankfurt am Main, West Germany). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 119-124. 22 refs. Research supported by the Bundesministerium für Bildung und Wissenschaft.

Spores of Bacillus subtilis were exposed to simulated lunar environmental factors, in order to estimate the chance of living matter to survive on the moon. Vacuum, radiation, and extreme temperature were selected, and their individual and combined influence was tested. High vacuum (up to .1 microtorr) and ultrahigh vacuum (up to 1 nanotorr), ultraviolet rays (254 nm), and a temperature of 80 C were used. The results are compared with those of experiments on vegetative cells. (Author)

A71-40568 # **Post-flight histological analysis of turtles aboard Zond 7.** L. S. Sutulov, S. G. Kulkin, P. P. Saksonov, J. L. Sutulov, N. I. Konnova, L. V. Truchina, E. S. Severgina, L. L. Samsonova, S. N. Sonina, T. V. Selivanova, and V. I. Solov'ev. In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 125-128.

On the occasion of the flight of Zond 7 four turtles were included in the payload. A detailed histological analysis was carried out upon recovery of the subjects. No gross changes were observed, but the nuclei in the cells of many tissues decreased in volume by a statistically significant amount. This decrease is assumed to correspond to certain changes in function which adapted the animal to space flight conditions. No pathological changes were observed. (Author)

A71-40570 # **Methods of search for extraterrestrial life.** A. A. Imshenetskii, B. G. Mursakov, G. G. Sotnikov, and M. D. Evdokimova (Akademiia Nauk SSSR, Institut Mikrobiologii, Moscow, USSR). In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 147-151.

A comparative evaluation of various methods for the detection of extraterrestrial life led to preference of the following ones: observation of the growth dynamics of bacterial cultures in nutrient media; increase in content of iron porphyrin proteins and ATP; change in pH of a medium; and measurement of radioactivity after addition of labelled carbon compounds to nutrient media. An electronic apparatus has been designed that makes it possible to receive signals indicating microbial activity either by individual methods successively, or by three methods applied simultaneously (photometry, manometry, and measurement of radioactive CO2). Studies on the optical activity of soils provided evidence that the measurement of optical activity of soils can give an indication of life. The comparison of these different methods formed the basis for the design of a biological station aimed at the detection of extraterrestrial life. M.V.E.

A71-40572 # **Some potentialities of living organisms under simulated Martian conditions.** L. K. Lozina-Lozinskii, V. N. Bychenkova, E. I. Zaar, V. L. Levin, and V. M. Rumiantseva. In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 159-165. 35 refs.

Studies of the Martian environment as a possible life-sustaining medium are reviewed in an attempt to summarize information which could support the hypothesis of the existence of life on that planet. The temperature, humidity and atmosphere composition on Mars are discussed in the light of available data, particularly from Mariners 4, 6 and 7. Also covered are simulation experiments on bacteria, emphasizing the fact that radiation resistance of unicellular organisms depends on the state of their cells. It is also indicated that a low atmospheric pressure alone does not affect microorganisms, plants and even insects, and that Protozoa sustain an atmosphere of 99% CO2 with 1% oxygen, so that even traces of oxygen in the Martian atmosphere may be sufficient for supporting microorganisms. V.Z.

A71-40573 # **The influence of ultra-high vacuum on crystalline enzymes.** S. V. Lysenko and G. G. Sotnikov. In: Life sciences and space research IX; COSPAR, Plenary Meeting, 13th, Open Meeting of Working Group 5, Leningrad, USSR, May 20-29, 1970, Proceedings. Meeting co-sponsored by the International Union of Biochemistry, the International Union of Biological Sciences, and the International Union of Physiological Sciences. Edited by Wolf Vishniac. Berlin, East Germany, Akademie-Verlag, 1971, p. 169-172. 6 refs.

Solutions of cytochrome C, catalase, peroxidase and ATP were kept under extremely high vacuum for 72 hr in a simulation study of possible effects of an outer space environment on their activity. Chemiluminescence techniques with luminol, and luciferin-luciferase from Photinus pizalis, were used to measure the activity of the enzymes after exposures. High vacuum exposures decreased the activity of the enzymes by up to 7% in concentrated solutions and by up to 30% in diluted solutions. V.Z.

A71-40586 **A mathematical model of the electrocardiographic QT-RR relationship.** M. E. Valentinuzzi (Baylor University, Houston, Tex.). *(Society of Engineering Science, Annual Meeting, 7th, Washington University, St. Louis, Mo., Nov. 3-5, 1969.) Medical and Biological Engineering,* vol. 9, July 1971, p. 255-261. 19 refs.

A mathematical model of the electrocardiographic QT-RR relationship is presented, and a curve produced by thereon based numerical estimates is shown to fit reasonably well an empirical approximation made with Bazett's (1918-1920) formula. The model is general and would agree in principle with previous membrane theories. This fact should encourage experiments in mammalian hearts and in single cells. M.V.E.

A71-40590 **Fatigue in the context of flight safety.** *Flight International,* vol. 100, Sept. 2, 1971, p. 362-365. 10 refs.

The role of pilot fatigue, due to lack of sleep, irregular duty patterns, and sleep disruption, in pilot performance is analyzed. It is shown that sleepiness has much the same effect as alcohol on human skills and that there is a measurable deterioration of performance with lack of sleep. Inability to discriminate (or even detect) small signals was established in test subjects with two to three hours of sleep. Evidence is presented that pilot performance varies diurnally, and that it is affected by desynchronization of diurnal rhythm by time-zone crossing. Rest and duty schedules that would contribute to flight safety are proposed. V.P.

A71-40593 * Studies of the electron transport chain of extremely halophilic bacteria. VI. Janos K. Lanyi (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.). *Journal of Biological Chemistry*, vol. 246, July 25, 1971, p. 4552-4559. 42 refs.

Electron microscopy and a light-scattering technique were applied to study the sedimentation properties of protein, phospholipids, flavoproteins and cytochromes in Halobacterium cutirubrum cell envelope vesicles subjected to disintegration in low-concentration salt solutions. NaCl concentrations causing solubilization of flavoproteins, the outer envelope, cytochrome b, phospholipids and cytochrome oxidase are determined. The stabilizing effects of NaCl, $NaNO_3$ and $NaClO_4$ concentrations on individual cell membrane components are compared. The action of hydrophobic and ionic binding forces of stabilization is discussed. V.Z.

A71-40629 Hypoxia and hypercapnia in asphyctic differentiation of regional sympathetic activity in the anesthetized rabbit. M. Iriki, K. Pleschka, O.-E. Walther, and E. Simon (William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim, West Germany). *Pflügers Archiv*, vol. 328, no. 2, 1971, p. 91-102. 15 refs.

Investigation of the contributions of hypoxia and hypercapnia to the differentiated changes of regional sympathetic activity during asphyxia in anesthetized, paralyzed rabbits. Under artificial ventilation with gas mixtures of various O_2 and CO_2 contents, the discharges of a postganglionic nerve twig accompanying the retroauricular artery (cutaneous sympathetic) and of a splanchnic nerve branch (visceral sympathetic) were recorded. PaO_2, $PaCO_2$, pH, arterial pressure, and heart rate were measured. Moderate hypoxia (PaO_2 27.2 torr) induced a differentiated response of regional sympathetic activity similar to that observed during moderate asphyxia - i.e., increase of visceral and decrease of cutaneous sympathetic activity. During severe hypoxia (PaO_2 16.4 torr) both visceral and cutaneous sympathetic activity increased, the latter after a temporary decrease. During hypercapnia ($PaCO_2$ 59.3 torr) only a slight increase of visceral sympathetic activity was observed, while cutaneous sympathetic activity did not change. It is concluded that the differentiated responses of the sympathetic nervous system during asphyxia are caused mainly by hypoxia. (Author)

A71-40630 Sensory transmission of spinal heat and cold sensitivity in ascending spinal neurons. E. Simon and M. Iriki (William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim, West Germany). *Pflügers Archiv*, vol. 328, no. 2, 1971, p. 103-120. 28 refs.

In anesthetized cats, the thoracic and lumbar sections of the cervical vertebral canal were selectively heated or cooled. Single unit activity was recorded with steel microelectrodes from the spinal cord. The positions of the electrode tips were determined by micromarking. The existence of two groups of temperature-dependent ascending spinal units was confirmed. One group of units was activated by spinal cord cooling below normal body temperature. The other group was activated by spinal cord heating. No temperature-dependent neurons were found, so far, exhibiting maximum discharge rates at normal body temperature. A roughly proportional relation between discharge rate and vertebral canal temperature seemed to exist in both heat-sensitive and cold-sensitive units within a limit range of spinal hyperthermia or hypothermia respectively. Part of the units exhibited dynamic responses to changes of vertebral canal temperature in addition to their static responses. M.M.

A71-40631 Intracellular pH and CO_2 combining curve of skeletal musculature in dogs (pH und CO_2-Bindungskurve im Intracellulärraum der Skelet-Muskulatur beim Hund). F. Saborowski, W. Usinger, and C. Albers (Regensburg, Universität, Regensburg; William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim, West Germany). *Pflügers Archiv*, vol. 328, no. 2, 1971, p. 121-134. 26 refs. In German.

The intracellular pH of muscle tissue was determined in 10 dogs anesthetized with Nembutal, using the DMO method. The arterial CO_2 tension was varied between 20 and 100 torr. The extracellular space was obtained as chloride space and was on the average 0.179 kg H_2O per kg tissue. The intracellular space was 0.563 kg H_2O per kg tissue. At a CO_2 tension of 40 torr and a pH of 6.934, the calculated total CO_2 was 5.62 mM per kg tissue in the intracellular and 3.86 mM per kg tissue in the extracellular compartment. No difference was found when the calculations were done replacing the pH and pCO_2 of the arterial blood by the corresponding values of the mixed venous blood. M.V.E.

A71-40632 Differentiation of cutaneous and intestinal blood flow during hypothalamic heating and cooling in anesthetized dogs. W. Schönung, H. Wagner, C. Jessen, and E. Simon (William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim; Giessen, Universität, Giessen, West Germany). *Pflügers Archiv*, vol. 328, no. 2, 1971, p. 145-154. 29 refs.

Blood flow in arteries supplying cutaneous and intestinal vascular regions were simultaneously measured with an electromagnetic flowmeter in anesthetized dogs, paralyzed with succinyl choline. The hypothalamic preoptic region was selectively heated and cooled by means of a stereotaxically inserted, water perfused thermode. Skin blood flow increased during hypothalamic heating and was reduced during hypothalamic cooling. Conversely, intestinal blood flow decreased during heating and increased during cooling. Arterial pressure was not influenced by hypothalamic cooling and decreased slightly during heating. The changes of blood flow distribution observed in the experiments are in keeping with the results obtained during selective spinal cord heating and cooling. It is assumed that antagonistic changes of blood flow in the cutaneous and intestinal vascular beds represent typical thermoregulatory responses of systemic circulation induced by regionally antagonistic changes of vasomotor activity. (Author)

A71-40633 Coronary flow at increased arterial pressure of carbonic acid (Coronardurchblutung bei Erhöhung des arteriellen Kohlensäuredrucks). F. Kosche, W. K. Raff, and W. Lochner (Düsseldorf, Universität, Düsseldorf, West Germany). *Pflügers Archiv*, vol. 328, no. 2, 1971, p. 170-175. 14 refs. In German.

In 9 dogs the heart rate was kept constant by electrical stimulation of the right auricle after elimination of the sinus node. Hypercapnia was induced by increasing inspiratory carbonic acid concentration at constant oxygen concentration. The mean arterial carbonic acid partial pressure increased from 40.5 to 70.5 mm Hg. The mean pH decreased from 7.30-7.14. Under these conditions the coronary flow did not change. Systolic and diastolic aortic pressure, left ventricular pressure, and the maximal rate of pressure rise in the left ventricle remained unchanged. Alterations of coronary blood flow caused by increased carbonic acid concentrations as described by other authors can be explained by a change of hemodynamic conditions. (Author)

A71-40634 Radiotelemetrical equipment for continuous subcutaneous measurements of the circadian temperature rhythm in rats. J. Bojsen, U. Møller, and M. Faber (Finsen Institute, Copenhagen, Denmark). *(Nordisk Forening for Klinisk Fysik, Annual Meeting, Aarhus, Denmark, Aug. 20, 1970.)* *Pflügers Archiv*, vol. 328, no. 2, 1971, p. 176-184. 19 refs. Research supported by the Danish Anti-Cancer League.

A wireless measuring device for long term measurements of the diurnal temperature rhythm on unrestrained rats is presented. Up to

5 rats could be tested simultaneously. The electronic units, the coating problems for the implanted transmitter, and the tissue reaction are described. It is observed that the circadian temperature rhythm in subcutis and in mammary cancer is almost in phase. The consequence of this is discussed. (Author)

A71-40668 Visual field projection columns and magnification factors in the lateral geniculate nucleus of the cat. K. J. Sanderson (Australian National University, Canberra, Australia). *Experimental Brain Research,* vol. 13, no. 2, 1971, p. 159-177. 40 refs.

The precision of the projection of the visual field to the dorsal lateral geniculate nucleus (LGNd) of the cat was studied by plotting the receptive fields of single neurons recorded extra-cellularly in the nucleus. The concepts of a 'projection column' and of 'random scatter in the location of receptive fields' have been defined in relation to cells in the LGNd. The projections of adjacent areas of visual field overlap extensively in the LGNd. In this study, the overlap of retinal afferents in the LGNd was measured in terms of the random scatter of receptive field positions for cells recorded in a given electrode penetration parallel to projection columns in the nucleus. The monocular receptive field scatter within a column in the LGNd is about of the same magnitude as both the monocular receptive field scatter within a cortical column and the binocular receptive field disparities of cortical units. The differential magnification of the visual field on the LGNd is a reflection of the ganglion cell density differences in the retina. M.M.

A71-40669 The properties of the binocular receptive fields of lateral geniculate neurons. K. J. Sanderson, P. O. Bishop, and I. Darian-Smith (Australian National University, Canberra, Australia). *Experimental Brain Research,* vol. 13, no. 2, 1971, p. 178-207. 66 refs.

The majority of cells in the dorsal nucleus of the lateral geniculate body (LGNd) in the cat have two receptive fields: one for each eye. Of the cells tested for binocularity (113), only 21 (18%) were purely monocular. The remainder had receptive fields for the nondominant eye, the great majority of which (81 or 88%) were purely inhibitory and only 11 (12%) were excitatory. The proportion of inhibitory receptive fields for the nondominant eye was slightly greater when the dominant eye was ipsilateral (77%) than when it was contralateral (68%). The properties of the inhibitory receptive fields were studied with moving slits of light and stationary flashing spots. Most of the fields were purely inhibitory and varied in size from 1.5 to 6 deg across. There were no specific stimulus requirements other than a change in contrast within the receptive field. The inhibitory effect was usually fairly weak, the spontaneous discharge of the neuron being inhibited much more readily than the driven discharge. M.M.

A71-40670 The retinal directional effect - A model based on the Gaussian distribution of cone orientations. Aran Safir (Mount Sinai School of Medicine, New York, N.Y.), John Philpot (Rutgers University, New Brunswick, N.J.), and Lyon Hyams. *Vision Research,* vol. 11, Aug. 1971, p. 819-831. 5 refs. NIH Grants No. NB-05895; No. EY-473.

Additional measurements of the retinal directional effect in several subjects confirm the validity of a previously advanced theory which describes the retinal directional effect in terms of a Gaussian distribution of the orientations of a population of retinal cones. Arguments are given which show that the proposed population distribution theory is capable of explaining not only the directional brightness effect (Stiles-Crawford effect), but also its spectral variation and the hue shift. T.M.

A71-40671 The tilt after-effect - A fresh look. F. W. Campbell (Physiological Laboratory, Cambridge, England) and L. Maffei. *Vision Research,* vol. 11, Aug. 1971, p. 833-840. 20 refs. Research supported by the Medical Research Council.

A high-contrast grating was used to induce the tilt aftereffect. The effect was found to occur only close to the vertical and horizontal orientations. The interocular transfer of the effect is complete. Judgement of the horizontal and vertical orientations (as measured by determining the standard deviation at a number of orientations) is much more precise than for oblique orientations even when the cue of gravity is removed. All of the characteristics of the tilt aftereffect cannot be accounted for by adaptation of neurons selectively sensitive to orientation, even though they may play a significant role. T.M.

A71-40706 * Stimulation experience and incentive variables as determinants of behavior elicited by hypothalamic stimulation. Verne C. Cox (Texas, University, Arlington, Tex.) and Jan W. Kakolewski (South Dakota, University, Vermillion, S.D.). *Psychonomic Science,* vol. 24, Sept. 10, 1971, p. 245, 246. 7 refs. NIH Grant No. M-4529; Grant No. NGL-36-005-001.

Extensive stimulation experience is shown to increase the proportion of hypothalamic electrode sites yielding elicited eating and drinking during electrical stimulation. The great number of stimuli required for some electrode sites, prior to the emergence of elicited eating and drinking, suggests the possibility that changes in neural tissues surrounding electrode sites underlie the appearance of elicited behavior. M.V.E.

A71-40709 # Speech intelligibility in the presence of time-varying aircraft noise. Carl E. Williams (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.), Karl S. Pearsons (Bolt Beranek and Newman, Inc., Canoga Park, Calif.), and Michael H. L. Hecker (Stanford Research Institute, Menlo Park, Calif.). *Acoustical Society of America, Spring Meeting, 81st, Washington, D.C., Apr. 19-23, 1971, Paper.* 13 p.

Outline of a special test procedure to derive the relation between intelligibility scores and articulation index (AI) for time-varying aircraft noise. This relation is then compared with a relation between intelligibility scores and AI obtained for steady-state simulated aircraft noise. A secondary objective of the study was to compare various physical measures of aircraft noise with respect to their effectiveness in predicting speech intelligibility. It is shown that for a given AI, time-varying noise provides less masking than steady-state noise. F.R.L.

A71-40853 # Specific banding patterns of human chromosomes. Maximo E. Drets and Margery W. Shaw (Texas, University, Houston, Tex.). *National Academy of Sciences, Proceedings,* vol. 68, Sept. 1971, p. 2073-2077. 10 refs. NIH Grant No. GM-15361.

Individual pairs of human chromosomes can be reliably identified by a new method that does not require special optical equipment and that results in permanent preparations. This method, which is based on treatment of the chromosomes in situ with NaOH, followed by incubation in sodium chloride-trisodium citrate and Giemsa staining, results in highly specific banding patterns in characteristic regions of the chromosome arms. It should prove useful for the detection of small structural changes in chromosomes. (Author)

A71-40854 # Hibernation - Alteration of mitochondrial membranes as a requisite for metabolism at low temperature. John K. Raison and James M. Lyons (California, University, Riverside, Calif.). *National Academy of Sciences, Proceedings,* vol. 68, Sept. 1971, p. 2092-2094. 10 refs.

Citellus lateralis squirrels were kept at 23 and 4 deg C in experiments designed to determine the metabolic processes in

mitochondrial membranes during hibernation. The activity of succinate oxidase from isolated mitochondria of hepatic cells of active squirrels showed a nonintersecting discontinuous Arrhenius plot, suggesting that lipids in mitochondrial membranes may undergo a phase change at about 23 deg C. This discontinuity was not evident in mitochondria from the livers of hibernating squirrels, indicating the nonoccurrence of this phase change in their mitochondrial lipids in a state of hibernation. V.Z.

A71-40864 Criteria for the onset of vascular murmurs. Alvin H. Sacks, E. Glenn Tickner, and Ian B. Macdonald (Palo Alto Medical Research Foundation, Palo Alto, Calif.). *Circulation Research,* vol. 29, Sept. 1971, p. 249-256. 11 refs. PHS Grant No. HE-11498.

In an attempt to determine what blood flow conditions give rise to vascular murmurs, a general 'sound boundary' curve was developed which establishes the combinations of minimum flow Reynolds numbers and percent stenosis required for the onset of vascular murmurs. The curve was derived by a combination of engineering analysis and animal experiments in which thin circular orifice plates were implanted in the descending aortas of anesthetized dogs. The results indicate that the sounds are produced by jet instability and associated 'free turbulence' in the flow. M.V.E.

A71-40865 The two components of the human atrial action potential. Alexandre Fabiato and Françoise Fabiato (Paris, Université, Laboratoire de Physiologie Comparée, Orsay, Essonne, France). *Circulation Research,* vol. 29, Sept. 1971, p. 296-305. 21 refs. Research supported by the Délégation Générale à la Recherche Scientifique et Technique and the Société Médicale des Hôpitaux de Paris.

Action potentials studied in 36 human atrial muscle strips at 27 C were found to be separated into two components. Simultaneous recordings with two microelectrodes demonstrated an independent conduction of the second component through selective and variable pathways. Increased separation of the two components was elicited by higher rate and lower intensity of stimulation. It is concluded that the separation is attributable to a nonhomogeneous excitation of the preparation and that the two components are triggered by two relatively independent depolarizations using different channels. M.V.E.

A71-40870 # Coacervates and protoplasm (Koatservaty i protoplazma). K. B. Serebrovskaia. Moscow, Izdatel'stvo Nauka, 1971. 199 p. 552 refs. In Russian.

Review of current concepts on the colloidal nature of protoplasm, and survey of research on the coacervative state of colloidal suspension and on coacervative systems containing biological catalysts. The theory for the regulation of enzyme functions in a living cell is examined within the framework of colloidal-chemical approaches to the study of life. Coacervates are examined from the following three viewpoints: (1) as models of the protoplasm and its elements, (2) as systems simulating the multiple-phase conditions of the cell for studies of the enzyme catalysis, and (3) as models of structures leading to the formation of the simplest organisms. T.M.

A71-40876 # Psychology and outer space (Psikhologiia i kosmos) (2nd edition). Iu. A. Gagarin and V. I. Lebedev. Moscow, Izdatel'stvo Molodaia Gvardiia, 1971. 225 p. In Russian.

This book describes in popular form the history and progress of aeronautics and astronautics with the emphasis on the personal experiences and emotions of individual aeronauts and astronauts during training and flights. The daily routine, equipment, food, habits and personal characteristics of some Soviet and American astronauts are depicted. Their reactions and emotional behavior before and during flights are discussed in some detail. The authors are the first Soviet astronaut and a physician working in space psychology. V.Z.

A71-40909 * Two quantitative measures of skill development. Richard W. Pew and Gary L. Rupp (Michigan, University, Ann Arbor, Mich.). *Journal of Experimental Psychology,* vol. 90, Sept. 1971, p. 1-7. 14 refs. Contract No. NASr-54(06).

A model-matching technique was used to derive estimates of two parameters, system gain and effective time delay, of a differential-equation model for the tracking behavior of fourth, seventh, and tenth graders. These parameters appear to provide more analytic insight into Ss' performance than did tracking error scores alone and suggested that the differences in time delay represent maturational effects while system gain is sensitive to more individualistic properties of Ss' behavior. (Author)

A71-40984 Muscle controlled flow. Y. C. Fung (California, University, San Diego, Calif.). In: Midwestern Mechanics Conference, 12th, University of Notre Dame, Notre Dame, Ind., August 16-18, 1971, Proceedings. Conference supported by the National Science Foundation and the U.S. Air Force. Edited by L. H. N. Lee and A. A. Szewczyk. Notre Dame, Ind., University of Notre Dame Press (Developments in Mechanics. Volume 6), 1971, p. 33-61. 30 refs. NIH Grant No. HE-12494; NSF Grant No. GK-10553.

Body fluids are generally contained in muscular organs. Thus we cannot understand blood circulation, lymph flow, etc., without knowledge of the function of the muscles. In this article a basic formulation of the mechanics of the muscular organ is presented, and is illustrated by the problem of ureteral peristalsis. (Author)

A71-40986 Nonlinear models of normal and abnormal heart rhythms. R. M. Rosenberg and C. H. Chao (California, University, Berkeley, Calif.). In: Midwestern Mechanics Conference, 12th, University of Notre Dame, Notre Dame, Ind., August 16-18, 1971, Proceedings. Conference supported by the National Science Foundation and the U.S. Air Force. Edited by L. H. N. Lee and A. A. Szewczyk. Notre Dame, Ind., University of Notre Dame Press (Developments in Mechanics. Volume 6), 1971, p. 91-118. 10 refs.

Description of a mathematical model of the heart and of an electrocardiograph which can compute the ECG of the heart model. An attempt is made to construct a system of nonlinear oscillators and a coupling between them so that this system reproduces the control system of the heart. A model of the electrocardiograph is constructed which produces six of the twelve traces of the ECG. F.R.L.

A71-41037 * Learned control of heart rate and blood pressure. Michael Hnatiow (Southern Illinois University, Carbondale, Ill.). *Perceptual and Motor Skills,* vol. 33, Aug. 1971, p. 219-226. 11 refs. Research supported by the Wisconsin Alumni Research Foundation and NASA; PHS Grant No. MH-10993.

Cardiac rate-variability control and an initial demonstration of systolic blood-pressure variability control using visual feedback of physiological information were examined. Continuous measures of respiration, heart rate, EKG waveform analysis, and systolic blood pressure were obtained for both experimental groups and for yoked controls who saw the same visual display as the experimental Ss. Ss successful at reducing heart-rate variability showed clear changes in the P-R wave relationships of the EKG, indicating possible direct attempts to manipulate heart rate so as to reduce variability. Ss controlling blood-pressure variability who had high heart rates were

more successful in reducing variability than those with low rates, possibly because of differential feedback to Ss with high and low heart rates. In addition, apparently as a reaction to E's adjustment of the visual target range, experimental Ss showed decreases in mean blood-pressure levels. (Author)

A71-41053 Study of reactivity to transverse accelerations and radioprotectants. V. V. Antipov, M. V. Vasin, B. I. Davydov, E. F. Panchenkova, and P. P. Saksonov. *(International Astronautical Federation, International Astronautical Congress, 21st, Konstanz, West Germany, Oct. 4-10, 1970.) Journal of the Astronautical Sciences,* vol. 19, July-Aug. 1971, p. 77-81. 28 refs. Translation.

The tests were carried out with white mice of mixed breed weighing from 20 to 25 g and guinea pigs weighing from 300 to 350 g. The animals were subjected to back-to-chest transverse accelerations in a centrifuge. All the tested radioprotectants, which were administered 30 min and 4 hrs before acceleration, reduced the resistance of the organism to acceleration. The reactivity of the organism to radioprotective compounds during the aftereffect of transverse accelerations was also studied. G.R.

A71-41055 # Influence of aminazine and chloral hydrate on the intensity of the metabolism of individual components of the brain gangliosides (Deistvie aminazina i khloralgidrata na intensivnost' obmena otdel'nykh komponentov gangliozidov mozga). S. Iu. Tumanova and N. F. Siniutina (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 14-18. 14 refs. In Russian.

Experimental data demonstrating different effects exerted by aminazine and chloral hydrate on brain gangliosides and on such ganglioside components as N-acetylneuramine acid and N-acetylgalactosamine. Aminazine does not substantially affect either the entire ganglioside molecule or the polysaccharide section components. Chloral hydrate changes the metabolism of the entire molecule and sharply increases the activity of N-acetylgalactosamine. The tests were performed on rats. T.M.

A71-41056 # Metabolism of glycerides in the brain under normal conditions and during hypoxia (Obmen glitseridov golovnogo mozga v norme i pri gipoksii). M. A. Flerov (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 18-22. 8 refs. In Russian.

The metabolism of individual fractions of glycerides in the brain of rats was studied under normal conditions and during hypoxia in order to obtain information on the role of glycerides in the biosynthesis of phospholipids. The results show that monoglycerides are intermediate compounds in the metabolism of the other glycerides and phospholipids. Diglycerides exhibit the highest specific activity of the fractions studied. The specific activity of both monoglycerides and diglycerides increases sharply during hypoxia. The largest increase (3.7 times) is exhibited by diglycerides which shows that they play a vital role in the synthesis of triglycerides and phospholipids. The triglycerides show only a small increase in specific activity during hypoxia, and it is considered likely that they constitute a reserve for the synthesis of biologically more important lipids under specific conditions. T.M.

A71-41057 # Content of gangliosides and cerebrosides in the brain under normal conditions, during hypoxia, and under the action of small doses of X-ray radiation (Soderzhanie gangliozidov i tserebrozidov v golovnom mozge v norme, pri gipoksii i deistvii malykh doz Rentgenovskogo obluchenila). L. S. Chaeva and T. N. Norman (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 22-26. 16 refs. In Russian.

The content of cerebrosides in the brain of growing rats was reduced by 2.5 times and the ganglioside content was reduced by almost four times after short exposures to acute hypoxia. The cerebroside content of adult rats remained unchanged, and their ganglioside content was reduced by three times. The cerebroside and ganglioside contents of both adult and growing rats remained within normal limits after exposure to moderate hypoxia. The cerebroside and ganglioside contents remained unchanged for fifteen days after exposure to small doses (40 r) of X-ray radiation. The data show that small doses of ionizing radiation do not cause significant changes in the ganglioside and cerebroside contents of nerve cells. T.M.

A71-41058 # Participation of butyric acid in the biosynthesis of brain carbohydrates (Uchastie maslianoi kisloty v biosinteze uglevodov mozga). Z. N. Tupikova (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 26-32. 20 refs. In Russian.

The synthesis of brain glucose and glycogen from organic-acid products of the endogenic metabolism was studied in rats under normal conditions and during functional disturbances of the central nervous system. The dynamics of butyric acid penetration into the cerebral hemispheres was investigated together with the rate of accumulation of carbon-14 (originating from labelled butyrate) in the glucose and glycogen under normal conditions and during stimulation by caffeine and inhibition by chloral hydrate. Under normal conditions, the radioactivity of glucose is much higher than that of glycogen. Narcotic inhibition further increases the radioactivity of glucose and reduces that of glycogen. A still sharper decrease in the overall level of glycogen activity is observed during stimulation by caffeine. T.M.

A71-41059 # Role of orthodromic and antidromic impulsation in changes of the functional state of the contralateral cerebrospinal center during prolonged stimulation of a mixed nerve (O roli ortodromnoi i antidromnoi impul'satsii v izmeneniiakh funktsional'nogo sostoianiia kontrlateral'nogo spinnomozgovogo tsentra pri dlitel'nom razdrazhenii smeshannogo nerva). N. N. Poliakova (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 41-48. 21 refs. In Russian.

The peroneal nerve in frogs was used to study the role of antidromic stimulation of efferent fibers and the role of orthodromic stimulation of afferent fibers in the evocation of changes in the functional state of the contralateral symmetrical center. Prolonged (duration of several tens of minutes) stimulation of the mixed nerve by rectangular pulses of threshold strength at a frequency of 80 to 100 pulses per second causes long-term changes in the excitability of the contralateral symmetrical cerebrospinal center. Stimulation of the afferent fibers may both enhance and depress the reflex excitability of the symmetrical center, depending on the mode of tetanization. Antidromic stimulation of the motor fibers reduces the reflex excitability of the symmetrical center. T.M.

A71-41060 # Study of the state of 'operational rest' in man (K izucheniiu sostoianiia 'operativnogo pokoia' u cheloveka). K. S. Tochilov, V. M. Ukhin, and A. I. Shabanov (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 99-105. 6 refs. In Russian.

The state of operational rest denotes a passive condition of heightened readiness in expectation of a stimulus requiring urgent active response. The situation is encountered in many practical situations when an operator awaits an urgent signal on a control panel. The waiting period is usually characterized by the complete absence of sensory stimuli and of muscular activity, which may have a detrimental effect on the response of the subject when the signal finally presents itself. This possibility was examined by an experi-

ment in which the waiting period was characterized by the presence of additional non-urgent signals requiring specific functions; in addition, some muscular nerves of the lower extremities were electrically stimulated. Care was taken not to remove the attention from the arrival of the urgent signal. The additional activation of the operator during the waiting period reduced the response time for the urgent signal and improved the functional state of the operator. T.M.

A71-41061 # **Trace processes as a basis for the change in efficiency during exercise and active rest according to Sechenov (Sledovye protsessy kak osnova izmeneniia rabotosposobnosti pri uprazhnenii i aktivnom otdykhe po Sechenovu).** L. P. Pavlova (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 105-112. 16 refs. In Russian.

The functional state continues to change in a phased manner after the stimulus has been terminated, and the necessity of analyzing these trace reactions when organizing rest and work periods in labor schedules has been demonstrated in previous studies. The present work examines the dynamics of trace processes in the symmetrical nerve centers of hands. The active rest mechanism is related with the trace exaltation phase on the basis of tests in which arbitrary rhythmic bending of fingers was used to determine the stimuli and sensations from exercised muscles. T.M.

A71-41062 # **Problem of the formation of a motor stereotype with different muscular loads (K voprosu o formirovanii dvigatel'nogo stereotipa pri razlichnykh myshechnykh nagruzkakh).** V. S. Aver'ianov and T. G. Mikhailova (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 113-118. 5 refs. In Russian.

Training exercises were performed in which the subject was required to pull a lever with his right hand in response to a lamp signal. Completion of the task extinguished the lamp. The entire training period lasted from 50 to 60 min and consisted of 80 tasks in eight stages; each stage involved only one of four different lever loads. Measurements show that the training period is divided into three stages successively characterized by a reduction of the motor period, a stabilization of the motor period, and a reduction of the latent period. The electrical activity of the main working muscle increases for lever motions with small loads and somewhat decreases for motions with large loads. The static tension decreases in the course of the training period. Distal muscles are the first to be activated at the beginning of training, while proximal muscles are the first to be activated at the end of the training period. T.M.

A71-41063 # **Adequatometry, discretometry, and creativity in the biophysical neurochemodynamics of man (Adekvatometriia, diskretometriia i sozidatel'nost' v biofizicheskoi neirokhemodinamike cheloveka).** P. O. Makarov (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 124-131. 11 refs. In Russian.

The phenomena of molecular, cellular, systemic, and psychic levels are examined from common biophysical viewpoints. Differential excitability, reactivity, adequacy, and guidance are observed at all of these levels, and a theory is proposed for the relationship between recovery and creativity. The observed dependence of the depolarization of a single nerve fiber on the duration of the stimulus confirms the proposed definitions of differential excitability and adequacy. The latent period observed for both single and paired stimuli is examined as a possible measure of human biophysical neurodynamics. Curves of stimulus magnitude vs response duration were constructed for the blinking reflex, and the influence of nerve and brain adjustment processes on the blinking reflex was examined. The critical discreteness interval of the human tactual analyzer was measured. T.M.

A71-41064 # **Investigation of the functional lability of the human tactual analyzer (K issledovaniiu funktsional'noi podvizhnosti kozhnogo analizatora cheloveka).** U. U. Teibe (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 140-142. 12 refs. In Russian.

The functional lability (rate of nerve processes) of a sensory analyzer can be determined by measuring the minimum interval between two discrete stimuli which are controlled in force, duration, and area of application. An air jet was used as a tactual stimulus, and the critical discreteness interval was measured on the basis of speech responses and unconditioned blinking reflex reactions. The duration of the critical discreteness interval is described as a function of stimulus duration, pressure, and affected area by a first-order equation in a four-dimensional space where the coordinates consist of these four variables. T.M.

A71-41065 # **Role of spatial coherence of the light flux in visual reception (O roli prostranstvennoi kogerentnosti svetovogo potoka v zritel'noi retseptsii).** A. B. Kravtsov and E. P. Shaitor (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 143, 144. 7 refs. In Russian.

Consideration of the problem of the visual localization of Obreimov's (1966) so-called aventurine spots in space. It is shown that each aventurine spot is perceived as a point light source,located further from the eye pupil than the screen used in the observations. It is concluded that an increase in the degree of spatial coherence of the light flux increases the reaction of the receptor without increasing the stimulus energy. A.B.K.

A71-41066 # **Experimental analysis of the information content of the aural electric field of the human body (Eksperimental'nyi analiz informatsionnogo soderzhaniia aural'nogo elektricheskogo polia tela cheloveka).** P. I. Guliaev, V. I. Zabotin, N. Ia. Shlippenbakh, and V. A. Gordienko (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 145-149. 5 refs. In Russian.

Description of two methods of extracting from the total electroaurogram pattern component relating only to the electrical activity of the heart. The first method consists in maintaining a fixed distance from the probe to the subject's chest, in order to decrease the mechanical vibrations of the latter with respect to the probe. The second method consists in limiting the frequency characteristic of the recording device. The types of information carried by the electrotonic and triboelectric components of the aural electric field are discussed. A.B.K.

A71-41067 # **An analog method of measuring one-dimensional EEG amplitude distribution functions (Analogovyi metod izmereniia odnomernykh funktsii raspredeleniia amplitud EEG).** V. A. Smirnov (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Nervnaia Sistema,* no. 11, 1970, p. 152-157. 15 refs. In Russian.

Description of a scheme for constructing an analog statistical analyzer for measuring one-dimensional EEG amplitude distribution functions. The proposed scheme is based on the use of an analog computer to achieve transformation of tau sub i intervals into a sequence of square pulses with a standard amplitude and with lengths equal to the lengths of the tau sub i intervals. The use of the method is illustrated in an experiment to determine the reaction of a subject to a weak (threshold) acoustic stimulus. A.B.K.

A71-41068 # **Certain studies of electroencephalogram wave asymmetry (Nekotorye issledovaniia asimmetrii voln elektroentsefalogrammy).** V. A. Doroshenko, A. I. Pudovkin, and V. E. Rozenfel'd (Leningradskii Gosudarstvennyi Universitet, Leningrad,

USSR). *Nervnaia Sistema,* no. 11, 1970, p. 158-161. 8 refs. In Russian.

Description of a method of EEG analysis involving the use of an analog computer to construct a certain function characterizing the changes in the difference between the lengths of EEG wavefronts. The proposed method employs a scale amplifier, a signal differentiator, an amplifier limiter, a low-frequency filter, and two pulse-counting integrators. It is shown that a change in the nature of an EEG is reflected in a change in the above-mentioned function. The use of this method of EEG analysis is illustrated by considering the detection of a reaction in the human EEG to a fairly weak (threshold) acoustic stimulus. It is concluded that the asymmetry level is not only a fine indicator of a change in the functional state of the organism but also apparently has a certain physiological meaning. A.B.K.

A71-41069 # **Participation of thyroxine in the interaction of the isoenzymes of brain glutaminase, and some thyroxine action peculiarities (Uchastie tiroksina vo vzaimosviazi izoenzimov glutaminazy mozga i osobennosti ego deistviia).** V. S. Oganesian, G. Kh. Buniatian, K. S. Mikirtumova, and L. L. Badalian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR). *Voprosy Biokhimii Mozga,* vol. 6, 1970, p. 5-13. 10 refs. In Russian.

Investigation results on the role of thyroxine in brain biochemistry are discussed. It is shown that thyroxine enhances the deamidation of glutamine in brain mitochondrial fractions much more strongly than sodium phosphate, acetylaspartate, bicarbonate and aspartate. It is found that phosphate-dependent and phosphate-independent isoenzymes of brain glutaminase form an enzyme system whose interaction is affected by thyroxine. M.V.E.

A71-41070 # ***Age-dependent changes in the free amino acid* content of the cerebral arteries and carotid artery in man and in dogs (Vozrastnye izmeneniia soderzhaniia svobodnykh aminokislot arterii mozga, aorty i sonnoi arterii u cheloveka i sobaki).** S. A. Mirzoian, B. A. Kazarian, V. P. Akopian, and E. Kh. Safarian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR). *Voprosy Biokhimii Mozga,* vol. 6, 1970, p. 109-119. 17 refs. In Russian.

Comparison of the free amino acid content and composition of the brain arteries with those of the aorta and carotid artery in young and old human subjects and dogs. The vessels of humans spanning the ages of 12 to 91 were studied 16 to 20 h after death due to various causes. It is shown that brain arteries have the larger free amino acid content and that, in contrast to other arteries, they contain considerable amounts of gamma-aminobutyric acid. The free amino acid content of all arteries decreases with age and reaches a minimum in old age. Findings pertaining to dog arteries parallel those concerning humans. M.V.E.

A71-41071 # **Purine and pyrimidine derivatives of the hypothalamus (Purinovye i pirimidinovye proizvodnye gipotalamusa).** A. A. Galoian, R. A. Zakharian, Iu. A. Antonian, V. T. Galfaian, and Dzh. K. Demirchian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR). *Voprosy Biokhimii Mozga,* vol. 6, 1970, p. 139-146. 12 refs. In Russian.

Review of the composition of purine and pyrimidine bases of cattle hypothalamus and their derivatives as determined by gel filtration and subsequent spectral analysis and chromatography. Substances recovered from the Sephadex G-10 column in an aqueous medium are in the order named: inosine monophosphate, guanosine monophosphate, adenosine monophosphate, hypoxanthine, uracil, and guanine. M.V.E.

A71-41072 # **Formation of coronary-dilating compounds from 'inert' proteins, carriers of the hypothalamus (Ob obrazovanii koronarorasshiriaiushchikh soedinenii iz 'inertnykh' belkov-nositelei gipotalamusa).** R. M. Srapionian, T. A. Dzhambazian, and A. A. Galoian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR). *Voprosy Biokhimii Mozga,* vol. 6, 1970, p. 157-160. 7 refs. In Russian.

Coronary-dilating substances of low molecular weight, separated from their protein carriers through dialysis, are studied. After dialysis, these proteins exhibit no coronary-dilating effect, but, following their hydrolysis with trypsin, some coronary-dilating substances of low molecular weight are formed. The latter have been separated by paper chromatography. These results suggest that some specific proteins separated from the hypothalamus represent probably not only carriers but also sources of these active substances. M.V.E.

A71-41073 # **Changes in serotonin and gamma-aminobutyric acid in midbrain slices incubated in media of various ionic composition, and the effect of gamma-aminobutyric acid on the release of serotonin (Izmenenie soderzhaniia serotonina i gamma-aminomaslianoi kisloty v srezakh srednego mozga, inkubirovannykh v sredakh s razlichnym ionnym sostavom, i deistvie gamma-aminomaslianoi kisloty na vysvobozhdenie serotonina).** N. A. Esaian and A. R. Armenian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR). *Voprosy Biokhimii Mozga,* vol. 6, 1970, p. 171-181. 20 refs. In Russian.

A study of the loss of serotonin from rat midbrain slices incubated in media of various ionic composition showed that in a medium of low Na(+) the loss of serotonin was significantly blocked. Conversely, the most pronounced loss of serotonin was observed in the presence of ouabain. Whereas the loss of serotonin from slices increased in a K-strengthened medium, it was markedly impeded after incubation in a high K(+)-low Na(+) medium. The loss of gamma-aminobutyric acid from slices was not significantly affected by the omission of Ca(++), was slightly reduced in the absence of K(+), and was very markedly enhanced in a low Na(+) medium. Gamma-aminobutyric acid inhibited the release of serotonin from slices in a medium of balanced ionic composition. M.V.E.

A71-41074 # ***The phospholipid composition of white matter* in different parts of the brain, spinal cord, and sciatic nerve in dogs (O fosfolipidnom sostave belogo veshchestva raznykh otdelov golovnogo i spinnogo mozga i sedalishchnogo nerva sobaki).** K. G. Manukian and L. G. Kirakosian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR). *Voprosy Biokhimii Mozga,* vol. 6, 1970, p. 183-202. 90 refs. In Russian.

The results of white matter composition studies indicate that the amount of lipids and phospholipids increases from the cerebral white matter to the thoracic section of the spinal cord after which it decreases. The lipids of the spinal cord and especially of the sciatic nerve are richer in phospholipids than the brain. The phosphatides of the white matter of the brain and of the various parts of the spinal cord and sciatic nerve are mainly ethanol-amine phosphatide, sphingomyelin, lecithin, and in lesser amounts serinephosphatide, monophosphoinositide, and polyglycerophosphatide. The content of total lipids and most phosphatides in the white matter of the cervical and thoracic sections of the spinal cord is higher than in the lumbosacral section. But the relative percentage of phosphatides is very stable in the white matter of the various parts of the spinal cord. M.V.E.

A71-41075 # ***Effects of gangliosides on active Ca(++) transport* in brain mitochondria (Vliianie gangliozidov na aktivnyi perenos Ca/++/ v mitokhondrii mozga).** E. E. Mkheian and O. P. Sotskii (Erevanskii Meditsinskii Institut, Yerevan, Armenian SSR). *Voprosy Biokhimii Mozga,* vol. 6, 1970, p. 213-218. 17 refs. In Russian.

The results are discussed of a study of ganglioside effects on the activation of respiration in rat brain mitochondria, using succinate (added both before and after the introduction of gangliosides) as the

respiratory substrate. The results obtained indicate that Ca(++) activates mitochondrial respiration by 44 per cent while gangliosides inhibit this process. The inhibitory effect of gangliosides is markedly reduced when they are added after the succinate. The reduction of Ca(++) transport in mitochondria seems to be due to reduction in oxidative phosphorylation. M.V.E.

A71-41198 The effect of a peripheral stimulus on accommodation. Robert T. Hennessy and H. W. Leibowitz (Pennsylvania State University, University Park, Pa.). *Perception and Psychophysics,* vol. 10, Sept. 1971, p. 129-132. 13 refs. PHS Grant No. MH-08061.

Accommodation was measured by the laser scintillation technique while the S viewed a stationary fixation spot through a series of apertures in a screen located at various distances. The magnitude of accommodation was a compromise between the distance of the fixation spot and the screen. Accommodation was affected significantly by the interaction of the distance of the screen with aperture sizes of 1 and 4 deg and distance of the screen with its order of movement from near to far or far to near. The data are interpreted as implying the importance of the peripheral visual field and/or perceptual factors when conflicting cues to distance coexist in the visual field. (Author)

A71-41199 The effect of perceived distance on induced movement. Walter C. Gogel and Michael Koslow (California, University, Santa Barbara, Calif.). *Perception and Psychophysics,* vol. 10, Sept. 1971, p. 142-146. 12 refs. PHS Grant No. MH-15651.

The magnitude of induced movement was measured as a function of the perceived depth between the test object and the plane of the induction object, with this perceived depth produced by stereoscopic cues. Predictions of the magnitude of induction as a function of the depth separation of the test and induction object were made from the subject-relative and object-relative hypotheses of induced motion. It was expected, however, that neither of these hypotheses would predict the results independently of a factor described in the adjacency principle. This principle states that the effectiveness of whatever cues or processes determine the induced movement will decrease with increased depth between the test and induction object. The data indicate that the adjacency principle must be considered in explaining the results. The subject-relative rather than object-relative hypothesis as modified by the adjacency principle was most successful in predicting the results. M.V.E.

A71-41369 # Morphophysiological alterations under the action of electromagnetic waves at radio frequencies (Experimental studies) (Morfofiziologicheskie izmeneniia pri deistvii elektromagnitnykh voln radiochastot /Eksperimental'noe issledovaniia/). M. S. Tolgskaia and Z. V. Gordon. Moscow, Izdatel'stvo Meditsina, 1971. 136 p. 134 refs. In Russian.

The monograph summarizes the results of morphological and physiological studies of the reversible and irreversible effects of radio waves on a total of 646 rabbits, rats and mice, covering chronic and acute exposures at 500 kHz to 1.5 MHz, 14.88, 69.7, 155 and 191 MHz, lasting from several minutes to 15 months. The functional and morphological changes produced by exposures of various lengths and intensities in the cardiovascular and nervous systems, myocardium, reproductive organs, biochemistry, blood, eye, weight, cerebrum, cortex, spinal cord, skin and neurons are discussed. Exposures in the centimeter wavelength range tended to affect the nervous fibers of the skin, internal organs and cortical neurons while exposures in the decimeter range showed no effect on the nervous activity of the skin. The monograph is intended for scientists interested in the subject. V.Z.

A71-41374 # Synopses of experimental research on the higher nervous activity of man (from a growth aspect) (Ocherki eksperimental'nogo issledovaniia vysshei nervnoi deiatel'nosti cheloveka /v vozrastnom aspekte/). A. G. Ivanov-Smolenskii. Moscow, Izdatel'stvo Meditsina, 1971. 448 p. 332 refs. In Russian.

Systematic evaluation of long-term experimental research on the physiology and pathophysiology of human higher nervous processes. Attention is given to the forms of nervous activity in normal and pathological states, the interaction of the cerebral cortex with lower substructures of the central nervous system, the behavior and interaction of nervous processes, and the unconditional-reflex activities. The main features of the reflex-forming function are described, together with the interaction of signal systems and the properties of conditioned and nonconditioned inhibitions. Special attention is given to the development of nervous processes in the course of biological growth. T.M.

A71-41418 Comparative study of hyperoxemic convulsions and their prevention in two primates, Macacus nemestrinus and Papio papio (Etude comparée chez deux primates /Macacus nemestrinus et Papio papio/ de la crise comitiale hyperoxique et de sa prévention). R. Grandpierre, G. Neverre, J. Rozier, and P. Henry (Bordeaux II, Université, Bordeaux, France). *Journal de Physiologie,* vol. 63, June-July 1971, p. 547-550. In French.

Use of the photosensitivity of two primates as a means of studying hyperbaric convulsions. Sensitivity to hyperbaric oxygen appears to be similar in both species. However, the preventive effect of Diazepam and two of its derivatives (Ro.05.4023 and Ro.05.4200) was more definite in Macacus nemestrinus than in Papio papio. F.R.L.

A71-41476 The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. Symposium sponsored by the National Illumination Committee of Great Britain and the Imperial College of Science and Technology. London, Adam Hilger, Ltd., 1971. 424 p. $16.80.

This series of papers brings together the knowledge and experience of scientists and engineers, those engaged in studies of perception, designers of signaling equipment, and users of flashing light signals. The sessions cover visual perception of flashing lights, general application of flashing lights, road, rail, and marine applications, aviation applications, and research - recent and future. Discussions are included at the end of every session. Also covered are a study of the apparent flicker rate at subfusional frequencies, the treatment of binocular vision problems with light flashing at 9 Hertz, and a study of the behavioral effects of flashing road pedestrian beacon. Author and subject indexes are provided. G.R.

A71-41477 Visual processes involved in seeing flashes. J. J. Vos and A. van Meeteren (Institute for Perception RVO-TNO, Soesterberg, Netherlands). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 3-16. 32 refs.

Aspects of flash perception considered include the conspicuousness at suprathreshold levels, the unreliability at threshold levels, and the latency effects which may be used with profit to simulate movement. The most important feature of flash perception is the state of unpreparedness of the visual system. All sorts of electrophysiological experiments have revealed so-called, 'center-surround' processes in which the surround partly annihilates the activity of the center. Data on the quantitative importance of these processes have been derived in recent years from the study of spatial contrast sensitivity functions. G.R.

A71-41478 Subjective brightness of a flashing light stimulus within the fovea as a function of stimulus size. R. McD. Saunders (Imperial College of Science and Technology, London, England). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 17-28. 20 refs.

It is found in the investigations conducted that the subjective brightness of a flashing light increases in two phases with increasing stimulus area. This is probably due to the integrated action of summation and inhibition in the retina. The transition area (the area at which transition between the two phases of increase in subjective brightness with stimulus area occurs) increases with increasing intensity. Background fields accentuate the shift in transition area with intensity. Edge effects contribute significantly to subjective brightness at suprathreshold levels but are insignificant at threshold levels. G.R.

A71-41479 Threshold perception of flashes in relation to flicker. J. A. J. Roufs (Instituut voor Perceptie Onderzoek, Eindhoven, Netherlands). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 29-42. 9 refs.

The experiments conducted show a high degree of constancy of the ratio of flicker and flash sensitivities even in cases in which the mean level of intensity is varied over a large range. The product of cut-off frequency and critical duration is also nearly constant. This constancy is explained in a theoretical analysis based on three system properties. The ratio of the sensitivity S, which is defined as the maximum value of the amplitude sensitivity at a certain level, and the sensitivity of flashes F is considered. The numerical experimental value of this ratio is found to be larger (by a factor of 2.5) than theoretically expected. G.R.

A71-41480 Absolute thresholds as a function of pulse length and null period. Douglas H. Williams and Terrence M. Allen (Michigan State University, East Lansing, Mich.). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 43-54. 14 refs.

Absolute foveal thresholds were obtained for a complete range of pulse lengths and null periods. It was found that the data could be described by a relation proposed by Blondel and Rey (1912), if the value of the empirical constant in the relation were variable. The constant is to be equal to the null period for very short null periods, and to approach the Blondel-Rey constant asymptotically for long null periods. A simple equation is suggested to describe the change of the constant with the null period. However, further data are needed to test the adequacy of this equation. G.R.

A71-41481 Variability of depth perception under conditions of intermittent illumination. A. M. Mayyasi, W. L. Johnston, and W. T. Burkes (Texas A & M University, College Station, Tex.). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 55-60. 15 refs.

The depth perception scores obtained for the ten subjects tested under the various combinations of the experimental conditions were statistically treated by a specialized analysis of variance routine. Source of illumination was the only statistically significant parameter which affected the depth perception scores. The data were further analyzed by the Duncan Multiple Range Test. The results indicate that the average decrement of depth perception under conditions involving a central illumination source was positive (i.e., subjects placed the movable rod in front of the stationary rod). Under the conditions of a peripheral source the average decrement of depth perception was negative (i.e., subjects placed the movable rod behind the stationary rod). G.R.

A71-41482 The application of flashing light stimuli to the detection and quantitative assessment of early pathological visual loss. C. H. Bedwell (City University, London, England). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 61-70. 14 refs.

The design of a clinical instrument employing flashed light stimuli is discussed. The instrument, called Visual Field Analyzer, is equipped with a separate external illuminator, which provides an illumination of 10 lux on a black screen. This screen contains the apertures for the stimuli, and has a reflection factor of approximately 10%. A xenon electronic discharge lamp was chosen as the light source. The minimum discernible luminance difference observed as a function of the age of the subject is discussed to obtain a basis for the differentiation between normal and abnormal cases. It is pointed out that the use of the Visual Field Analyzer makes it possible to conduct routine visual field examinations. G.R.

A71-41483 The influence of the angular size, adaptation luminance, pulse shape, and light colour on the Blondel-Rey constant a. H. J. Schmidt-Clausen (Philips' Gloeilampenfabrieken, Eindhoven, Netherlands). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 95-111. 5 refs.

The tests in the investigation were performed by two observers with good binocular vision. The observations were carried out at super-threshold luminances. The effects of the angular size and of the adaptation luminance were studied for white, blue, green, yellow, and red light signals with a constant pulse shape of the light flashes. With Bloch's law and the form factor relations for arbitrary pulse shapes can be determined. The calculation of the transfer factor of a light signal is discussed. The transfer factor describes the effective intensity of a flashing light in comparison to a steadily burning light under the same conditions of observation. G.R.

A71-41484 An investigation of the effective intensity of flashing lights at threshold and supra-threshold levels. Edward J. Rinalducci and Kent E. Higgins (Virginia, University, Charlottesville, Va.). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 113-125. 22 refs. U.S. Department of Transportation Contract No. DOT-CG-83635.

The stimuli in the investigation were presented haploscopically in Maxwellian view in order to avoid possible retinal interaction effects that might be obtained with monocular stimulation. A true standard flash of a fixed duration and intensity was employed. The method of co-terminating stimulus presentation was also used. The data obtained show the presence of a Broca-Sulzer effect for point stimuli only when the standard flash illuminance is 1 or 2 log units above the 99% threshold. The backward masking hypothesis suggested by Raab and Osman (1962) and Naus (1967) offers a tenable explanation for the results. G.R.

A71-41485 A probability approach to visual effectiveness of signal lights. Guy P. Clark (U.S. Coast Guard, Applied Technology

Div., Washington, D.C.). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 145-151. 5 refs.

Data of Blackwell and McCready (1952) regarding the normalized standard deviation are considered together with the hypothesis that supra-threshold brightness matching is analogous to maintaining constant levels of the normalized standard deviation above 50% threshold. Data reported by Naus (1968) are used as an example of the use of this hypothesis. A set of curves is produced with the Broca-Sulzer effect clearly shown. The conventionally used real world threshold of 0.2 microlux is the basis of a 0.2 microlux curve presented. A similarity with the Blondel-Rey equation makes the 0.2 microlux curve a useful approximation. G.R.

A71-41486 The relative conspicuities of flashing lights by a comparison method. R. A. Edwards (Imperial College of Science and Technology, London, England). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 209-216. Research sponsored by the Road Research Laboratory.

The possibility of classifying flashing lights of various characteristics in order of conspicuity, or attention-attracting value, is investigated by showing the observer the lights in a series of pairs and asking him to judge which one attracted his attention the more in each comparison. It is shown how the data can be converted into a psychometric scale of conspicuity. Practical precautions which should be taken to achieve the best results are outlined. V.P.

A71-41487 Some theoretical aspects of an apparent motion phenomenon associated with certain configurations of flashing lights. David H. Foster (Imperial College of Science and Technology, London, England). In: The perception and application of flashing lights; *Proceedings of the International Symposium*, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 217-224. 9 refs.

The sensation of motion that appears under certain conditions between two discrete stationary sources of light flashed on and off with one source lagging the other is analyzed. It is shown that both this apparent motion phenomenon and real motion phenomena may be described by the same functional processes. Specifically, it is demonstrated that the existence of an apparent motion effect associated with stationary flashing light sources is a natural consequence of a model designed to describe certain real motion effects, and that the frequency response characteristics of this apparent motion are the same as those of the equivalent real motion effect. V.P.

A71-41488 Detection, discrimination and brightness of successively presented flashing lights. Sidney Stecher (Brandeis University, Waltham, Mass.). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 225-244. 30 refs. NIH Grants No. NB-7340; No. EY-00023.

Two flashes of equal area were presented to the same foveal location in succession, using a four-channel binocular Maxwellian viewing system. Changes in the field threshold as a function of the interstimulus interval (ISI) were evaluated for various durations of the test flash (in all experiments, the interval separating two flashes was greater than that required to just perceive two flashes). A lack of difference in the relative threshold changes was found in monocular and binocular conditions. This indicates that temporal interactions yielding the threshold effects observed in the successive method are centrally limited, to the degree that binocular presentation reflects central involvement. Brightness matches for simultaneously presented spatially adjacent fields (simultaneous contrast) showed that the temporal data reflecting adaptation and backward masking are adequately fitted by the Jameson and Hurvich formulation under successive contrast conditions. V.P.

A71-41489 A survey of the use of flashing lights in aviation. C. A. Douglas (National Bureau of Standards, Washington, D.C.). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 251-270. 13 refs.

The history and progress of flashing light applications in aviation up to date are surveyed, noting that the flashing characteristics of aviation lights were in most cases developed empirically from flight experience. It is pointed out that the primary purpose of flashing light uses in aviation has been and is conspicuity and identification and that except for high intensity beacons economy of power has been a secondary consideration. The photometric characteristics of most flashing lights in aviation are given in terms of steady burning intensity and minimum flash duration, or in terms of instantaneous intensity during a flash integrated within a certain time limit, often 0.5 sec. V.Z.

A71-41490 Colour defective vision and the recognition of aviation colour signal light flashes. Mark F. Lewis and Jo Ann Steen (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 271-280. 9 refs.

Subjects with varying types and degree of color deficiency were given various color tests including the American Optical H-R-R plates, the Dvorine plates, the Color Threshold Tester, the Farnsworth Lantern, the Farnsworth Munsell 100-hue, the Farnsworth Panel D-15, the Titmus Vision Tester Color Plate, and an anomaloscope examination. Correlations are obtained to characterize the ability of subjects to discriminate red, white and green aviation signals. The results generally indicated that the Farnsworth Lantern was a superior predictor of performance in practical tests. V.Z.

A71-41491 Aircraft flashing lights - A summary of Canadian Forces investigations. F. C. Brewer. In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 281-287. 7 refs.

Recent work on aircraft warning signals, navigation and anti-collision displays, and the autokinetic phenomenon carried out by the Canadian Forces is reviewed. Covered are two laboratory experiments on warning signals, three operational studies on anti-collision and navigation lights, and one laboratory experiment on autokinetic latency and displacement. The results are summarized as follows: pilots wearing spectacles in flight are not less sensitive to peripheral visual stimulation than others. The tactile warning display studied is not effective in easing the workload of the visual system. Strobe lights of white rotating beacons should not be used on aircraft. Any rotating beacons operating in clouds can cause disorientation. Conventional navigation and anticollision lighting systems fail to indicate aircraft flight path and altitude. Aircrew should be briefed on, but not trained in, autokinetic motion. V.Z.

A71-41492 Perception of effective flashes produced by a scintillating xenon arc flash tube. Robert Bates (Rochester, University, Rochester, N.Y.). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College

of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 289-301. 8 refs.

An experimental procedure similar to the one used by Blackwell (1958) was used to determine the applicability of the Blondel-Rey equation (1911) to xenon arc flash tubes, particularly when the constant a in the equation is 0.21. A diagnostic scintillator controlled the flashes produced by bursts of xenon arc pulses at a flicker frequency of 100 and a burst length of 0.3 sec to obtain an effective 0.3 sec test flash for perception by human eyes. The constant a was between 0.147 and 0.211 for 30 microsec and 0.01 sec flashes and was consistently smaller for 0.01 sec flash than for 30 microsec flash in the observer's perception. The use of 0.2 as the constant in intensity determinations of xenon tube flashes is suggested. V.Z.

A71-41493 Strobe lighting - A strengthening factor for the 'see and be seen' backbone of collision avoidance. James G. Golden (Air Line Pilots' Association). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 303-310.

The potential of strobe lighting in aviation is discussed as an effective approach to the reduction of the ever increasing midair collision hazards. The Collision Avoidance System (CAS) developed by the Airline Transport Association and the more recent Pilot Warning Indicator (PWI) are assessed, noting the latter as the one which is more promising for the application of strobe lighting to assist pilots in sighting approaching aircraft. Arguments are given in favor of a speedy introduction of strobe lighting into aviation. V.Z.

A71-41495 Effects of hypoxia on response time to peripheral visual signals. John L. Kobrick (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 323-335. 10 refs.

Description of three studies conducted to determine the effects of hypoxia on the detection of flash signals occurring in a number of positions distributed throughout the peripheral visual field. It appears that response time increased markedly and systematically as stimulus position became more peripheral. The data show that in a situation where visual signals occur in unpredictable fashion, operators are progressively slower and more variable in response as signal locations become more peripheral. These changes are heightened by hypoxia, in direct relation to severity and duration of exposure. F.R.L.

A71-41496 Approximation of the radiation characteristics of flashing lights and designing photometric apparatus. V. G. Baryshnikov (Vsesoiuznyi Nauchno-Issledovatel'skii Svetotekhnicheskii Institut, Moscow, USSR). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 343-362. 14 refs.

Discussion of a method of analyzing the sensitivity and errors of the measuring apparatus, the principle of which is to examine successive stages of measurement of the pulse as it passes through the measuring channel elements, and to compare the output and input signals. The flash photometric apparatus is composed of an optical system, a photoreceiving unit, and an amplifying system with an indicating or a registering unit. Three aspects of the problem of passing these pulses through the apparatus measuring channel can be distinguished: spatial, spectral, and temporal, each of which can be matched with the same characteristics of the corresponding elements of the photometric apparatus. F.R.L.

A71-41497 A study of the apparent flicker rate at sub-fusional frequencies. S. C. Sharma and H. C. Yorke (Aston, University, Birmingham, England). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 363-368. 19 refs.

Results of a pilot study to investigate stimulus variables (test field size, brightness, and retinal location) that may influence an observer's assessment of the rate of flicker of a stimulus. A modified stroboscope was used to produce a constant light output per flash over the frequency range used. Observations were made monocularly, and throughout the study a rigorously applied sequence of instruction and observation was used for every observer. The results obtained tend to support the view that the retinal location of the stimulus is significant in modifying assessments of flicker rates. The tendency for the assessment of frequency to be moved toward 9 Hz leads to the suggestion that this is due to the inherent clock mechanism of the brain. F.R.L.

A71-41498 Systematic variations in the absolute threshold for flashing lights. F. J. J. Clarke (Ministry of Technology, National Physical Laboratory, Teddington, Middx., England). In: The perception and application of flashing lights; Proceedings of the International Symposium, Imperial College of Science and Technology, London, England, April 19-22, 1971. London, Adam Hilger, Ltd., 1971, p. 375-378. 8 refs.

Determination of thresholds by means of a special instrument (the quadrant adaptometer) which makes possible continuous tracking of fluctuations of sensitivity. The threshold stimulus display consists of four quadrant-shaped panels of opal glass which can be flashed sequentially or simultaneously for 0.1 sec at a controllable repetition period. In use, the luminance of the panels is continuously increasing or decreasing. Systematic statistical analysis of data for several observers indicates that threshold variations are unaffected by varying wavelength or the position of a small stimulus in the retina, showing that rod and cone initiated responses behave similarly and that the origin of the effect is probably not in the receptors. F.R.L.

A71-41521 # Myocardial metabolism in cyanotic congenital heart disease. J. Scheuer, J. A. Shaver, F. W. Kroetz, and J. J. Leonard (Pittsburgh, University, Pittsburgh, Pa.). *(American College of Cardiology, Annual Meeting, New Orleans, La., Feb. 27, 1970.) Cardiology,* vol. 55, no. 4, 1970, p. 193-210. 32 refs. Research supported by the Health Research and Services Foundation; NIH Grant No. FR-56.

Eight normal subjects and seven cyanotic patients, five with tetralogy of Fallot, and two with Eisenmenger's syndrome, were studied with coronary sinus catheterization. In the resting state, myocardial lactate balance was similar in the two groups, but coronary sinus lactate/pyruvate ratios were frequently higher than arterial ratios in the cyanotic group. Myocardial oxygen delivery appeared adequate during exercise stress in cyanotic patients, and lactate and pyruvate analysis failed to show evidence of myocardial hypoxia. The results indicate that, although the mechanisms of oxygen delivery to the myocardium may differ in normals and some patients with cyanotic congenital heart disease, left ventricular myocardial oxidative metabolism is intact even in the presence of hypoxemia. M.M.

A71-41522 # Sympathetic control of right ventricular dynamics. J. B. Pace (Pennsylvania, University, Philadelphia, Pa.). *Cardiology,* vol. 55, no. 4, 1970, p. 218-236. 21 refs. PHS Grant No. HE-07762; Contract No. Nonr-551(54).

Pressure-flow dynamics in the right ventricular outflow-tract were analyzed during sequential increases in cardiac sympathetic nerve activity in dogs anesthetized with chloralose. The aim of the study was to provide a precise definition of the extrinsic nervous

control of pressure and flow in the right ventricle. The measurements allowed for the assessment of the magnitude of kinetic pressure and permitted an analysis of the influence of the kinetic component on the formation of outflow-tract pressure differences. The first wave developed in early systole and was independent of flow velocity in the outflow tract; the second wave developed in midsystole and extended into late systole. When the kinetic component was taken into account by recording impact pressure in the conus, the magnitude of the late systolic pressure difference was markedly reduced from values recorded as a function of lateral pressure. Total pressure differences in late systole were attributed to the formation of a dynamic resistance in the infundibular zone. M.M.

A71-41568 Relation between the appearance of the injury current on the ECG in anoxia and the fall of the phosphorylcreatine content of the myocardium. II (Relation entre l'apparition du courant de lésion sur l'E. C. G. en anoxie et l'effondrement de la teneur du myocarde en phosphorylcréatine. II). Paul Borredon. *Revue de Médecine Aéronautique et Spatiale*, vol. 10, 2nd Quarter, 1971, p. 59-62. In French.

Review of many previous studies of the effect of anoxia on cardiac action in laboratory animals (guinea pigs, rabbits, frogs), with evaluation of results. It is suggested that it may be possible to predict the importance of the phosphorylcreatine content on the injury current. The concept of evolution, as well as the ECG record, is emphasized. F.R.L.

A71-41569 Hyperventilation in flying personnel (Report of 13 cases) (L'hyperventilation dans le personnel navigant /A propos de 13 observations/). R. Pannier, G. Leguay, and A. Didier (Ministère des Armées, Hôpital d'Instruction des Armées Dominique Larrey, Versailles, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 63-66. In French.

Discussion of the effects of hyperventilation, defined as an inappropriate ventilation above that necessary to meet the requirements of the organism. The syndrome expresses itself by numerous symptoms, dominated by paresthesia and eventually by contractions of the extremities. Among aircrew, the cause is frequently psychoemotional. An essential element of treatment is to explain the mechanism by which hyperventilation can be controlled. F.R.L.

A71-41570 Equilibrium tests with the aid of the pendulum armchair as applied to flying personnel (Les épreuves d'équilibration à l'aide du fauteuil pendulaire appliquées au personnel navigant). R. Bertoni (Ministère des Armées, Hôpitaux des Armées, Paris, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 67-70. In French.

Results of three years of experiment using the swinging armchair to accomplish labyrinth studies among 200 aircrewmen of various ages and degrees of experience. The neurological reflex was studied by means of the nystagmus induced. The tests showed that there is no exact type of labyrinth reflex, but rather a real but individual adaptation. The reflex is very little perturbed by the profession of flying itself. F.R.L.

A71-41571 The interest of chemical oxygen in air evacuations to hospital (Intérêt de l'oxygène chimique dans les évacuations sanitaires aériennes). H. Ducros (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 71-74. 10 refs. In French.

Discussion of the use of chemical compounds to supply oxygen to air-transported patients, thus replacing heavy and cumbersome oxygen bottles. Highly oxygenated salts such as permanganates and especially chlorates are suggested. A chlorate of soda 'candle' enclosed in a generating assembly is described, and is considered to be a source of chemical oxygen suitable for many applications.F.R.L.

A71-41572 The transport of sick and injured aboard regular airliners (Le transport des malades et blessés à bord des avions de ligne réguliers). J. Lavernhe, J. Pasquet, M. Perin, and E. Lafontaine. *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 75-77. 6 refs. In French.

Consideration of the various factors involved in air transport of sick or injured persons, with an attempt to determine what pathological or psychological conditions forbid such transport. In general, a patient can be carried provided there is no inconvenience to the crew or other passengers. Among medical contraindications are serious heart conditions, certain respiratory and digestive ailments, glaucoma, otitis, and severe mental disturbance. As a rule, air transport is considered far superior to other means of carriage, and medical incidents in flight have been rare. F.R.L.

A71-41573 Physiopathological problems posed by vibrations in the course of transport to hospital - Solutions brought by reanimation (Problèmes physiopathologiques posés par les vibrations au cours des transports sanitaires - Solutions apportées par la réanimation). E. Pichard, S. Ivanoff, J.-P. Hurtaud, R. Auffret, H. Seris, J. Collin, and M. Cara. *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 81-83. In French.

Discussion of clinical elements which especially concern paroxysmal accidents and cardiovascular troubles induced by transport. Various therapeutic methods are considered, and a preventive treatment is proposed. It is shown that air transport involves fewer clinical incidents than ambulance transport; the most commonly observed incidents being of the cardiovascular type. Barbiturates, hemineurine, and diazepam or valium are recommended for protection. F.R.L.

A71-41574 Study and perfection of a miniaturized multichannel FM/AM biological telemetry system adapted to psychophysiological studies (Etude et mise au point d'une chaine de télémesure biologique FM/AM multivoies et miniaturisée adaptée aux études psychophysiologiques). Marcel Klein, Claude Milhaud, Bernard Cailler, and Jacques Rebelle. *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 84-90. 13 refs. In French. Direction des Recherches et Moyens d'Essais Contract No. 632-68.

Description of a telemetry system which simultaneously transmits EEGs, EMGs, EOGs, and EKGs, which was satisfactorily tested on man, the cat, and the primate. An AM/FM transmission group was used, the carrier frequency of which could be regulated between 27 and 160 MHz. The tests made it possible to demonstrate with absolute fidelity the reconstitution of the transmitted signals; the stability of the transmitter-receiver eliminates all restrictions on use and operation. The size and weight of the apparatus are very low. F.R.L.

A71-41575 Study of psychopathological causes of inaptitude among Air Force flying personnel (Etude des causes psychopathologiques d'inaptitude chez le P. N. de l'Armée de l'Air). J. C. Lachaud (Centre Principal d'Expertise Médicale du Personnel Navigant, Paris, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 91-93. In French.

Study of the psychopathological causes of inaptitude in order to demonstrate their importance in relation to other causes of inaptitude and to attempt to determine the reasons for this frequency. Inaptitude is understood to involve either dismissal or declassification to a less demanding specialty. The importance of psychopathology among the causes of inaptitudes reduces most often to an irreducible problem of motivation. Age is an important factor. F.R.L.

A71-41576 The world gliding championships of Marfa, Texas - Survey of the medicophysiological supervision of the French

team (Les championnats du monde de vol-à-voile de Marfa /Texas/ - Bilan de la surveillance médico-physiologique de l'équipe de France). J.-P. Crance and M. Boulange (Nancy, Université, Nancy, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 94-96. In French.

Discussion of the medical problems of the French gliding team, among which were: adaptation to the subtropical semidesert climate, nutrition, protection against hypoxia in the course of certain flights, protection against local faùna, and general supervision of the pilots' physical and psychomotor conditions. In general, weight losses were noted, and there was a greatly increased fluid intake. F.R.L.

A71-41577 The concept of time experienced among small human groups isolated in an underground environment (La notion du temps vécu chez de petits groupes humains isolés en milieu souterrain). P. Saumande, R. Angiboust, and P. Galban. *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 97, 98. In French.

Attempt, by study of the results of three experiments, to determine if modifications of the time sense are found at the level of groups isolated under identical conditions and deprived of means of time keeping. The three groups took part in significant and constructive tasks. It appears that when individual behavior is averaged, the groups tend to keep to a timetable close to that of the surface. F.R.L.

A71-41578 Radiological examination of the spine and fitness for employment as a helicopter pilot (L'examen radiologique du rachis et l'aptitude à l'emploi de pilote d'hélicoptère). R. P. Delahaye, H. Seris, R. Auffret, R. Jolly, G. Gueffier, and P. J. Metges (Ministère des Armées, Hôpital d'Instruction des Armées Dominique Larrey, Versailles; Centre Principal d'Expertise Médicale du Personnel Navigant, Paris; Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France). *Revue de Médecine Aéronautique et Spatiale,* vol. 10, 2nd Quarter, 1971, p. 99-102. In French.

Proposal of a fitness standard applicable to helicopter pilots, in view of the frequency of spinal troubles among them. A better seat configuration and reduction of vibration amplification through the seat are recommended, as well as regular medical examination, special exercises, and elimination of candidates who exhibit certain symptoms of spinal weakness. F.R.L.

A71-41636 Using alternating displays to improve operator performance. Charles Abrams, Donald N. Buckner (Human Factors Research, Inc., Goleta, Calif.), and C. H. Baker (Defence Research Establishment, Toronto, Canada). *Instruments and Control Systems,* vol. 44, Sept. 1971, p. 113-115. 14 refs. Contract No. Nonr-4120(00).

The alternating display concept was tested using simulated radar and sonar CRT displays in a laboratory environment. Each of the four experimental conditions began with a 3-minute pretest, during which eight signals were presented at random locations. Two consecutive 24-minute duty periods followed. In each period six signals were presented at random intervals and locations. This was followed by a posttest identical to the pretest. Radar monitoring neither benefited nor was impaired by display alternation. Statistical analysis of the sonar data did not disclose a significant interaction between display conditions and time on duty. However, graphic portrayal of the data did suggest the presence of such an effect. G.R.

A71-41690 * # The vestibular space experiment OFO-A - Some results and conclusions. T. Gualtierotti and F. Bracchi (Milano, Università, Milan, Italy). *American Institute of Aeronautics and Astronautics and Aerospace Medical Association, Weightlessness and Artificial Gravity Meeting, Williamsburg, Va., Aug. 9-11, 1971, Paper.* 7 p. 5 refs. Contract No. NASw-2211.

The results and the conclusions reached so far on the vestibular space experiment OFO-A are presented here. The various parameters of the life support systems are indicated. The activity at rest and the response to centripetal acceleration obtained by an on-board centrifuge have been studied in four statoreceptors in two bull frogs. Some units were quiescent during the flight, some were at times stimulated slightly by the vibration induced by the water pump belonging to the life support system. The change was observed mostly for the activity at rest that first was slowed down and then increased in frequency to reach normal level at the end of the fifth day in the mission. A feedback control system throughout the efferent network is considered to be responsible for the changes and the following normalization. The impact of the method has a more general use in the physiological field. The vestibular space experiment OFO-A is a part of a program to investigate the transfer function of the labyrinth. It studies the long term reaction of the positioning sensors of the vestibule to the disappearance of the effect of a major environmental constant on earth - gravity - at the single unit level. This factor, gravity, is particularly important as it corresponds to the proper stimulus of the receptors: the lack of it will provide the input 'O' point in the input-output relationship in a close loop situation. (Author)

A71-41717 Body composition, aerobic capacity, and density of muscle capillaries in young and old men. J. Pařizková, E. Eiselt, S. Šprynarová, and M. Wachtlová (Výzkumný Ústav Tělovýchovný; Karlova Universita, Prague, Czechoslovakia). *Journal of Applied Physiology,* vol. 31, Sept. 1971, p. 323-325. 19 refs.

In the young body height and weight, relative and absolute amount of lean body mass, maximal oxygen uptake, maximal pulse rate, and maximal oxygen pulse were significantly higher than in old men. The number of capillaries per square millimeter was the same in the young and the old. The number of muscle fibers per square millimeter was significantly higher in the old. The capillary-fiber ratio was, therefore, significantly higher in the young. A significant relationship between maximal oxygen uptake and maximal oxygen pulse on one hand and capillary-fiber ratio on the other was found only in the young men. G.R.

A71-41718 # Atrial function during volume loading. Robert M. Payne, Hubert L. Stone, and Edward J. Engelken (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Journal of Applied Physiology,* vol. 31, Sept. 1971, p. 326-331. 34 refs.

This study attempts to define atrial function directly in an intact animal, using the Frank-Starling approach to evaluate extent of atrial shortening as atrial load is increased by infusion. From analysis of diameter changes which reflect atrial fiber length, it is possible to define the limits of booster pump and conduit function during volume infusion. As atrial diameter was increased, atrial stroke shortening increased initially; however, as volume was further increased, the amplitude of atrial shortening decreased. Over the normal range of filling pressures the atrium functions as a conduit to transfer blood when the A-V valves are open, a capacitor or reservoir to accept venous inflow during ventricular ejection, and a booster pump during atrial systole. G.R.

A71-41719 Effects of extended hypoxia on visual performance and retinal vascular state. John L. Kobrick and Budd Appleton (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Journal of Applied Physiology,* vol. 31, Sept. 1971, p. 357-362. 10 refs.

Eight subjects were exposed to 15,000-ft equivalent hypobaric elevation for 48 hr in an altitude chamber during which they were periodically measured for near and far visual acuity, stereopsis, binocular depth perception, critical flicker fusion, dark adaptation, and response time to peripheral visual signals. The central retinal fundi were also examined clinically and photographed. Performance

on all visual tasks showed similar decrements which occurred rapidly and reached their maximum extent within approximately 1 hr of exposure and thereafter gradually recovered over the remaining interval. The impairments noted are apparently due to the effects of hypoxia acting directly on the visual system rather than to the possible influence of subjective feeling states, since they preceded by several hours the onset of subsequent illness symptoms. The retinal vascular changes observed corroborated former findings of engorgement, increased diameter, and tortuosity, but did not immediately abate upon return to normoxia. Signs of retinal hemorrhage or edema previously reported by others during exposure to higher elevations than that of this study were not observed. (Author)

A71-41720 Effect of water immersion on renin-aldosterone and renal sodium handling in normal man. Murray Epstein and Takao Saruta (USAF, School of Aerospace Medicine, Brooks AFB, Tex.; Miami, University; U.S. Veterans Administration Hospital, Miami, Fla.; Texas, University, Dallas, Tex.). *Journal of Applied Physiology,* vol. 31, Sept. 1971, p. 368-374. 40 refs.

Eight normal male subjects were used in the investigations. All subjects were studied on three occasions while in balance on a 10 mEq Na, 88-120 mEq K diet including waist immersion, neck immersion, and control studies. Waist immersion produced a decrease of one-third in plasma renin activity without changing urinary aldosterone excretion. Neck immersion produced a decrease in plasma renin activity exceeding that induced by waist immersion with a two-thirds decrease in urinary aldosterone excretion. Since water immersion to the neck initially results in a redistribution of blood volume with a relative increase in intrathoracic blood volume, the current study lends further support to the concept of intrathoracic and/or cardiac receptors as important factors in volume regulation in man. G.R.

A71-41721 Energy sources during muscular work under normoxic and hypoxic conditions. Robert Bason, Charles E. Billings, Edward L. Fox, Ralph J. Gerke, and H. Spencer Turner (Ohio State University, Columbus, Ohio). *Journal of Applied Physiology,* vol. 31, Sept. 1971, p. 392-396. 16 refs. Research supported by the Ohio State University; NIH Grant No. FR-5409.

The power derived from the aerobic, lactacid, and alactacid energy sources was measured while eight male subjects performed three intensities of work (30, 60, 80% of maximal sea-level aerobic capacity) on a bicyle ergometer at 223, 2286, and 3810 m. The data suggest that there is a reciprocal relationship between the aerobic and anaerobic energy sources, so that the total power input for a given amount of work remains unaffected by hypoxia. The reduction in aerobic power was further shown not to be due to a decrease in Vo sub 2 but rather to a decrease in the duration of the exercise. The lactacid power is greater with altitude because this energy system produces the same or in some cases more lactic acid in less time. The alactacid capacity is unaffected by altitude. Alactacid power likewise increases with altitude because of the same energy release over a shorter period of time. (Author)

A71-41722 Availability of substrates and capacity for prolonged heavy exercise in man. Bengt Pernow and Bengt Saltin (Kungl. Karolinska Institutet, Gymnastik- och Idrottshögskolan, Stockholm, Sweden). *Journal of Applied Physiology,* vol. 31, Sept. 1971, p. 416-422. 19 refs. Research supported by the Greta Jeansson Foundation and the Swedish Medical Research Council.

The effects of a reduced availability of free fatty acids (FFA) on the physical working capacity in normal man were investigated. The subjects first depleted their glycogen stores by bicycle exercise to exhaustion. Thereafter only fat and protein were given until the next day, when the exercise was performed under conditions in which the release of FFA from the adipose tissue was blocked by nicotinic acid that had been given to the subjects. Only limited stores of glycogen were then available in the body, facilitating the evaluation of the importance of a diminished FFA supply to skeletal muscle during exercise. It was found that when the glycogen stores are reduced, prolonged work can still be performed on submaximal levels provided that the supply of FFA is adequate. Elimination of both muscle glycogen and exogenous FFA seriously impairs the ability for prolonged exercise. G.R.

A71-41723 Computation of mean body temperature from rectal and skin temperatures. Jean Colin, Jean Timbal, Yvon Houdas, Charles Boutelier, and Jean D. Guieu (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France). *Journal of Applied Physiology,* vol. 31, Sept. 1971, p. 484-489. 10 refs.

The calculation of the heat stored by the human body in a hot environment according to Burton (1935) requires information concerning the mean body temperature. An equation for determining the mean body temperature from rectal and skin temperatures contains a factor x. The possibility that x can have different values in neutral and hot environments is investigated. Ninety-one experiments were made in five hot environments. The best values for x in neutral and in hot environments were calculated by an optimization method using a computer. G.R.

A71-41798 The antecedents of myocardial infarction and sudden death in a cohort of actively employed men. Lawrence E. Hinkle, Jr. (Cornell University, New York, N.Y.). *(Industrial Medical Association, Annual Meeting, 56th, Atlanta, Ga., Apr. 19-22, 1971.) Journal of Occupational Medicine,* vol. 13, Sept. 1971, p. 433-440. 5 refs. PHS Grant No. HE-07796.

The health records of 1,152 actively employed, middle-aged American men were analyzed to determine the incidence of coronary heart disease and sudden death, and to ascertain some of the characteristics of those men who die suddenly and unexpectedly. Middle-aged men whose deaths are reported as due to coronary heart disease (including those with sudden and unexplained deaths) are not drawn from the population of apparently healthy men. Coronary deaths occur among a mixed population of men with coronary heart disease, hypertensive cardiovascular disease, chronic lung disease, or a combination of these. Men reported as dying from coronary heart disease have detectable abnormalities of cardiac rate, rhythm, and conduction prior to the onset of the final episode. Significant metabolic abnormalities include hyperlipidemia, impaired glucose tolerance, elevated serum uric acid, obesity, and alcoholism. T.M.

A71-41822 Reflex vestibular control of head movement in man. J. S. Outerbridge and G. Melvill Jones (McGill University, Montreal, Canada). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 935-940. 31 refs.

Vestibularly driven head movement (the 'vestibulo-collic reflex') was examined in seated human subjects exposed to sinusoidal and stepwise changes in rotational velocity about a vertical axis. In the absence of vision nystagmoid head movements occurred, but not in all subjects. Slow-phase head velocity showed less phase advance during slow sinusoidal stimulation than corresponding vestibulo-ocular response, and made a substantial contribution to ocular stabilization in the period immediately following a step change in rotational velocity. The practical and theoretical significance of these findings is discussed. (Author)

A71-41823 Survey of the medical causes of rejection of applicants for the BEA/BOAC sponsored ab-initio pilot training scheme. R. M. Barnes (Air Corporations Joint Medical Service, London Airport, Hounslow, Middx., England). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 941-946. 5 refs. Research supported by the Royal Air Force and the Ministry of Defence (Navy).

Since 1960 BEA and BOAC have sponsored young men between 18 and 24 years of age for ab-initio pilot training. Applicants may be excluded on medical grounds at three stages of the selection

procedure. An analysis of the causes of medical rejection at each stage was made. The results have been compared with those obtained by the RAF Aircrew Selection Center and the Royal Naval Officer Candidate Selection Board, the latter representing a group of applicants of similar age not connected with flying. In the Corporations and RAF, ophthalmic, ear, nose and throat and general medical conditions were the major causes of failure, in that order, accounting for some 89% of those rejected. In the Royal Navy, ophthalmic conditions were by far the most important reason for rejection, followed by general medical causes. Ear, nose and throat diseases accounted for only 2%. A follow-up of candidates selected for training by BEA and BOAC shows that out of 625 candidates who could have completed training, 11 have had to give up flying permanently on medical grounds. On these figures it is concluded that there are no reasons to alter the selection procedure at the present time. (Author)

A71-41824 Study of simulated airline pilot incapacitation. Phase II - Subtle or partial loss of function. C. R. Harper, G. J. Kidera, and J. F. Cullen (United Air Lines, Inc., Denver, Colo.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 946-948.

The risk factor in airline flight operations generated by partial loss of cerebral function of one crew member is discussed with regard to etiology, incidence and detection. Airline flight crews have received little instruction concerning subtle cerebral incapacitation, and no observations existed regarding the reactions of the crew members who remained unimpaired. An original study involving 36 line qualified B-727 flight crews was performed in an aircraft simulator. The pilot-in-command became nonfunctioning, but not unconscious, during approach for landing. Reaction times of the unimpaired crew members and their subsequent conduct are discussed. Educational recommendations are presented. (Author)

A71-41825 * Effects of hypobaric hyperoxia in vivo on lipid synthesis in rat liver and adipose tissue slices. D. D. Feller, E. D. Neville, and K. S. Talarico (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 949-956. 14 refs.

Male rats, fed ad libitum, were exposed to 100% oxygen at 191, 258, or 350 mm Hg for periods of time varying from one-half to 4 days. Food consumption decreased as the barometric pressure decreased. After exposure, the in vitro incorporation of acetate-2-C14 into CO2 and fatty acids by slices of liver and epididymal adipose tissue was measured. In all hyperoxic exposures, the oxygen-exposed rats converted more acetate into fatty acids in both liver and adipose tissue than did their respective pair-fed controls. At 258 and 350 mm Hg, the oxygen-exposed rats incorporated acetate into liver fatty acids at rates comparable to those of ambient ad libitum controls. At 258 mm Hg, fatty acid synthesis in the adipose tissue of the oxygen-exposed rats was comparable to that of ambient ad libitum controls and at 350 mm Hg, exceeded that of the ambient ad libitum controls by 30%. Placing the oxygen-exposed rats on a restricted diet abolished the increase in fatty acid synthesis. It is concluded that 100% oxygen has a stimulatory effect upon fatty acid synthesis in the liver and adipose tissue of rats exposed to the hypobaric hyperoxic environment of 258 and 350 mm Hg provided that the rats have free access to food. (Author)

A71-41826 # Relationship of pentathlon sports skills to vestibulo-ocular responses to Coriolis stimulation. P. J. Dowd and R. L. Cramer (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 956-958. 6 refs.

A Coriolis test on the USAFSAM biaxial stimulator was administered to pentathlon athletes, advanced Air Force pilots, and airman trainees. The rates of decay and sensitivity coefficients of vertical nystagmic responses were compared for these three groups. A significantly different rate of decay was found between athletes and airman trainees and a significantly different sensitivity coefficient was shown between athletes and the pilots and airman trainees. The pentathlon athletes demonstrated a significantly greater degree of habituation and suppression of responses to Coriolis stimulation than the pilot or airman trainee groups. The possible reasons for these findings are discussed in terms of the physical conditioning requirements of the pentathlon athlete. (Author)

A71-41827 Influence of alcohol on vestibular responses to angular accelerations. David J. Schroeder (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 959-970. 27 refs.

Although alcohol is known to affect the vestibular system through the development of a positional alcohol nystagmus, information concerning the effects of alcohol on 'vertigo' and nystagmus from stimulation of the semicircular canals is contradictory. Several investigators have reported that alcohol enhances these responses, while others have reported suppressive effects. This study was designed to investigate the effect of alcohol ingestion on both 'vertigo' and nystagmic responses to angular stimulation. Responses were obtained (1) with and without visual fixation, and (2) with the alertness of the subjects controlled. When recorded in total darkness, the nystagmic reaction to rotatory stimulation was suppressed by the alcohol. When visual fixation was allowed, a high-frequency, low-amplitude nystagmus to rotation was obtained following alcohol ingestion; there was little or no response prior to drinking. This apparent enhancement of the response was not due to an increase in vestibular sensitivity but, rather, to the suppressive effect of alcohol on the ability of the subject to maintain adequate visual fixation. 'Vertigo' sensations resulting from the rotatory stimuli evidenced only slight declines following alcohol ingestion. (Author)

A71-41828 # Heart rate response to square wave breathing - One G compared to zero G. Philip C. Richardson, Ashley J. Welch, and Robert Groshner (Texas, University, Austin, Tex.; USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 971-974. 9 refs. Grant No. AF AFOSR 69-1792.

A transient change in beat-by-beat heart rate occurs in the human when sudden inspiratory or expiratory efforts are effected. Under conditions of zero G, as produced while flying in a parabolic flight path, the heart rate responses were of a similar shape for inspiration and for expiration; however, there was a significant baseline shift down of 4.3 beats per minute for inspiration and 3.8 beats per minute for expiration in the zero G environment. We propose that this change in base line is due to hydrostatic pressure changes in the carotid sinus and aortic arch receptors. (Author)

A71-41829 # Performance and fatigue in experimental double-crew transport missions. D. A. Harris, G. Verne Pegram, and Bryce O. Hartman (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 980-986. 10 refs.

Six experimental transport missions using a double crew were flown in a C-141 on routes generating various combinations of long and short legs. Crews followed a 4/4 of 16/16 work/rest schedule within operational constraints. On-board crew-rest facilities were provided so that the plane could fly through the airlift system without crew changes or crew delays. The missions required approximately 55-60 hours to complete. The flying time averaged around 43 hours. Crew performance was evaluated by ratings made by an on-board flight examiner. There were no significant differences in flight examiner ratings. Subjective fatigue was measured by a rating scale. There were no significant differences related to work/rest cycles. There were significant differences related to mission profile and crew position. Sleep EEGs were recorded on the two navigators and were supplemented by self-reports from all crewmembers. There was a marked reduction in total sleep as well as stage 1-REM and deep sleep. Findings are discussed in relation to the demands of flying transport missions. (Author)

A71-41830 Experimental results on time of useful function (TUF) after exposure to mixtures of serious contaminants. J. G. Gaume, P. Bartek, and H. J. Rostami (Douglas Aircraft Co., Long Beach, Calif.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 987-990. 5 refs.

Description of experimental data from 53 exposures of mice to single, double, and triple gas mixtures. Contaminants used were CO, CO2, and NH3. The TUF for CO exposure was used as a baseline against which other exposures were compared. It was found that double gas exposures extended the TUF, whereas triple gas exposures extended the TUF even more. A theory is suggested for the mechanism of this extension phenomenon. These results are considered to be preliminary and their validity must be further substantiated from additional experimental studies. This information is applicable to: (1) the selection and development of interior materials which neither burn nor produce dangerous toxic products; and (2) stimulate further investigation in this neglected area of research. M.M.

A71-41831 Effect of altitude acclimatisation and cold on cold pressor response in man. C. S. Nair, M. S. Malhotra, O. P. Tiwari, and P. M. Gopinath (Defence Institute of Physiology and Allied Sciences, Delhi, India). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 991-994. 8 refs.

Cold pressor response was elicited on 18 subjects of the age group 21-28 years at sea level and at an altitude of 11,000 ft under hypoxic acclimatization and under simultaneous acclimatization to hypoxia and cold at 10 days' interval for 40 days after which they were retested at sea level. A group of 10 highlanders were also studied. Results indicate that there is a depression of cold pressor response irrespective of superimposition or withdrawal of cold stress. However, the group of subjects who were exposed to cold and hypoxia simultaneously from the day of arrival at altitude showed a return of the sea-level pattern of response at the end of 40 days of their stay at altitude and on retest at sea-level. The depression of cold pressor response was also noticed in highlanders. (Author)

A71-41832 # Ingestive capacity of peritoneal macrophages from mice exposed to hypobaric hypoxia. George W. Irving, III and Jerome P. Schmidt (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 995-998. 15 refs. USAF-supported research.

At approximately 6-day intervals peritoneal macrophages were harvested from groups of mice exposed continuously to a simulated altitude of 18,000 ft. These cells were allowed to attach to suitable vessels and exposed to a suspension of Serratia marcescens. After a carefully controlled ingestion period, bacteria were liberated from the phagocytes by freezing and thawing and the ensuing quantitative assays were based on colony-forming units of the microorganisms in the resulting suspensions. The ingestive efficiency of peritoneal macrophages from mice exposed to altitude was generally less than that of peritoneal macrophages from nonexposed mice. This change in ingestive ability in relation to the time of exposure to hypobaric hypoxia is evidently a physiological reaction to the environmental conditions. The change in functional efficiency of the macrophage may be a factor in the susceptibility to infection of animals subjected to altitude. (Author)

A71-41833 # Vertigo due to increased middle ear pressure - Six-year experience of the aeromedical consultation service. Frederic M. Brown (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 999-1001. 6 refs.

Vertigo due to increased middle ear pressure appears to be more common than is generally realized. Although it has been known as a syndrome for 75 years, only recently has it received any significant study. In this article 6 years' experience with this entity from the USAF School of Aerospace Medicine Aeromedical Consultation Service is presented. Four new cases are presented and discussed with two previously published cases. The facts that two cases occurred during a rapid descent with a forceful Valsalva rather than during climb-out and that two cases experienced vague symptoms which were not classic vertigo but could be duplicated by caloric testing are felt to be significant. Other associated factors are discussed, and a simple preventive approach is suggested. (Author)

A71-41834 Investigation of fatal aircraft accidents - 'Physiological incidents.' Laurence R. Simson, Jr. (USAF, Air Training Command, Randolph AFB, Tex.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 1002-1006. 5 refs.

Incapacitating or distracting physiological phenomena occur with considerable frequency during aerial flight. Only rarely, however, have such 'physiological incidents' been firmly established as cause factors in fatal aircraft accidents. By tradition medical investigation of accidents has largely been restricted to cataloguing mechanical trauma and searching for preexisting organic disease. By definition 'physiological incidents' are transient functional disturbances and not expected, by the inexperienced investigator, to be amenable to demonstration after the fact. However, it is often possible to reconstruct, with high probability, physiological factors which initiated a sequence of events terminating in a fatal accident. Two cases are presented as illustrations. Attention is drawn to the fact that 'physiological incidents' and psychological factors undoubtedly underlie many presently obscure aircraft crashes. (Author)

A71-41835 Comparison of the encephalographic, behavioral and subjective correlates of natural and drug-induced sleep at atypical hours. M. F. Allnutt and P. J. O'Connor (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 1006-1010. 6 refs.

Eight trainee pilots retired to sleep under laboratory conditions from 2000 hours to 0300 when they were awakened to spend 8 hours performing 2 behavioral tests (calculation and vigilance). This regime was repeated on alternate nights in a 4 x 2 design. The 4 experimental conditions under which they slept were No Drug, Placebo, Mogadon (5 mgs) and Seconal (100 mgs). Each subject spent 2 nights under each condition and during every alternate 24-hour period they were off-duty and free to sleep as they pleased. Continuous EEG recordings were made on each 'experimental' night and subjective ratings of mood and quality of sleep were used to complement the behavioral measures. Under both the drug conditions there were changes in the EEG together with a slight decrement in vigilance performance (d') in the later (1100-1500) runs of the day and an improvement in the rated quality of sleep. (Author)

A71-41836 # Electroencephalograms of 2,947 United States Air Force Academy cadets (1965-1969). Paul L. Richter, Earl A. Zimmerman, Marcus E. Raichle, and E. Liske (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 1011-1014. 15 refs.

Coincident with the beginning of the Second World War, attempts were made at the USAF School of Aviation Medicine at Randolph AFB, Texas, and at the Naval Air Station, Pensacola, Florida, to develop electroencephalographic methods for determining the suitability of candidates for flight training. These efforts were largely unsuccessful, but hope remained that the electroencephalograph would be useful in detecting latent epilepsy or other brain disturbances. In further pursuit of this goal, 2947 senior cadets at the USAF Academy in Colorado, during the period from the beginning of 1965 through the end of 1969, had at least a single electroencephalogram which included hyperventilation and photic stimulation. Three per cent of the records were abnormal. This percentage is strikingly low when compared with that of 'normal populations,' and may result partially from our practice of considering 'normal' the majority of occipital slow waves encountered in the EEGs of young adult subjects. (Author)

A71-41837 Psychophysiologic and conversion mechanisms - The aviator's emotional face curtain. J. A. Pursch and R. F. Reinhardt (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.). *Aerospace Medicine,* vol. 42, Sept. 1971, p. 1015-1017. 5 refs.

Psychophysiologic and conversion mechanisms as an unconscious expression of the student pilot's decreasing motivation for further flight training are discussed. Flight students in this category are characterized by a family life style of excessive use of rationalization, blaming others for their own shortcomings, exaggerating minor complaints into disabling symptoms and manifesting very little subjective concern about them (la belle indifférence). They do not look for disability compensation and they unconsciously force the examiner into removing them from flight status. If this is not swiftly accomplished they are apt to develop new symptoms. Four case histories are used to illustrate how the flight surgeon can interview the failing student by listening with a 'third ear' for such checkpoints as life style, problem-solving techniques, slips of the tongue and metaphores. These data along with health record and flight record information then point to the proper disposition.

(Author)

A71-41861 * Stereometric measurement of body and limb volume changes during extended space missions - A progress report. R. E. Herron, J. Cuzzi, M. J. Bender, and J. E. Hugg (Baylor University, Houston, Tex.). *Société Française de Photogrammétrie, Bulletin,* Oct. 1970, p. 45-50. Contract No. NAS 9-10567.

Development of a photogrammetric program intended to measure the variations of the volume of the body and the members of astronauts after a prolonged space voyage. During the experimental phase photographs taken with two opposed stereometric cameras recorded the variations of a human body subjected to different conditions of depressurization. Results indicate that it is possible to establish a versatile and practical method of plethysmography which equals or exceeds the accuracy and reliability of current methods.

F.R.L.

A71-41936 * Diurnal patterns in water and food intake and body weight changes in rats with hypothalamic lesions. Jan W. Kakolewski, Edward Deaux, Janice Christensen, and Barbara Case (Fels Research Institute, Yellow Springs, Ohio). *American Journal of Physiology,* vol. 221, Sept. 1971, p. 711-718. 25 refs. NSF-NASA-supported research; PHS Grant No. M-4529.

Rats with ventromedial hypothalamic (VMH) lesions, after the dynamic phase, displayed a permanent loss of the diurnal rhythm in food intake, a 180 degree reversal of the diurnal rhythm in the pattern of body weight changes, and hypophagia, whereas the water intake and water-to-food ratio remained similar to preoperative levels. Rats with lateral hypothalamic (LH) lesions, after recovery, displayed a decrease in water and food intake and an augmentation of body weight loss exclusively during the light phase of the diurnal cycle. Since, after VMH or LH lesions, the animals continued to regulate the ingestive behavior and controlled their body weight, the concepts regarding the function of these two hypothalamic structures, presumed to be primary regulatory centers, appear to be oversimplified.

M.M.

A71-41937 Mechanism of norepinephrine-induced stimulation of myocardial oxygen consumption. Henry Neal Coleman, Edmund H. Sonnenblick, and Eugene Braunwald (National Institutes of Health, National Heart and Lung Institute, Bethesda, Md.; Mayo Foundation, Rochester, Minn.). *American Journal of Physiology,* vol. 221, Sept. 1971, p. 778-783. 23 refs.

A polarographic method was used to determine the effects of norepinephrine (NE) on the myocardial oxygen consumption of cat papillary muscles contracting under both afterloaded isotonic and isometric conditions. In order to separate the increased extent of shortening and external work from the increased velocity of shortening, the effects of NE on myocardial oxygen consumption were evaluated in isometric contractions at equal levels of developed tension. Under these conditions, augmentation of the contractile state, characterized by increased velocity of contraction, was linearly related to the increase in myocardial oxygen consumption. The stimulation of myocardial oxygen consumption is attributed to the induced alterations in the intrinsic speed of contraction and may explain the so-called 'O_2 wasting' effect of NE.

M.M.

A71-41938 Plasma creatine phosphokinase activity, hypothermia, and stress. Herbert Y. Meltzer (Chicago, University, Chicago, Ill.). *American Journal of Physiology,* vol. 221, Sept. 1971, p. 896-901. 32 refs. Research supported by the Scottish Rite Foundation; PHS Grant No. RO MH-16127.

Markedly increased activity of creatine phosphokinase (CPK) in rat plasma resulted from restraint at 2 C (cold restraint, CR) for as little as 15 min. The mean increase in enzyme activity after 2 hr of CR was 28-fold, but the range was very great. The increase in plasma CPK activity was highly correlated with the extent of hypothermia following CR. Adrenalectomized, adrenal demedullated, thyroidectomized, and control rats had comparable decreases in rectal temperature and increases in plasma CPK activity following CR of 30 min duration. The increase in plasma CPK activity following CR was markedly diminished in some cold-acclimated rats, varying with the extent of cold acclimation.

M.M.

A71-41939 * Mechanism of antidiuretic action of chlorpropamide in the mammalian kidney. S. M. Zweig, Bruce Ettinger, and L. E. Earley (California, University, San Francisco, Calif.). *American Journal of Physiology,* vol. 221, Sept. 1971, p. 911-915. 18 refs. NIH Grants No. AM-12753; No. AM-05670; Grant No. NGR-05-025-007.

In dogs undergoing water diuresis, the effect of unilateral intrarenal infusions of chlorpropamide on urinary concentration, free water clearance (CH_2O), GFR (glomerular filtration rate), and sodium excretion was compared with that obtained in another group of similarly water-loaded animals during intravenous infusion of vasopressin. The antidiuretic action of chlorpropamide was demonstrable only in the presence of vasopressin and was not dependent on a fall in GFR. Since blood levels of chlorpropamide equal to those which were antidiuretic in the presence of infused vasopressin were without effect on urinary concentration in the absence of infused vasopressin, it does not appear that the drug increases water reabsorption as a result of the release of endogenous vasopressin. Therefore, the renal effects of chlorpropamide may be attributed to an action in the kidney to potentiate circulating vasopressin.

M.M.

A71-41940 # Hypothermia and the brain (Gipotermiia i mozg). V. A. Bernshtein. *Uspekhi Fiziologicheskikh Nauk,* vol. 2, Apr.-June 1971, p. 49-67. 113 refs. In Russian.

Review of recent research on the effect of hypothermia on the nutritive processes and regulator activity of the brain. Changes in the blood supply of the brain, in respiration, and in carbohydrate metabolism are considered, as well as the resistance of the brain to oxygen deficiency at low body temperatures. Data concerning the temperature levels at which unconsciousness occurs in humans and data concerning conditioned reflex activity in animals are presented, as well as data concerning the special features of the electrical activity of the brain cortex. The effect of hypothermia on the excitability of the centers of the diencephalon, the mesencephalon, the pons varolii, the medulla oblongata, and the spinal cord is shown.

A.B.K.

A71-41941 # Ultrasound and the possibility of using it in physiological studies (Ul'trazvuk i vozmozhnosti ispol'zovaniia ego v

fiziologicheskikh issledovaniiakh). V. A. Mastriukov (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Meditsinskogo Priborostroeniia, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk,* vol. 2, Apr.-June 1971, p. 105-125. 36 refs. In Russian.

Attempt to give the experimental physiologist an idea of the methods of ultrasonic investigation of the human organism and to show the possibility of using this method in physiological and pathophysiological experiments. Information concerning certain physical properties of ultrasonic vibrations and concerning the acoustic properties of living tissue is presented, which not only makes it possible for the reader to comprehend the methods and examples of ultrasonic diagnostics presented, but also to determine himself the range of applicability of this method in physiological studies. A.B.K.

A71-41985 * # Medical results of Apollo 14 - Implications for longer duration space flights. Charles A. Berry (NASA, Washington, D.C.). *International Astronautical Federation, International Astronautical Congress, 22nd, Brussels, Belgium, Sept. 20-25, 1971, Paper.* 24 p. 6 refs.

Review of the information on biomedical effects of space flight obtained from the Apollo 14 mission. Various facets of the process of adaptation to weightlessness are discussed. The differences found in Apollo 14 results for the command module pilot versus the other two crewmembers suggest certain benefits for 34 hours at one-sixth gravity and for lunar surface exercise. These findings indicate that the extent of the adaptation of astronauts to weightlessness, and any resulting change in subsequent ability to enter and work in new force environments, can be controlled to some degree. On the whole, space flights to date demonstrate that man can live and work productively in the space environment for periods of at least several weeks. M.E.V.

A71-41990 # Advanced systems of extravehicular protection (Systèmes avancés de protection extravehiculaire). James G. Sutton, Philip F. Heimlich, and Edward H. Tepper. *International Astronautical Federation, International Astronautical Congress, 22nd, Brussels, Belgium, Sept. 20-25, 1971, Paper.* 48 p. In French.

Evaluation of various concepts for systems for use in the 1980s to make possible extravehicular activity (EVA) with complete or partial regeneration of resources, with identification of the new regions of technology which will be set in motion. The methodology used is described, as well as the results of studies of systems and subsystems. Schematic configurations proposed for the cases of the Space Station, the Lunar Base, and Martian missions are presented. The new technological developments required to make possible the working out of the concepts of the Advanced Extravehicular Protection System (AEPS) are discussed. F.R.L.

A71-42017 * # Spacecraft oxygen recovery system. P. D. Quattrone (NASA, Ames Research Center, Moffett Field, Calif.). *International Astronautical Federation, International Astronautical Congress, 22nd, Brussels, Belgium, Sept. 20-25, 1971, Paper.* 39 p. 20 refs. Contracts No. NAS 2-6118; No. NAS 2-4444.

A spacecraft oxygen recovery system using an electrochemical CO2 concentrator for CO2 removal, a Sabatier reactor for conversion of the CO2 to methane and water, and an electrolysis subsystem for recovery of O2 from the H2O is described. Details are given on the recovery system component designs, operation and performance, with a diagram showing the working cycle of the system, and other illustrative diagrams. The concentrator can be used in aircraft rebreather systems and in spacecraft applications. The Sabatier subsystem has a high conversion efficiency in both H2-rich or CO2-rich gas mixtures, dry or humid. The electrolysis subsystem showed long term reliability and is operable at high current densities. V.Z.

A71-42033 * # The astronaut-teleoperator team for space operations. Edwin G. Johnsen (AEC-NASA, Space Nuclear Systems Office, Washington, D.C.). *International Astronautical Federation, International Astronautical Congress, 22nd, Brussels, Belgium, Sept. 20-25, 1971, Paper.* 12 p. 7 refs.

Discussion of the use of teleoperators as a means for further cost reduction of space operations and for increasing the productivity of future manned space experiments by augmenting the capabilities of astronauts. Some of the advantages and possible configurations and applications of teleoperators are examined and astronaut-teleoperator capabilities identified. M.V.E.

A71-42041 # Psychological aspects of adaptive behavior under complex spatial conditions (Psikhologicheskie aspekty adaptivnogo povedeniia v slozhnykh prostranstvennykh usloviiakh). V. I. Miasnikov, O. P. Kozerenko, and N. M. Rudometkin. *International Astronautical Federation, International Astronautical Congress, 22nd, Brussels, Belgium, Sept. 20-25, 1971, Paper.* 6 p. In Russian.

Investigation of the possibility of organizing posture-spatial human activities amid psychologically trying conditions of the altered posture-motor regime characteristic of astronauts' tasks. The conditions confronted on the limited support area of a parachute jump tower or high diving board (i.e., a stabilographic platform at the edge of the tower top) at heights of 18 and 10 m were selected as the experimental model. The results of a series of tests performed with young healthy male subjects on the stabilographic platform are reported and discussed. M.V.E.

A71-42043 * # Summary of a 90-day manned test of a regenerative life support system. Albin O. Pearson (NASA, Langley Research Center, Hampton, Va.) and John K. Jackson (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). *International Astronautical Federation, International Astronautical Congress, 22nd, Brussels, Belgium, Sept. 20-25, 1971, Paper.* 32 p. 7 refs.

A 90-day manned test of a regenerative life support system was completed on September 11, 1970. The test was performed with a crew of four men and featured closed chamber operation with no resupply. All food, makeup water, spare parts, and tools were stored onboard at the start of the test. This paper presents the test objectives, describes the life support subsystems, outlines some of the operating procedures, and reviews some of the more significant accomplishments of the test. Conclusions and some recommendations for additional future efforts are presented. (Author)

A71-42119 * An electrostatic computer model of a biological membrane. Vincent F. Gallucci (North Carolina State University, Raleigh, N.C.) and I. H. Shames (New York, State University, Buffalo, N.Y.). *Computers in Biology and Medicine,* vol. 1, Sept. 1971, p. 263-277. 19 refs. Grant No. NsG-501.

Description of a model of a biological cell membrane (Danielli-Davson, Robertson). The membrane is simulated by planar arrays of dipoles. Dipoles represent lipid polar end groups and protein C = O, N-H and R-group components of the membrane. An electrostatic self-consistent field approach is used to solve a set of four simultaneous equations. The four equations describe the forces acting upon each molecule. The solution of the set of equations is a set of angles which specify the orientation of the molecules. Then the electrostatic field from the entire molecular array can be calculated for any point in the neighborhood of the 'membrane'. An empirical 'resisting torque' function is introduced to allow simulation of the gross effects of the many interacting forces which act at the molecular level. The effect of a macromolecule near the membrane is simulated by using an appropriate electron density in a multipole field expansion. M.M.

A71-42155 **Continuous dynamic sampling calorimeter for measurement in man.** Allan Short (Cambridge University, Cambridge, England) and John Anderson (King's College Hospital, London, England). In: Joint Conference on Infra-Red Techniques, University of Reading, Reading, Berks., England, September 21-23, 1971, Proceedings. London, Institution of Electronic and Radio Engineers, 1971, p. 419-428. 9 refs.

The continuous dynamic sampling calorimeter measures separately and continuously the radiative, convective and evaporative heat loss for the whole and different regions of the body. The machine scans the body in the form of a close spiral in 45 seconds. It is possible to warm different areas of the subject by radiant heaters which allows heating to be independent of the measuring devices. This enables the subject to be considered as part of a closed loop control system which can be analyzed by standard control system procedures. (Author)

A71-42193 * **A preliminary theory of the effects of task and environmental factors on human performance.** Warren H. Teichner (New Mexico State University, University Park, N. Mex.) and Diane E. Olson (Massachusetts, University, Amherst, Mass.). *Human Factors,* vol. 13, Aug. 1971, p. 295-344. 53 refs. Grants No. NGR-22-007-070; No. AF AFOSR 68-1575.

An attempt is made to develop a systematic approach to the prediction of human performance as a function of task variables and environmental factors. The approach uses the basic literature of experimental psychology and of physiology in a context in which postulates and assumptions about underlying processes and empirical relationships are made as specific as possible. This paper is a presentation of the postulates, assumptions, and models for handling them. Its aim is toward organization and feasibility rather than toward a final theory of human performance. What is presented is more in the nature of a model of what a general theory might be and the variables of importance rather than a theory as such. (Author)

A71-42194 **The effect of prior muscle exertions on simple movements.** Brian M. Lance and Don B. Chaffin (Michigan, University, Ann Arbor, Mich.). *Human Factors,* vol. 13, Aug. 1971, p. 355-361. 8 refs.

Results of a study to determine the time for initiation and stabilization of a precision movement both before and after sustained muscle exertion of sufficient duration and level to produce electromyogram (EMG) frequency changes. It was found that fatiguing muscle exertions do not seem to alter the speed of initiation of responses, but do alter movement time, particularly for movement associated with final corrective action. F.R.L.

A71-42195 **The effects of letter size, case, and generation method on CRT display search time.** Allen G. Vartabedian (American Telephone and Telegraph Co., New York,-N.Y.). *Human Factors,* vol. 13, Aug. 1971, p. 363-368. 5 refs.

The effects of letter size, case, and generation method were studied in a task of searching for a common five-letter word in a CRT display. Symbol sizes of 0.12, 0.14, and 0.16 in. were evaluated. Words were composed of all uppercase or all lowercase letters. Two symbol generation methods - letters drawn by means of continuous strokes and by means of a seven-wide-by-nine-high pattern of dots in a fixed matrix - were investigated. The results indicated that for both methods of symbol generation, uppercase words were searched 13% faster than lowercase words. No significant differences were found due to symbol generation method or letter size. (Author)

A71-42196 # **Visual performance with simulated flare light - Effects of flare-ignition altitude.** Robert L. Hilgendorf (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Human Factors,* vol. 13, Aug. 1971, p. 379-386. 12 refs.

Four groups of ten subjects performed simulated target acquisition (detection and recognition) tasks under simulated Mark 24 flare light (2,000,000 cp). One group performed with six aerial flares dropped 0.25 mi apart (simulated), another group with six flares 0.50 mi apart, another with four flares 0.75 mi apart, and the last group with two flares 1 mi apart. All groups performed at two simulated observer altitudes (2000 and 2500 ft) and with three simulated flare-ignition altitudes (2000, 2500, and 3000 ft). Generally, more targets were acquired at the 2000-ft flare-ignition altitude. There were no statistically significant differences attributed to flare separation or observer altitude. (Author)

A71-42226 * **Urease reaction rates at low water activity.** J. Skujiņš and A. D. McLaren (California, University, Berkeley, Calif.). *Space Life Sciences,* vol. 3, Aug. 1971, p. 3-11. 26 refs. Grants No. NsG-704; No. NGL-05-003-079.

Demonstration that hydrolysis of urea by urease takes place in 'dry' urea-urease mixture exposed to discrete water vapor pressures from 100 to 20% relative humidity and at 2 to 70 C. A discontinuity in enzymatic activities is observed at the transition of urea from a solid to a deliquescent solution. Urease is inactivated more readily at higher relative humidities in saturated urea solution than at lower relative humidities where water for urea hydrolysis is adsorbed on enzyme-protein only. Hydrolysis of urea by urease proceeds at a measurable rate in concentrated solutions of urea and of urea hydrolysis products, ammonium carbonate and bicarbonate, in the absence of ionic strength or pH stabilizing agents. (Author)

A71-42227 * **Survival of microorganisms in a simulated Martian environment.** R. H. Green, D. M. Taylor (Boeing Co., Seattle, Wash.; California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), E. A. Gustan, S. J. Fraser, and R. L. Olson (Boeing Co., Seattle, Wash.). *Space Life Sciences,* vol. 3, Aug. 1971, p. 12-24. 15 refs.

Mariner 4 data were utilized to establish the environmental test parameters. The test conditions involved maximum temperatures of 25 C, minimum temperatures of -60 C, and an atmosphere consisting of 70% carbon dioxide, 25% nitrogen and 5% argon at an atmospheric pressure of 6 mm Hg. On the basis of the test results it is concluded that survival probabilities for exposed microorganisms on the Martian surface would be very small. However, if microorganisms were protected from the solar irradiation the probability for survival increases. Microorganisms protected in subsurface environments would be expected to survive for extended periods. G.R.

A71-42228 * **Behavioral responses to linear accelerations in blind goldfish. I - The gravity reference response.** R. J. Von Baumgarten, G. Baldrighi, J. Atema (Michigan, University, Ann Arbor, Mich.), and G. L. Shillinger, Jr. (Michigan, University, Ann Arbor, Mich.; NASA, Ames Research Center, Moffett Field, Calif.). *Space Life Sciences,* vol. 3, Aug. 1971, p. 25-33. 11 refs. Grant No. NGR-23-005-201.

Blind goldfish were subjected to linear accelerations on a motor car and on a parallel swing. Movements of the fish in a tank during the accelerations were recorded with a movie camera. During the horizontal acceleration, the fish aligns his longitudinal axis in a plane perpendicular to the direction of an apparent gravity with the fish's back pointing away from the direction of this apparent gravity vector. This is similar to the manner in which the fish usually aligns himself horizontally in response to the vertically downward terrestrial gravity and can therefore be termed 'gravity reference response.' It is concluded that blind goldfish cannot distinguish between otolith displacements caused by passive tilts and equivalent otolith displacements caused by moderate inertial forces during rectilinear acceleration. With a horizontal jerk of higher magnitude, two additional responses can occur: horizontal 180 deg turns following tailward jerks and straight forward darting following noseward jerks. (Author)

A71-42229 **On the unlikelihood of non-aqueous biosystems.** R. A. Horne (Woods Hole Oceanographic Institution, Woods Hole, Mass.). *Space Life Sciences,* vol. 3, Aug. 1971, p. 34-41. 24 refs.

The properties of water are examined, and the possibility of enzymatic activity in nonaqueous media is considered. It is concluded that the unique ability of the solvent liquid water to form polymorphic, 3-dimensional, H-bonded aggregates and solvation envelopes of widely different character (hydrophilic or coulombic hydration and hydrophobic hydration) is a necessary condition for the realization of the levels of order in form and complexity in function required by carbonaceous biotic systems. G.R.

A71-42230 **Survival of blue-green algae under primitive atmospheric conditions.** R. R. Stoecker (United States International University, Makawao, Hawaii). *Space Life Sciences,* vol. 3, Aug. 1971, p. 42-45. 7 refs. Research supported by the Long Island University.

Conditions on the primordial earth are reviewed and information on pertinent microfossils and primitive microorganisms presented. A series of simulated pre-Cambrian environments are set up and 8 strains of blue-green algae are tested under 7 different anaerobic, mildly reducing atmospheres. Of 61 cultures tested, 12 showed growth, 32 survived and 17 died. Growth was measured spectrophotometrically. Microscopic examination failed to show any gross morphological changes in the experimental cultures. It is concluded that certain strains of blue-green algae have retained their ability to survive or grow under a primordial atmosphere. (Author)

A71-42231 * **Exponential decontamination models for count data.** Richard G. Cornell and Ashok K. Bansal (Florida State University, Tallahassee, Fla.). *Space Life Sciences,* vol. 3, Aug. 1971, p. 46-53. 5 refs. Grant No. NGR-10-004-029.

Several models are developed for the estimation of the rate of exponential die-off from decontamination data. Calculations with illustrative data are reported which indicate that the estimation of this rate and its variance are sensitive to changes in modeling assumptions. Since extrapolation using this estimated rate is used in the specification of planetary quarantine standards, special care should be taken in the selection of an appropriate model and corresponding estimation procedure for the analysis of each set of decontamination data to be used for this purpose. (Author)

A71-42233 * **A computerized bacterial identification system as applied to planetary quarantine.** R. T. Dillon, Diane Holdridge (Sandia Laboratories, Albuquerque, N. Mex.), J. R. Puleo, and G. S. Oxborrow (U.S. Public Health Service, Center for Disease Control, Cape Kennedy, Fla.). *Space Life Sciences,* vol. 3, Aug. 1971, p. 63-84. 7 refs. NASA Contracts No. W-12,853; No. W-13,062.

A system has been developed to identify the samples obtained from Apollo spacecraft which uses a computer to process laboratory test results. This system is described in detail. The results of using the system with the available data are presented compared with conventional laboratory identifications. As a result of the performance with these comparisons, the system has been incorporated into NASA's Planetary Quarantine Lunar Information System for routine use. (Author)

A71-42239 **Keeping the pilot happy - The contribution of research and development (Third Sir Geoffrey de Havilland Memorial Lecture).** Morien Morgan (Royal Aircraft Establishment, Farnborough, Hants., England). *Aeronautical Journal,* vol. 75, Sept. 1971, p. 630-647. 13 refs.

Aspects of handling research during the years from 1935 to 1945 are related together with problems which had to be solved during the war years, giving attention to combat operations, accident prevention, and improvements in the basic understanding of the handling characteristics of military aircraft. Current work discussed includes the development of handling criteria, work in the Avionics Department, and investigations concerned with the pilot in order to improve his personal equipment. G.R.

A71-42241 **Pulmonary antibacterial defenses with pure oxygen breathing.** Paul A. Shurin, Solbert Permutt, and Richard L. Riley (Johns Hopkins Hospital, Baltimore, Md.). *Society for Experimental Biology and Medicine, Proceedings,* vol. 137, Sept. 1971, p. 1202-1208. 22 refs. NIH Grant No. 5 PO1 ES-00454.

After exposure to bacterial aerosols, mice were placed in air and in pure oxygen at 1 atm total pressure. Animals breathing pure oxygen showed an inhibition of early intrapulmonary clearance of Staphylococcus aureus and enhanced early clearance of Klebsiella pneumoniae. Furthermore, oxygen breathing for 24 hr after infection produced a delay of subsequent mortality due to K. pneumoniae. In vitro bacterial growth studies showed inhibition of growth of S. aureus by high oxygen and no effect on the growth of K. pneumoniae. Exposure to pure oxygen for 24 hr does not appear to have any major effect on the ability of the lung to inactivate inhaled bacteria. M.M.

A71-42250 * **Ultrasonic imaging of in vivo bubbles in decompression sickness.** G. J. Rubissow (California, University, Berkeley, Calif.) and R. S. Mackay (Boston, University, Boston, Mass.). *Ultrasonics,* vol. 9, Oct. 1971, p. 225-234. 19 refs. PHS Grant No. B-233; Grant No. NsG-500.

Scanning ultrasonic imaging is used to monitor, in vivo, the development and location of microscopic bubbles formed in decompression sickness. Stationary or moving bubbles as small as 5 microns are detected. Methods of comparison of earlier reference images with real time images on an oscilloscope are described. Different image displays are presented, emphasizing the usefulness of combined deflection and brightness scan modulation. Experiments show unmistakable decompression bubble echoes around fatty tissues in guinea pig legs, which disappear almost completely with recompression. Guinea pigs can be safely decompressed by keeping imaged bubble echoes below a threshold. Preliminary results of human studies are discussed. (Author)

A71-42341 # **Magnetic recordings of the heart's electrical activity with a cryogenic magnetometer.** A. Rosen, G. T. Inouye, A. L. Morse (TRW Systems Group, Redondo Beach, Calif.), and D. L. Judge (Southern California, University, Los Angeles, Calif.). *Journal of Applied Physics,* vol. 42, Sept. 1971, p. 3682-3684. 15 refs. Research supported by the U.S. Department of Health, Education, and Welfare.

The greatest difficulty in measuring magnetic field generated by the heart's electrical activity is in eliminating noise from other sources. The common mode portion of the noise was rejected by using a magnetometer with a pair of differentially connected superconducting flux transformers. The high sensitivity associated with the two Josephson junction quantum interference device permitted highly resolved magnetocardiograms of quality comparable to the normal electrocardiogram, without the use of shielded enclosures or signal averaging. (Author)

A71-42416 # **Electrolyte distribution and renal function in the hibernating hedgehog.** Gunnar Clausen and Asbjörn Storesund (Bergen, Universitetet, Bergen, Norway). *Acta Physiologica Scandinavica,* vol. 83, Sept. 1971, p. 4-12. 19 refs.

The concentrations of Na, K, Mg, and Cl were determined in muscles and liver, various zones of the kidney, plasma, red blood cells, and bladder urine in active and hibernating hedgehogs. Freezing point depression and urea concentration were determined in the kidney, plasma, and urine. Unaltered tissue water concentration and

15 to 20 percent decreased Cl and Na space suggest a shift of water from the interstitium to the cells during hibernation. Hibernation tended to alter the partition of electrolytes between tissues and plasma similarly to in vitro cooling of mammalian tissues. The osmolarity and the concentration of urea, Na, and Cl did not increase from cortex to papilla in the kidneys of hibernating hedgehogs. M.V.E.

A71-42417 **The spectrum of ST segment elevation in the electrocardiograms of healthy adult men.** Alfred F. Parisi (USAF, Medical Center, Lackland AFB, Tex.), Charles H. Beckmann (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), and Malcolm C. Lancaster (USAF, Medical Center, Brooks AFB, Tex.). *Journal of Electrocardiology*, vol. 4, no. 2, 1971, p. 137-144. 17 refs.

From 49,512 EKGs filed on USAF flying personnel in 1968, 1188 had ST segment elevation in two or more limb or precordial leads. The prevalence was 2.10% in those less than 35, and 2.65% in those 35 or older. The individual lead most commonly showing ST elevation was V sub 6 (90%). In the limb leads it was noted most frequently in lead II (51%). One hundred EKGs, representative of the entire series, were analyzed in greater detail. ST elevation in excess of 2.0 mm was noted in 3 records. Precordial T waves in excess of 10 mm were seen in 23 instances. Slurring of the the QRS complex into the ST segment was common in both limb and precordial leads, but a terminally notched QRS was not noted in the limb leads. Prior records, available in 87 cases, showed a consistent pattern of ST elevation in 65 instances for an average duration of 8.2 yrs. M.M.

A71-42432 **The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969.** Symposium sponsored by the University of the Pacific and the U.S. Department of Health, Education, and Welfare, NIH Grant No. 1 R 13 ET 00512-01A1. Edited by Paul Bach-y-Rita, C. C. Collins, and J. E. Hyde (University of the Pacific, San Francisco, Calif.). New York, Academic Press, Inc., 1971. 560 p. $14.50.

The topics treat the anatomical, physiological, pharmacological, psychological, and clinical correlations of eye movements. Models of various parts of the oculomotor system are discussed in a comprehensive survey of biophysical, mathematical, and engineering aspects of eye movement control. Other topics include the structure of the extraocular muscle fibers of mammals, EEG, evoked potentials, supranuclear disorders of ocular control systems in man, and eye movements and perception. A comprehensive subject index is provided. M.M.

A71-42433 **Neurophysiology of eye movements.** Paul Bach-y-Rita (University of the Pacific, San Francisco, Calif.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 7-45. 109 refs. PHS Grant No. NB-06038.

Discussion of questions fundamental to an understanding of movement in general, as well as movement of the eyes, such as the significance of ocular proprioception, the role played by sensory receptors in oculorotatory muscles, and the type of peripheral innervation which supplies the extraocular muscles (EOMs) so that they can move with the swiftness of a saccade or the slow smoothness of a following movement. Emphasis is placed on the afferent and efferent innervation of the EOMs. Results of studies of stretch receptors and their pathways, types of motor innervation, and muscle fiber types are presented. A few pertinent effects of central nervous system (CNS) control are discussed. M.M.

A71-42434 **The structure of the extraocular muscle fibers of mammals.** Lee Peachey (Pennsylvania, University, Philadelphia, Pa.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 47-66. 34 refs.

Brief review of the structural and functional properties of the muscles of the extraocular group, restricted to mammals and to the extrafusal fibers of the six muscles within the orbit, excluding the retractor bulbi. The histological arrangement of fibers in the muscles is discussed, together with the histochemical and ultrastructural aspects of the various fiber types, leading to a classification system including five different types of fibers. Some problems of relating structure to function are discussed, and the motor nerve endings in these muscles are touched upon. M.M.

A71-42435 **Central oculomotor pathways.** Malcolm B. Carpenter (Columbia University, New York, N.Y.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 67-103. 99 refs. NIH Grant No. NS-01538-12.

Brief review of studies of the nuclei of the extraocular muscles and of afferent pathways to the nuclei of the extraocular muscles. It is pointed out that observational data suggest that relatively discrete unilateral lesions in the interstitial nucleus produce primarily disturbance of head posture. Unilateral lesions involving the nucleus of Darkschewitsch, fibers from the interstitial nucleus which cross in the posterior commissure, and variable amounts of the lateral central gray substance appear to produce bilateral eyelid retraction and impairment of vertical eye movements, particularly those associated with upward gaze. Lesions involving fibers crossing in the ventral part of the posterior commissure produce a similar syndrome in the monkey, and appear to involve the same fiber systems. M.M.

A71-42436 **Vestibulo-ocular relations.** Bernard Cohen (Mount Sinai School of Medicine, New York, N.Y.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 105-148. 323 refs.

Brief review of eye movements induced by the vestibular apparatus and some aspects of vestibular nuclei organization. Central pathways which connect the vestibular and oculomotor nuclei, particularly pathways through the pons responsible for horizontal eye movements induced by both visual and vestibular stimuli are described. From the data presented, it seems likely that neural organizations which generate rapid horizontal eye movements lie in the paramedian zone of the pontine reticular formation (PPRF). In addition, pathways or neural groups important for producing slow eye movements also appear to be located in the PPRF. M.M.

A71-42437 **EEG, evoked potentials, and eye and image movements.** Dietrich Lehmann (University of the Pacific, San Francisco, Calif.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 149-174. 81 refs. NIH Grant No. NB-06038.

Outline of the present knowledge about cerebral EEG phenomena which precede, accompany, or follow eye and image movements, with the emphasis on observations in humans. The topics include preference for certain eye movements in wakefulness and different EEG sleep stages, eye position and generation of alpha EEG patterns, EEG potentials which precede eye movements, pontine-geniculate-occipital waves and the question of efference copy, EEG potentials evoked by image movements on the retina, EEG potentials evoked by eye movements across patterned visual fields (lambda waves), EEG potentials evoked during saccades, and the saccadic suppression of perception, and the effect of stabilization of retinal images. M.M.

A71-42438 **Supranuclear disorders of ocular control systems in man.** William F. Hoyt (California, University, San Francisco, Calif.) and Robert B. Daroff (U.S. Veterans Administration Hospital; Miami, University, Miami, Fla.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 175-235. 283 refs.

Reappraisal, for the benefit of clinicians, of the supranuclear ocular motor syndromes and signs in terms of current physiological concepts. An offer is made to share with colleagues in physiology and bioengineering opportunities for useful collaborative investigations of various defective eye movement control systems exemplified in patients with clinical involvement in the cerebrum, cerebellum, or brain stem. Much of the discussion is speculative, although based on what seems supported by current physiological, anatomical and clinico-pathological correlation. The various types of ocular motor disorders are discussed in terms of horizontal, vertical and vergence movements, with a section on para- and internuclear disorders. Several varieties of nystagmus are discussed. M.M.

A71-42439 **The pharmacology of extraocular muscle.** Kenneth E. Eakins and Ronald Katz (Columbia University, New York, N.Y.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 237-258. PHS Grants No. GM-09069; No. NB-07079 (now No. EY-00457).

The topics include the structure and function of twitch and tonic neuromuscular systems in the frog and in extraocular muscles, effect of cholinergic agents on extraocular muscle, the effect of neuromuscular agents on extraocular muscles, nondepolarizing neuromuscular blocking agents, and a simple method for determining the presence or absence of depolarizing neuromuscular blockade. Also treated are the effect of cholinesterase inhibitors on extraocular muscles, effect of adrenergic agents on extraocular muscle, and the autonomic nervous system and extraocular muscles. M.M.

A71-42440 ***Eye movements and perception.*** Leon Festinger (New School for Social Research, New York, N.Y.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 259-273. 32 refs.

Brief discussion of the manner in which eye movements affect the input to the visual system and how these movements affect the use of visual information. Eye movements serve a variety of functions, such as: (1) acquisition of a source of visual input; (2) maintaining the flow of information input through the visual system; (3) providing information about direction and egocentric localization of objects; and (4) providing the basis for the organization that results in visual perception of contours, shape, and distance. M.M.

A71-42441 **Orbital mechanics.** Carter C. Collins (University of the Pacific, San Francisco, Calif.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 283-325. 23 refs. PHS Grant No. 5 R O1 EY-00498; NIH Grant No. P O1 EY-00299; Contract No. N 0014-70-C-0141.

Description of preliminary dynamic studies of isolated oculorotatory muscles and globe restraining tissues, primarily carried out on cats but with some observations on humans. The static and dynamic mechanical properties of the orbital elements of the cat under conditions of graded stimulation are treated. These preliminary investigations have resulted in a conceptual model of the mechanical part of the oculomotor system on which further investigations of the human oculomotor plant will be based. Measurements of the mechanical characteristics of the human eye movement control system are discussed. It is pointed out that insights derived from the mechanical measurements and calculations of the oculomotor system of the cat make it possible to guide further research and interpretations of mechanical parameters of the human oculomotor system which may be of clinical significance. M.M.

A71-42442 **Extraocular muscle forces in strabismus.** Alan B. Scott (University of the Pacific, San Francisco, Calif.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 327-342. 13 refs. PHS Grant No. 5 R O1 EY-00498; NIH Grant No. P O1 EY-00299; Contract No. N 0014-70-C-0141.

Description of tests used in studies of the mechanical properties in strabismus which are helpful in understanding, diagnosis, and treatment. Some pertinent data on the passive and active forces giving horizontal alignment are reviewed, and it is shown that a quantitative approach to the forced duction test yields useful information. Ways of assessing the active force which the muscle gives during fixation or while the eye tries to move (force generation tests) are shown. The static forces which balance one another during steady fixation are first dealt with. It is then shown how one can get useful information from the dynamic behavior of the eye as it moves or tries to move with inputs from the various motor systems of the general oculomotor apparatus. M.M.

A71-42443 **The saccadic system.** Albert F. Fuchs (Washington, University, Seattle, Wash.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 343-362. 64 refs. NIH Grant No. FR-00166.

Only one model has been proposed which simulates the behavior of the saccadic control system and which, with slight modifications, has survived since its original presentation in 1962. Before this model is described and evaluated, some pertinent saccadic properties which must be satisfied by the model are reviewed. In conclusion, some of the oculomotor pathways and areas believed to be concerned with the saccade are discussed. M.M.

A71-42444 **The control system for versional eye movements.** Lawrence Stark (California, University, Berkeley, Calif.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 363-428. 88 refs. NIH Grant No. 7 RO1 NB 08546-01; Contract No. N 00014-67-A-0114-0022.

Review of the control system for versional eye movements in order to expose the current state of knowledge as the complex situation it really is: two well-formulated models under attack by their very success in generating critical new experiments; a few less refined models encompassing behavior as yet not understood; some quantitative descriptions without adequate underlying formulation; and many qualitative descriptions of complex phenomena, pursuit of which may lead to further crystallizations as new models. Four sections are each devoted to a somewhat separable major physiological process of the versional system: (1) dual mode control, (2) intermittency, (3) plant dynamics, and (4) prediction and pattern recognition. Each section contains models and quantitative descriptions that are related to each one of these four control phenomena.

A71-42445 * **Pursuit eye tracking movements.** Laurence R. Young (MIT, Cambridge, Mass.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 429-443. Grants No.

NGL-22-009-025; No. NGR-22-009-156; Contract No. AF 33(615)-69-C-1425.

Review of features of the pursuit eye movement system which are known at present, and discussion of some system characteristics which are still uncertain. A simplistic view of the human eye tracking system recognizes two major modes of tracking: rapid saccadic eye movements and smooth pursuit movements. The saccadic eye movement system supposedly acts to maintain the image of the object of interest on the fovea by a sequence of discrete high velocity jumps. The smooth pursuit system has been assigned the role of stabilization of retinal images, or more particularly matching the angular velocity of the eye to the velocity of the object. This view has led to the development of several models which treat the saccadic system as a velocity servomechanism. It is shown that the pursuit system is not a simple linear-velocity servomechanism based on retinal error velocity. M.V.E.

A71-42446 Control of vergence eye movements. Bert L. Zuber (Illinois, University, Chicago, Ill.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 447-471. 31 refs. PHS Grant No. NB-07777.

Discussion of the system of vergence - i.e., disjunctive - eye movements that provides the binocular organism of primates and higher animals with a crucial degree of freedom which permits the fixation of points in visual space at various distances from the organism. The vergence system has received less attention from researchers than the versional system. Complexities are met at the input to the vergence system where either fusional or accommodative stimuli may be used to drive the system. Both of these inputs are difficult to generate compared to the relatively simple versional inputs. At the output of the vergence system, the range of eye movement is about one fourth of the range of versional movement. The system interacts in a complex, and as yet incompletely understood, fashion with the accommodative and pupillary systems as an integral part of the so-called near triad. M.V.E.

A71-42447 Discussion of the control of eye vergence movements. Gerald Westheimer (California, University, Berkeley, Calif.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 473-482. 12 refs. PHS Grant No. NS-08091.

Experimental data are used to define the mechanisms by which the need for an eye vergence movement is recognized and its magnitude and direction become fixed. Target configurations which are effective in producing eye vergence movements are illustrated, together with horizontal and vertical receptive field disparities of binocular units. The influence of barbiturates on the motor component of vergence movements is examined, and it is concluded that there is a central (probably midbrain) site for convergence responses that is affected by barbiturates. T.M.

A71-42448 Vestibular and proprioceptive stabilization of eye movements. Jacob L. Meiry (MIT, Cambridge, Mass.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 483-496. 25 refs.

The input-output characteristics of the vestibulo-ocular reflex arc and associated neck proprioceptive mechanisms are examined with reference to the generation of a stabilized visual image during head and body movements. Compensatory eye movements for vestibular stimulation with earth-fixed and environmental fixation points are discussed for lateral stabilization. T.M.

A71-42449 Organization of neural control in the vestibulo-ocular reflex arc. G. Melvill Jones (McGill University, Montreal, Canada). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 497-518. 40 refs.

Analysis of experimental data for the vestibulo-ocular reflex arc indicates that the hydrodynamic response of the semicircular canal (at least during natural head movements) leads to the generation of an afferent neural signal containing the essential meaning of head angular velocity. This signal is then fed forward through subsequent neural relays to the oculomotor nuclei in a form which is largely unchanged and which hence retains the angular velocity message. This then generates a 'primary' oculomotor response after passing through a first-order lag system, with the special added feature that a 'secondary' saccadically generated signal (also acting through the subsequent first-order lag system) tends to restore correct phase (and presumably amplitude) relations between the response and the original stimulus head movement. T.M.

A71-42450 Models of oculomotor neural organization. David A. Robinson (Johns Hopkins University, Baltimore, Md.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 519-538. 30 refs. PHS Grant No. NB-08633-01.

Hypothetical neural arrangements are described which are compatible with the known structure and function of individual organizational elements in the oculomotor system. The vestibular-ocular reflex is represented by a system which stabilizes the visual axes in space over a certain frequency range for head excursions too small to trigger the fast phase of vestibular nystagmus. Speculations are offered on the manner in which this basic reflex system can be overlaid by the more complex visually controlled saccadic and smooth pursuit systems. Sets of brain stem neural networks are proposed as the generator of saccadic eye movements. Attempts at assigning neurological mechanisms to the smooth pursuit system indicate that the available system models are greatly oversimplified and must be modified to make them more compatible with the capabilities of neural networks. T.M.

A71-42451 Time delays in the human eye-tracking system. Derek H. Fender (California Institute of Technology, Pasadena, Calif.). In: The control of eye movements; Proceedings of the Symposium, University of the Pacific, San Francisco, Calif., November 10, 11, 1969. New York, Academic Press, Inc., 1971, p. 539-543.

It is argued that the phase lags observed in the human oculomotor system during tracking tasks can be represented accurately by simple time delays whose value is a function of the class of target motion. Experimental evidence indicates that the delay time is the time required by the retinal passage to sweep across enough receptors so that the integrated neural messages can generate the minimum afferent signal necessary to elicit corrective eye movements. T.M.

A71-42518 Pulse wave velocity in healthy subjects and in patients with various disease states. Marcel Eliakim, Dan Sapoznikov, and Joseph Weinman (Hadassah University Hospital, Jerusalem, Israel). *American Heart Journal*, vol. 82, Oct. 1971, p. 448-457. 38 refs.

Determination of the pulse wave velocity (PWV) in a large number of healthy subjects and patients suffering from eight different pathological states. A noninvasive photoplethysmographic technique was used, and two time periods were measured - the time period between the 'feet' of the pulse waves of the femoral and the dorsalis pedis arteries and the period between the QRS complex and

the pulse wave of the dorsalis pedis artery. PWV was found to increase significantly with age. Hypertension was accompanied by increased PWV only in older subjects, while peripheral vascular disease was associated with decreased PWV. No significant change was observed in normotensive subjects suffering from ischemic heart disease, rheumatic heart disease, congestive heart failure, diabetes mellitus, or anemia. The time interval between the feet of the femoralis and dorsalis pedis arteries was not altered significantly by cardiac pacing at fixed and increasing heart rates in eight patients with A-V block. Beat-to-beat measurements in eight cases of chronic atrial fibrillation showed that this interval was constant and independent of the preceding cycle length and, therefore, of variations in blood pressure. Premature beats generated intervals which were equal to or shorter than those generated by sinus or postpremature beats. On the other hand, the interval between the Q wave of the ECG and the foot of the pulse wave of the dorsalis pedis artery was prolonged by cardiac pacing and was inversely related to the preceding cycle length in atrial fibrillation. Likewise, intervals generated by premature beats were longer than those of sinus and postpremature beats. This finding is interpreted as indicating a prolongation of the 'left ventricular tension period,' rather than a change in the propagation time of the pulse wave. A.B.K.

A71-42519 Inferior atrial rhythms - Vectorcardiographic study and electrophysiologic considerations. Eligio Piccolo, Andrea Nava, and Sergio Dalla Volta (Padova, Università, Padua, Italy). *American Heart Journal,* vol. 82, Oct. 1971, p. 468-476. 10 refs.

Results of a vectorcardiographic analysis of 19 subjects with inferior atrial rhythm as diagnosed by ECG. A predominance of clockwise rotation of the P loop in the frontal plane and counterclockwise rotation in the horizontal and right sagittal planes is noted. The initial limb of the loop and the greatest vector are directed upward and usually leftward. The spatial voltage of the greatest vector and the dimensions of the loop are within normal limits. No correlation is observed between the VCG and ECG classifications of nodal and coronary sinus rhythms. An analysis of the horizontal plane makes it possible to identify several types of IAR, probably resulting from different locations of the pacemaker. A.B.K.

A71-42577 # Analysis of the relation between the hypothalamus anterior and the limbic system (Analiz vzaimootnoshenii mezhdu perednim gipotalamusom i limbicheskoi sistemoi). N. A. Losev, I. V. Tomilina, and Iu. S. Borodkin (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, June 1971, p. 790-797. 8 refs. In Russian.

Description of experiments in which electroencephalographic analysis was made on 48 curarized rabbits with electrodes implanted in various sections of the cerebrum. The intracentral relations between the paraventricular and supraoptical hypothalamus anterior nuclei on the one hand and the dorsal hippocampus and the medial septum on the other are studied. The effect of oxitocin on these cerebral structures is discussed. V.Z.

A71-42578 # Analysis of the neuron activity in the posterolateral associative nucleus of the thalamus (Analiz neironnoi aktivnosti zadnelateral'nogo assotsiativnogo iadra talamusa). L. A. Vasil'eva (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, June 1971, p. 798-805. 15 refs. In Russian.

The neutron activity of the posterolateral thalamus nucleus in response to heteromodal visual, acoustic and somatic stimuli is studied in anesthetized cats with microelectrodes inserted in the posterolateral thalamus nucleus. Pronounced but different reactions on these stimuli, single or combined, are established in most of these neurons. V.Z.

A71-42579 # Comparison of residual and reversed microinterval maskings by measurement of absolute sound level estimates (Sopostavlenie ostatochnoi i obratnoi mikrointerval'nykh maskirovok putem izmereniia absoliutnoi otsenki gromkosti). G. V. Bogdanov, S. N. Gol'dburt, T. S. Zubova, and M. L. Sokolova (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, June 1971, p. 806-817. 29 refs. In Russian.

The volume of perceived sound intensity information was studied in soundproof chamber experiments on 3 trained subjects with normal hearing. The subjects were instructed to discriminate test signals from masking signals on an electrodynamic TD-6 telephone system when signals of either type were delivered in alternation. The rectangular 1000-Hz 30-microsec 20-to-70-dB test signals and the rectangular 1000-Hz 300-microsec 85-dB masking signals were produced by two ZG-10 acoustic generators and an electronic device designed by Makarov et al. (1963). The perception capacity of the subjects declined when the microintervals between test and masking signals were reduced. V.Z.

A71-42580 # Frequency analysis of slow fluctuations in the local blood circulation and the oxygen tension in the cerebrum (Chastotnyi analiz medlennykh kolebanii mestnogo krovotoka i napriazheniia kisloroda v golovnom mozgu). I. P. Fedulova and I. T. Demchenko (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, June 1971, p. 857-862. 12 refs. In Russian.

Frequency analysis is carried out for blood circulation rhythms and oxygen tension in the cerebra of rabbits, cats, Macacus rhesus monkeys and human subjects with electrodes implanted in the cortical structures under normal physiological conditions. Computer calculations showed that most of the slow blood stream and pO2 fluctuations had frequencies from 0.005 to 0.2 Hz with some differences for individual genuses of animals and for man. V.Z.

A71-42581 # Vasomotor effects of the vagus nerve on the lung (O vazomotornykh vliianiiakh bluzhdaiushchego nerva na legkie). B. I. Mazhbich and L. P. Osadchuk (Akademiia Nauk SSSR, Institut Fiziologii, Novosibirsk, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, June 1971, p. 879-887. 23 refs. In Russian.

Study of the reaction of the posterior sections of canine lungs in response to alternate stimulation of ipsi- and counterlateral peripheral ends of severed truncus vagosympatheticus. EKG, plethysmogram, pneumogram, and the pressure in the pulmonary artery were recorded in 26 anesthetized dogs given artificial respiration when the contraction of the respiratory muscles was drug-arrested. Stimulation of the ipsilateral nerve produced an increase of blood content in the central section and a decrease of blood content in the peripheral sections of the lung. V.Z.

A71-42582 # Effect of the ambient temperature on spontaneous rewarming of ground squirrels during awakening after hibernation (Vliianie temperatury sredy na samorazogrevanie suslikov pri probuzhdenii ot zimnei spiachki). G. M. Daudova (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR) and N. V. Ipat'eva (Vsesoiuznaia Akademiia Sel'sko-Khoziaistvennykh Nauk, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 57, June 1971, p. 893-896. 29 refs. In Russian.

Observations indicate that Citellus suslicus and Citellus major animals rewarmed at ambient temperatures of +10, +1 and -2 C during recovery from hibernation. The process of awakening was slowed down to 300 to 360 min at -2 C from 60 to 90 min at +10 C. The temperature of the heart rose faster than that of the brain when the ambient temperature during awakening was low. V.Z.

A71-42583 # A universal apparatus for caloric stimulation of the labyrinth (Universal'noe ustroistvo dlia kaloricheskogo razdrazheniia labirintov). G. I. Gorgiladze and S. N. Rusanov.

Fiziologicheskii Zhurnal SSSR, vol. 57, June 1971, p. 910-912. 6 refs. In Russian.

Description of an assembly for controlled stimulation of the labyrinths of a subject by automatic admission of water strictly dosed in volume, temperature and duration of the feed. The assembly facilitates separate stimulation of each labyrinth by water at various temperatures, simultaneous stimulation of both labyrinths by water of the same or different temperatures, and caloric stimulation of the labyrinths against a background of adequate stimulation. A programmed control device with a time relay provides for a desirable stimulation process. Various ultrathermostats, centrifugal pumps, flow meters, and thermosensors were tested for the assembly. V.Z.

A71-42699 Radiobiological aspects of the reactivity of organisms in connection with space flights (Radiobiologicheskie aspekty reaktivnosti organizma v sviazi s kosmicheskimi poletami). Edited by P. P. Saksonov and B. I. Davydov. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 14), 1971. 411 p. In Russian.

Experimental studies of the influence of radiation-protection drugs on the reactions of organisms to accelerations and hypoxia. The effects of extremal flight factors on the response of organisms to these drugs are also examined, and extensive test data are quoted on the effectiveness of drugs and partial body screening in minimizing the effects of ionizing radiation. Symptoms brought about by combinations of drugs and flight conditions are described in detail. Methodological articles describe procedures for measuring the composition of cosmic radiation, for preparing samples in radiation pathology, and for determining the relative biological effectiveness of various types of radiation. T.M.

A71-42700 # Influence of mercaptoalkylamine-group radiation-protection preparations (cystamine, S,beta-aminoethylisothiuronium) on the stability of animals to lateral accelerations (Vliianie radiozashchitnykh preparatov iz gruppy merkaptoalkilaminov /tsistamin, S,beta-aminoetilizotiuronii/ na ustoichivost' zhivotnykh k poperechno napravlennym peregruzkam). B. I. Davydov and N. A. Gaidamakin. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 7-25. 9 refs. In Russian.

Experimental determination of the dose dependence of the influence of cystamine and aminoethylisothiuronium on the resistance of rats and mice to lateral accelerations thirty minutes after the administration of the drug. The dose dependence of the drug effects was determined on the basis of the cardiac contraction rate. The resistance of the animals to the accelerations becomes stabilized within four hours after administration of the drugs. The reduction of the depressant effect of the drugs with time is associated with the elimination of the pharmacological (toxic) effect. The reduction of glycogen supplies in the liver is a possible mechanism responsible for the drop in resistance to acceleration under the influence of cystamine. T.M.

A71-42701 # Influence of the monosodium salt of beta-aminoethylthiophosphoric acid on the stability of animals to lateral accelerations (Vliianie mononatrievoi soli beta-aminoetiltiofosfornoi kisloty na ustoichivost' zhivotnykh k poperechno napravlennym peregruzkam). B. I. Davydov and V. A. Kozlov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 25-32. In Russian.

Mice were subjected to lateral accelerations on a centrifuge after periods of 30 min, 4 hr, and 1, 2, and 5 days following the intraperitoneal administration of the drug. Expressions are derived for the dose dependence of the acceleration resistance of male and female animals during the 30-min period following the administration of the drug. The response of the animals receiving a 300 mg/kg dose did not differ from control animals after periods longer than 4 hr. T.M.

A71-42702 # Influence of aminothiol-group radiation-protection drugs on the cardiac function of guinea pigs during accelerations (Vliianie radioprotektorov iz gruppy aminotiolov na funktsiiu serdtsa morskikh svinok pri deistvii peregruzok). V. A. Kozlov and B. I. Davydov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 33-37. 5 refs. In Russian.

Cystamine, mercaptopropylamine, and aminoethylisothiuronium (AET) reduce the resistance of guinea pigs to lateral accelerations. The bradycardia induced by these drugs is further aggravated by the accelerations and enhances the rate at which the adaptation (to acceleration) reserves are used up. The AET did not affect the cardiac contraction rate, but acute bradycardia also followed when it was combined with acceleration. The influence of cystamine can be totally or partially eliminated with the aid of atropine or dimedrol. T.M.

A71-42703 # Mechanism responsible for the reduction in tolerance to accelerations under the influence of radiation-protection pharmacological preparations (K mekhanizmu snizheniia perenosimosti peregruzok pod vliianiem radiozashchitnykh farmakokhimicheskikh veshchestv). N. A. Gaidamakin, V. G. Petrukhin, and B. I. Davydov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 38-44. 32 refs. In Russian.

Rats were subjected to the influence of lateral accelerations, cystamine, and a combination of both these factors. Pathomorphological and histochemical changes were examined in the lungs, liver, heart, diaphragm, and the adrenal glands. Both the accelerations and cystamine caused oxygen deficiency in the tissues and led to rapid exhaustion of energy reserves in the organism. The hypoxia effects were added during the combined action of accelerations and cystamine. T.M.

A71-42704 # Influence of certain radiation protection drugs on the resistance of albino rats to acute hypoxia (Vliianie nekotorykh radioprotektorov na ustoichivost' belykh krys k ostroi gipoksii). L. A. Tiunov, V. V. Kustov, G. A. Vasil'ev, and A. N. Ukshe. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 45-47. 14 refs. In Russian.

The behavior of an organism treated with radiation-protection drugs in response to acute hypoxia was examined in experiments conducted with albino rats. Intraperitoneally and perorally administered cystamine (250 mg/kg) and aminoethylisothiuronium (800 and 250 mg/kg) substantially reduced the resistance of the animals to acute hypoxic hypoxia and to hypoxia induced by carbon dioxide. Possible pathophysiological mechanisms responsible for this effect are considered. T.M.

A71-42705 # Certain aspects of the practical use of medicinal preparations under flight-duty conditions (Nekotorye aspekty prakticheskogo ispol'zovaniia lekarstvennykh veshchestv v usloviiakh letnoi deiatel'nosti). P. P. Saksonov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 48-52. In Russian.

Recommendations for the use and avoidance of specific drugs by crewmembers of spacecraft and aircraft. The composition of on-board medical supplies is examined from the viewpoint of preventing indiscriminate use of particular medicines by crew-

members who have only superficial knowledge of possible after-effects. Allergies induced by certain drugs are characterized, together with resulting effects as they affect the health requirements of flight personnel. T.M.

A71-42706 # Tolerance of mice to aminothiol- and indolylalkylamine-series radiation-protection drugs in the after-effects period following lateral accelerations (Chuvstvitel'nost' myshei k radioprotektoram iz riada aminotiolov i indolilalkilaminov v period posledeistviia poperechno napravlennykh peregruzok). V. V. Antipov, M. V. Vasin, B. I. Davydov, P. P. Saksonov, and N. V. Smirnova. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 53-57. 5 refs. In Russian.

Study of the influence of lateral accelerations on the tolerance of mice to toxic doses of cystamine, aminoethylisothiuronium (AET), monosodium salt of beta-aminoethylthiophosphoric acid (cystaphose), and 5-methoxytryptamine (5-MOT). A small increase in the tolerance to aminothiols (cystamine and cystaphose) was observed immediately after the accelerations. After 30 min, there was a statistically significant rise in the sensitivity of the mice to cystamine and AET; after 1 hr, this reaction returned to normal. Increased tolerance to 5-MOT was observed for a day following the acceleration. Increased levels of acceleration substantially enhanced the tolerance to cystamine. T.M.

A71-42707 # Influence of certain radiation-protection preparations on the evacuatory motor function of the gastrointestinal tract of healthy and irradiated rats (Vliianie nekotorykh radiozashchitnykh preparatov na motorno-evakuatornuiu funktsiiu zheludochno-kishechnogo trakta zdorovykh i obluchennykh krys). I. G. Krasnykh and L. A. Tiutin. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 57-65. 22 refs. In Russian.

Cystamine, aminoethylisothiuronium, monosodium salt of beta-aminoethylthiophosphoric acid, and 5-methoxytryptamine (administered in radiation-optimal doses through the mouth, intraperitoneally, and into the small intestine) reduced the rate of tracer (barium sulfate) evacuation from the stomach by factors of 4 to 8, 2, 5 to 6, and 2 to 3, respectively. Intraperitoneal administration of cystamine prior to irradiation at first increases the spasm of the pylorus and aggravates the disturbance of the stomach's evacuatory function; subsequently, the drug exerts a clear normalizing effect on the functional state of the gastrointestinal tract. T.M.

A71-42708 # Certain features in the action of sympathomimetic amines on the reflex functions of the central nervous system in irradiated and desymphatized animals (O nekotorykh osobennostiakh v deistvii simpatomimeticheskikh aminov na reflektornye funktsii tsentral'noi nervnoi sistemy obluchennykh i desimpatizirovannykh zhivotnykh). P. P. Saksonov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 65-74. 20 refs. In Russian.

Adrenaline, symphatol, veritol, adrenalone, ephedrine, amphetamine, and methamphetamine depress the reflex activity of the spinal chord. The severity and nature of this effect have a specific dependence on the chemical structure of the amine and on the functional state of the central nervous system. The toxicity of all amines is from two to four times higher for irradiated animals than for normal animals. The degree of depression of the spinal chord in irradiated animals was approximately the same as that in desymphatized animals. T.M.

A71-42709 # Characteristic effects of drugs under hypothermia conditions (K kharakteristike deistviia lekarstvennykh veshchestv v usloviiakh gipotermii). B. G. Volynskii and S. L. Freidman. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 75-85. In Russian.

Caffeine, euphyllin, and cordiamin depress respiration, reduce arterial blood pressure, disturb the heart's bioelectrical activity, and affect the metabolic processes in the organism during hypothermia (rectal temperatures of 19 and 20 C). Glycogen and ATP contents become reduced in tissues of the heart, liver, kidneys, and brain. A tendency toward increased excretion of calcium ions with the urine was observed. Morphine does not increase the depressing effect of low temperature on the cardiac function and on the state of metabolic processes in the tissues; calcium chloride substantially reduces the arterial pressure. Adrenaline and mesaton retain their usual effects during hypothermia. T.M.

A71-42710 # Chemical prophylaxis of radiation sickness (Khimicheskie sredstva profilaktiki luchevoi bolezni). V. S. Shashkov, B. V. Anisimov, and P. P. Saksonov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 86-102. 42 refs. In Russian.

Current uses of chemical compounds in radiation sickness prophylaxis are discussed, covering mercaptoalkylamines, aminoalkylisothiourea derivatives and indolylalkylamines. The topics include the mechanisms of protective action, inactivation of radicals, protection by changing the state of biosubstrate molecules and metabolism modification, and recovery of radiation-afflicted cells. V.Z.

A71-42711 # Pharmacological properties of prophylactic medication of radiation damages (Farmakologicheskie svoistva sredstv lekarstvennoi profilaktiki radiatsionnykh porazhenii). V. S. Shashkov and B. V. Anisimov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 102-121. 44 refs. In Russian.

Pharmacological properties of chemical compounds used as radiation protectors are reviewed. Covered are beta-mercaptoethylamine, beta-mercaptopropylamine, beta-aminoethylthiophosphoric acid, cystamine, cysteine, S-beta-aminoethylisothiuronium Br-HBr, dimethylsulfoxide and indolylalkelamines. Toxicity, metabolism, protective doses and physiological action of these compounds are discussed in the light of current knowledge. V.Z.

A71-42712 # Radiation-protective action of cystamine under different conditions of gamma irradiation (Protivoluchevaia effektivnost' tsistamina pri razlichnykh usloviiakh gamma-obluchenііa). M. V. Vasin, P. P. Saksonov, V. V. Antipov, and V. S. Shashkov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 121-131. 31 refs. In Russian.

The death rates, median life span, and weight were studied in mice exposed to gamma radiation doses of 139 to 159 r/min after intra-abdominal injections of cystamine. The protective action of cystamine was not affected when injections of 15 mg/kg were made 30 min before exposures but it did decrease when this time was extended to 1 hr. The protective action of cystamine and other aminothiol protectors declined sharply when the exposures lasted 1.5 to 4 hr. V.Z.

A71-42713 # Chemical protection from mixed gamma-neutron radiation with different proportions of neutrons in the absorbed dose (Khimicheskaia zashchita pri smeshannom gamma-neitronnom obluchenii s razlichnym vkladom neitronov v pogloshchennuiu dozu). M. V. Vasin, V. A. Kozlov, B. L. Razgovorov, and I. G. Krasnykh. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 132-136. 13 refs. In Russian.

The radiation protective properties of cystamine, S-beta-aminoethylisethiuronium bromide-hydrobromide, monosodium salt of beta-aminoethylthiophospheric acid and 5-methoxytryptamine was studied on albino mice exposed to gamma-neutron emission. Depending on the radiation doses and composition, the protective effect of these compounds varied from zero to some statistically measureable levels. V.Z.

A71-42714 # **Elimination of cystamine in the organism and prolongation of its radiation-protective action (Eliminatsiia tsistamina v organizme i prolongirovanie ego radiozashchitnogo deistviia).** B. I. Davydov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 137-158. 17 refs. In Russian.

Experiments on rats showed that the elimination rates of cystamine in them were 25 to 35% per hr during 3 hr following injections. An attempt was made to extend the radiation-protective action of cystamine by reinjection of eliminated portions. Cystamine elimination rates were lower when small doses of cystamine were added repeatedly at intervals of one hour, and its toxic action increased after 3rd injection. In general, its radiation-protective action declined faster with time than its toxic action. Preliminary experiments indicated that elimination of other radiation protectors could also be studied by this method. V.Z.

A71-42715 # **Effect of gamma emission on the elimination of the toxic effect of cystamine (Vliianie gamma-oblucheniia na eliminatsiiu toksicheskogo effekta tsistamina).** M. V. Vasin, B. I. Davydov, V. V. Antipov, and P. P. Saksonov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 158-163. 15 refs. In Russian.

Half-elimination times of cystamine toxic effect in gamma-irradiated and control mice are compared in a study of the effect of gamma emission on the elimination of cystamine in the organism. Residual cystamine in the organism is calculated from the shift in LD50 of the protector 3 hr after injections. Gamma doses of 850 r increased T50 from 1.8 in control mice to 2.3 in irradiated mice when cystamine was used as a prophylactic. The portion of cystamine remaining in the organism was 44.2% in exposed mice and 24.5% in control mice 3 hr after injection. It is theorized that a slower elimination of the toxic effect of cystamine after irradiation is due to a depressive effect of radiation on cystamine metabolism. V.Z.

A71-42716 # **Effect of the shielding of some portions of the body on the progress of radiation sickness and on the survival rates of animals under general gamma neutron radiation (Vliianie ekranirovaniia nekotorykh oblastei tela na techenie luchevoi bolezni i vyzhivaemost' zhivotnykh pri obshchem gamma-neitronnom obluchenii).** B. L. Razgovorov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 163-175. In Russian.

Experiments on rats exposed to general gamma neutron radiation with a neutron component of about 90% showed that the shielding of the head provided a much less effective protection than the shielding of the front section of the belly when the masses of protected tissues in both cases were equal. The shielding of equal head or belly tissue masses was nearly as effective during exposure to fission neutrons of about 1 MeV as it was during exposure to 120-MeV protons but was much less effective during exposure to gamma emission. Protective effect of head and belly shielding was substantially higher when the neutron proportion in gamma emission was reduced from 90 to 30%. V.Z.

A71-42717 # **Changes in the reactivity of animals to certain pharmacochemical preparations when parts of the body are shielded during total irradiation (Izmenenie reaktivnosti zhivotnykh k nekotorym farmakokhimicheskim preparatam pri ekranirovanii chastei tela vo vremia obshchego obluchenija).** B. L. Razgovorov, P. P. Saksonov, V. V. Antipov, V. S. Shashkov, and V. S. Morozov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 175-185. 10 refs. In Russian.

Study of the effect of cystamine, AET, and 5-methoxytryptamine (5-MOT) on rats subjected to total irradiation with 120-MeV protons and Co 60 gamma rays while their abdomen and head regions were protected by shields. It is found that the effectiveness of these preparations is considerably increased, especially in those cases where the substances are administered in suboptimal doses in the presence of 'low-efficiency' shields, under conditions of exposure of the animals to absolutely lethal radiation doses. While in the case of cystamine and AET the increase in specific effectiveness was the same whether the head was shielded or the abdomen tissue, in the case of 5-MOT the increase in its effectiveness is much more pronounced when the abdomen is shielded than when the head is shielded. This difference in the reaction of the animals is attributed to certain differences in the mechanism of action of the preparations. A.B.K.

A71-42718 # **Effect of shielding of certain parts of the body on the evolution of radiation sickness in dogs subjected to total gamma irradiation (Vliianie ekranirovaniia nekotorykh chastei tela na techenie luchevoi bolezni u sobak pri obshchem gamma-obluchenii).** B. L. Razgovorov and N. I. Konnova. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 185-199. 6 refs. In Russian.

Study of the effect of shielding of the head and the anterior part of the abdomen on the clinical evolution and outcome of radiation sickness in dogs subjected to lethal doses of total gamma irradiation. The test results confirmed the basic data obtained in experiments on small laboratory animals and showed the great effectiveness of shielding parts of the body in the case of dogs. Given a shielding of equal masses of tissue by shields producing an identical degree of radiation attenuation, and given an equal irradiation dose, shielding of portions of the anterior part of the abdomen is found to be considerably more effective than shielding of the head. In order to produce a significant protective effect of shielding in the presence of lethal irradiation doses, it is necessary to protect an abdomen (head) tissue mass equal to 10 to 15% of the body mass and to reduce the irradiation dose on the shielded tissue by a factor of 3 to 4. A.B.K.

A71-42719 # **Effect of shielding of the abdomen on the frequency of chromosome aberrations in the bone marrow cells of guinea pigs and rats subjected to gamma irradiation in doses of 50 to 200 r (Vliianie ekranirovaniia zhivota na chastotu khromosomnykh aberratsii v kletkakh kostnogo mozga morskikh svinok i krys pri gamma-obluchenii v dozakh 50 - 200 r).** M. V. Vasin and B. L. Razgovorov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 199-204. 5 refs. In Russian.

Comparative study of the effect of irradiation in doses of 50 to 200 r on the level of disruption of the chromosome complex of bone marrow cells in experimental animals (with shielded abdomens) and control animals. Although no differences in chromosome behavior are noted within the first 12 or 24 hr after irradiation, after three days the frequency of chromosome aberrations in the bone marrow of the experimental animals practically returned to the initial level and was statistically reliably lower than in animals irradiated without a physical shield. The level of disruption of the chromosome complex in the experimental animals was also somewhat lower than in animals irradiated with a half-dose of irradiation, thus attesting to a decrease in the radiation effect by a factor of 2 to 2.5. A.B.K.

A71-42720 # **Blood serum aminotransferases in dogs after total exposure to gamma rays under conditions of shielding of the**

abdomen or head regions (Aminotransferazy syvorotki krovi sobak posle total'nogo vozdeistviia gamma-luchei v usloviiakh ekranirovaniia oblasti zhivota ili golovy). B. I. Davydov and E. E. Simonov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 204-217. 15 refs. In Russian.

Investigation of the activity of glutamicoaspartic (GAST) and glutamicoalanine (GALT) aminotransferases in the blood serum of dogs subjected to single irradiation with Co 60 in a dose of 600 r (2.9 r/min) with shielding of the head or abdomen. Hyperfermentemia was observed within 40 to 90 days after exposure. When the animals were subjected to radial accelerations (before the appearance of symptoms of disruption of cardiac activity), an almost equal hyperfermentemia occurs both in intact animals and in those irradiated with the abdomen region shielded, as contrasted with an absence of changes in the activity of GAST and GALT in dogs with head shielded. These differences are attributed to the dynamics of changes in aminotransferase activity, and to the rate and volume of the repair processes under different shielding conditions. A.B.K.

A71-42721 # Pathomorphological changes in the organs of white rats subjected to irradiation by 120-MeV protons and the role of partial shielding in the attenuation of radiation damage (Patomorfologicheskie izmeneniia organov belykh krys pri obluchenii protonami s energiei 120 MeV i rol' chastichnogo ekranirovaniia v oslablenii radiatsionnogo porazheniia). L. S. Sutulov, N. A. Gaidamakin, B. L. Razgovorov, P. P. Saksonov, V. G. Petrukhin, V. V. Antipov, V. N. Kop'ev, N. A. Bogdanova, N. V. Trukhina, Iu. L. Sutulov, A. G. Krasnolobov, S. G. Kul'kin, A. M. Zagrebin, V. N. Anan'ina, V. A. Tolchenkin, and T. V. Tarapina. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 217-231. In Russian.

Study of the pathomorphological changes occurring in the spleen, testes, stomach, intestines, myocardium, central and peripheral nervous system, and the retina of the eye in rats subjected to irradiation with 120-MeV protons in a dose of 640 rad under conditions of partial shielding of the abdomen region. In the irradiated animals destructive changes typical of radiation sickness are noted not only in radiosensitive organs, but also in so-called radioresistant organs (the myocardium, the nervous system). Local shielding of the abdomen is found to reduce the extent and intensity of changes in the organs, especially in organs directly covered by the shield. A.B.K.

A71-42722 # Significance of radiosensitivity of various regions of the body in the development of radiation pathology (Znachenie radiochuvstvitel'nosti otdel'nykh oblastei tela v razvitii luchevoi patologii). N. A. Gaidamakin. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 231-245. 14 refs. In Russian.

Study of the special features of the pathomorphological changes occurring in the organs of rats subjected to total gamma neutron irradiation in a dose of 300 rad under conditions of shielding of the head and abdomen regions. The mortality rate of the rats and the frequency of diarrhea were taken into account, the nature of the pathomorphological changes in the organs was noted, and the degree of recovery of the reproductive function in irradiated males was estimated. A special feature of radiation sickness in rats subjected to total gamma neutron irradiation is pronounced early damage to the intestines. Placing a shield in the abdomen region is a more effective means of ensuring protection from radiation than the use of a shield in the head region. A.B.K.

A71-42723 # Certain ways of preventing radiation sickness (Nekotorye puti profilaktiki luchevoi bolezni). L. A. Tiutin. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 245-250. 13 refs. In Russian.

Study of the effectiveness of employing the radioprotective preparation cystamine hydrochloride, or a vitamin B complex together with vitamin C, in the course of radiation therapy. It is found that when patients undergoing radiation therapy are given before each irradiation 0.6 gram of cystamine hydrochloride the frequency of the appearance of various symptoms of radiation sickness is reduced by a factor of 2 to 3. The administering of a vitamin B complex and vitamin C in the course of radiation therapy has a favorable effect on the overall state of the patients and decreases intoxication symptoms, without appreciably affecting the white blood pattern. A.B.K.

A71-42724 # Reactivity of irradiated animals protected by mercapto-(cystamine and cystaphos) and indolylalkylamines (5-MOT and serotonin) to transversely directed accelerations (Reaktivnost' obluchennykh zhivotnykh, zashchishchennykh merkapto-/tsistamin i tsistafos/ i indolilalkilaminami /5-MOT i serotonin/, k poperechno napravlennym peregruzkam). B. I. Davydov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 251-271. 14 refs. In Russian.

Study of the reaction of a large number of mice to acceleration (44 g) after various periods of radiation sickness brought on by exposure to gamma irradiation in doses ranging from 500 to 400 r. Regression equations for the tolerance to acceleration by the irradiated animals are calculated for the case of exposure to radiation without radioprotectors and for the cases of exposure to radiation with the use of the radioprotectors cystamine, cystaphos, 5-methoxytryptamine (5-MOT), and serotonin. A.B.K.

A71-42725 # Rate of recovery of radioresistance after exposure of the organism to the combined action of ionizing radiation and dynamic flight factors (Skorost' vosstanovleniia radiorezistentnosti pri kombinirovannom deistvii na organizm ioniziruiushchikh izluchenii i dinamicheskikh faktorov poleta). N. N. Dobrov, V. A. Kozlov, V. S. Parshin, and P. P. Saksonov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 271-285. 20 refs. In Russian.

Study of the rate of recovery of the radioresistance of mice subjected to the combined action of gamma radiation and dynamic factors such as vibration and acceleration. In this study the rate of recovery is estimated on the basis of a determination of the dose which causes a 50% decrease in the weight of the spleen within four days after the test irradiation. A lengthening of the period of semirecovery of radioresistance is noted in mice subjected to the combined action of radiation and dynamic factors in comparison with mice subjected only to radiation. A.B.K.

A71-42726 # The effect of cystamine in a mixture with sympathomimetic amines on repair processes after exposure to radiation and accelerations (Vliianie tsistamina v smesi s simpatomimeticheskimi aminami na reparativnye protsessy posle vozdeistviia radiatsii i peregruzok). N. N. Dobrov, V. A. Kozlov, V. S. Parshin, and P. P. Saksonov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 285-288. In Russian.

Determination of the protective effect of a radioprotector administered to a large number of white mice subjected to acceleration before and after exposure to gamma radiation. The radioprotector in this case was cystamine in a mixture with adrenaline and amphetamine, the criterion for estimating the protective effect being the rate of repair of the reversible part of the radiation damage, as determined from the time required for semirecovery of the radioresistance of the animals. It is established

that the protective effect of cystamine during the combined action of radiation and acceleration is of the same extent as during radiation alone. A.B.K.

A71-42727 # Reaction of peripheral blood in dogs to the complex action of transverse accelerations and gamma irradiation (Reaktsiia perifericheskoi krovi u sobak pri kompleksnom deistvii poperechnykh peregruzok i gamma-oblucheniia). N. I. Konnova. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 292-304. 9 refs. In Russian.

Study of the effect produced in the blood system of dogs by the complex action of single prior transverse accelerations and gamma irradiation in a dosage of 100 or 200 r with intervals of 2 or 24 hr between exposures. With an interval of 2 hr between exposures and an irradiation dosage of 100 r the changes in the peripheral blood during the first few hours were caused mainly by the action of acceleration and consisted of neutrophilic leucocytosis, lymphoeosino-, and thrombocytopenia, expressed to a considerably greater extent than in the group subjected to irradiation alone. With an increase in the dosage to 200 r this effect decreases. With an interval of 24 hr between the acting factors and dosages of 100 and 200 r a more rapid and complete recovery of the composition of the peripheral blood is noted than in the case of exposure to irradiation alone. A.B.K.

A71-42728 # Determination of the influence of vibration on the reaction of dogs to radiation with the aid of certain clinico-hematological indices (Otsenka vliianiia vibratsii na luchevuiu reaktsiiu u sobak s pomoshch'iu nekotorykh kliniko-gematologicheskikh pokazatelei). T. S. L'vova. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 304-314. 10 refs. In Russian.

Thirty-three dogs were vibrated at a frequency of 70 Hz and an amplitude of 0.4 cm 2 hr and one day prior to gamma-irradiation in doses of 100 and 200 rads. Vibration is found to produce changes in the reaction of peripheral blood to irradiation. The effect of vibration was most pronounced in a group of dogs subjected to vibration 2 hr before irradiation in a dose of 100 rads. The effect of vibration was less pronounced when the dose was increased to 200 rads. Vibration one day prior to irradiation has no effect for either of the doses. V.P.

A71-42729 # Influence of preliminary administration of the radiation protector phinam on the reactivity of tissues of irradiated animals under various test conditions (Vliianie predvaritel'nogo vvedeniia radioprotektora finama na reaktivnost' tkanei obluchennykh zhivotnykh pri razlichnykh eksperimental'nykh usloviiakh). L. S. Sutulov, R. P. Saksonov, M. N. Volkov, V. A. Kozlov, Iu. L. Sutulov, A. P. Kuz'mina, N. N. Dobrov, A. G. Krasnolobov, V. N. Anan'ina, L. V. Trukhina, V. A. Tolchenkin, G. A. Lialina, and A. M. Zagrebin. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 314-335. 27 refs. In Russian.

The influence of a radiation protector belonging to the class of aminothiols on the degree to which a number of internal organs of white rats were damaged by single and twofold gamma-irradiation and by the combined effect of gravitational overloads and radiation is investigated. The radiation protector is found to decrease radiation damage and to further healing of damaged tissue. V.P.

A71-42730 # Influence of pharmacochemical substances on the reactivity of the organism to the combined effect of gamma-irradiation and transverse loads (Vliianie farmakokhimicheskikh veshchestv na reaktivnost' organizma k kombinirovannomu vozdeistviiu gamma-oblucheniia i poperechnykh peregruzok). N. A. Gaidamakin, S. G. Kul'kin, B. I. Davydov, and B. S. Shashkov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 336-350. 24 refs. In Russian.

The effectiveness of cystamine and S, beta-aminoethylisothiuronium administered in doses of 75 mg/kg each 15 to 30 min prior to exposure to the combined effect of Co60 gamma-radiation (350 and 700 rads) and transverse loads (10 units during 30 min) is studied on mice. The action of overloads one day prior to irradiation is found to decrease the radiation damage of hemopoietic organs. Mice exposed to overloads one day after irradiation exhibited a slight increase in radiation damage of spleen and bone marrow and a buildup of destructive changes in the peripheral nervous system. The combined effect of cystamine and aminoethylisothiuronium is found to reduce radiation damage both in the case of irradiation without overloads and in the case of irradiation combined with overloads. V.P.

A71-42731 # Resistance of test animals to acute hypoxia during various phases of radiation sickness (K voprosu ob ustoichivosti eksperimental'nykh zhivotnykh k ostroi gipoksii v razlichnye stadii luchevoi bolezni). G. A. Vasil'ev, L. A. Tiunov, Iu. A. Medvedev, V. V. Kustov, and A. N. Ukshe. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 350-355. 7 refs. In Russian.

The influence of X-ray doses of 50, 100, 200, 500, 700, and 1000 r on the resistance of white rats to acute anoxic, anemic, and histotoxic hypoxia is studied. The histophysiological state of the adrenal cortex was studied in parallel experiments. The observed increase in the resistance of irradiated rats to hypoxia is attributed to a nonspecific reaction of the organism, through the adrenal cortex, to stress effects. V.P.

A71-42732 # The state of peripheral blood in irradiated animals during prolonged exposure to conditions of reduced barometric pressure (Sostoianie perifericheskoi krovi obluchennykh zhivotnykh pri dlitel'nom prebyvanii v usloviiakh ponizhennogo barometricheskogo davleniia). N. I. Ezepchuk and N. N. Dobrov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 355-362. 10 refs. In Russian.

Investigation of radiation (450-r dose) effects in rats exposed up to 98 days to a pressure of 198 mm Hg with partial oxygen pressure close to its sea-level value. The reduced barometric pressure exhibited a negative influence on the survivability of the irradiated animals. Preliminary acclimatization of the animals to the low-pressure environment somewhat mitigated the progress of radiation sickness. No substantial differences were seen in the blood indices of acclimatized and nonacclimatized rats exposed to radiation. T.M.

A71-42734 # Method of composite tissue blocks for comparative pathomorphological investigation of radiation pathology (Metodika kombinirovannykh tkanevykh blokov dlia sravnitel'nogo patomorfologicheskogo izucheniia radiatsiomoi patologii). V. G. Petrukhin and N. A. Gaidamakin. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 369-378. 9 refs. In Russian.

An original sample-preparation method for radiation pathology research is described whereby sample sections of animal organs from different test series are closely packed on filtering paper. The resulting composite tissue blocks are frozen in solid carbon dioxide, and sections are cut for histochemical tests. Without preliminary freezing, such blocks can be placed in corresponding fixative mixtures (formaldehyde solution, Carnoy's fixative, and others), subjected to dehydrating and indurating media, and studied by ordinary histological methods. The method provides composite sections of any organ from animals in different test series, prepared under identical conditions. T.M.

A71-42735 # **Problem of the relative biological effectiveness of fast neutrons (K voprosu ob otnositel'noi biologicheskoi effektivnosti bystrykh neitronov).** B. L. Razgovorov. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 378-393. 42 refs. In Russian.

A majority of the available neutron sources emit gamma rays together with the neutrons. Experiments performed with rats show that the magnitude of the gamma-ray background can be neglected in approximate calculations of the relative biological effectiveness (RBE) of neutrons if the gamma-ray contribution to the total radiation dose is not greater than 15%. For higher levels of the gamma component, the error in determining the RBE factor increases substantially and can significantly distort the experimental results. A table of total gamma and neutron radiation doses for two different values of the gamma background is given which facilitates the determination of the RBE of neutrons with allowance for the contribution of the gamma component. T.M.

A71-42736 # **Excretion of free amino acids with urine as a test for early diagnosis of radiation damage (Ekskretsiia svobodnykh aminokislot s mochoi kak test dlia rannei diagnostiki luchevykh porazhenii).** L. A. Tiutin. In: Radiobiological aspects of the reactivity of organisms in connection with space flights. Moscow, Izdatel'stvo Nauka, 1971, p. 394-398. 14 refs. In Russian.

The paper chromatography method was used to study the features of free amino acid excretion with urine and the changes in amino acid levels within the blood as a function of the total radiation dose in 30 subjects undergoing radiation therapy due to cancer of the uterus. Increased levels of several amino acids in the urine are shown to provide an early and sensitive indication of radiation effects on the human organism. T.M.

A71-42789 **Problems of cosmic biology. Volume 16 (Problemy kosmicheskoi biologii. Volume 16).** Edited by V. N. Chernigovskii. Moscow, Izdatel'stvo Nauka, 1971. 352 p. In Russian.

Collection of experimental studies covering the physiology of man and animals under extremal loads, the action of artificial gas media on the organism, and the toxicology of an artificial atmosphere as a life-supporting ambient medium. Also covered are spacecraft life support systems and approaches to the detection of extraterrestrial life. V.Z.

A71-42790 # **Responses of the organism under conditions of extended space flight (Reaktivnost' organizma v usloviiakh dlitel'nykh kosmicheskikh poletov).** P. V. Vasil'ev. *(Mezhdunarodnyi Simpozium po Osnovnym Problemam Zhizni Cheloveka v Kosmose, 3rd, Geneva, Switzerland, Nov. 1968.)* In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 5-11. 50 refs. In Russian.

Available space flight data are analyzed to show that the orthostatic and vestibular stabilities of humans are affected by weightlessness during extended space flights. It is also shown that acceleration tolerance, physical efficiency, infection resistance, and medication sensibility are influenced negatively by prolonged weightlessness. V.Z.

A71-42791 # **Some results of medical studies on the 'Voskhod 2' spaceship (Nekotorye rezul'taty meditsinskikh issledovanii na korable 'Voskhod-2').** I. I. Kas'ian, D. G. Maksimov, I. G. Popov, V. G. Terent'ev, L. S. Khachatur'iants, and G. F. Khlebnikov. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 11-24. 16 refs. In Russian.

It was found that the cardiovascular and respiratory systems of astronauts Beliaev and Leonov were essentially normal during all phases of their space flight, with the exception of launching during which their heart beat and respiration rates increased 1.5 to 2 times. Also generally normal was their oculomotor activity, with the frequency of oculomotor reactions increasing to 105 to 110 per min during the initial two orbits. The contents of adrenalin, noradrenalin, and creatinine in the urine, ketosteroids, and of lymphocytes and leucocytes in the blood were somewhat higher after the flight. V.Z.

A71-42792 # **Study of the characteristics of high-intensity noise effects during space flight (Izuchenie osobennostei shumovogo vozdeistviia bol'shoi intensivnosti kosmicheskogo poleta).** E. M. Iuganov, Iu. V. Krylov, and V. S. Kuznetsov. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 25-28. 19 refs. In Russian.

The effects of 20-min exposures to 114 to 115 dB and 125 to 126 dB noise on 24 subjects were investigated in a series of 105 experiments. Unfavorable reactions of the auditory and motor analysors to noise of 125 to 126 dB were observed. Exposures to noise of 114 to 116 dB for 20 min are believed to be safely acceptable during space flights. V.Z.

A71-42793 # **Effect of immersion on some motor function characteristics (Vliianie immersii na nekotorye pokazateli dvigatel'noi funktsii).** A. A. Korobova, A. V. Ovsiannikov, G. G. Ratishvili, and A. V. Korobkov. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 29-40. 26 refs. In Russian.

Healthy male subjects were kept at 34 C for 5 days immersed in water containing NaCl in experiments designed to determine the effect of a modified gravitational field on their motor functions. The functional behavior of the segmental apparatus of the spine cord during the execution of voluntary motions was studied during immersion. The results suggest that the functional activity of the supraspinal centers is depressed by the 2nd day of immersion. V.Z.

A71-42794 # **Basic metabolism under conditions of simulated weightlessness (Osnovnoi obmen v usloviiakh imitatsii nevesomosti).** V. I. Sokolkov. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 41-46. 21 refs. In Russian.

Subjects were kept immersed in water, or restricted to bed rest for 24 hr on the same diet in a study of basic metabolic processes and external respiration under such conditions. Oxygen requirement, carbon dioxide discharge, pulmonary ventilation, and the oxygen consumption coefficient were higher in immersed subjects than in subjects with bed rest. V.Z.

A71-42795 # **Alteration of some characteristics of the external respiratory function under the action of accelerations (Izmenenie nekotorykh pokazatelei funktsii vneshnego dykhaniia pri deistvii peregruzok).** S. F. Simpura. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 54-65. 16 refs. In Russian.

The variations in the external respiratory function and gas metabolism under transverse accelerations of 9 to 16 g were studied in a series of 77 experiments on 53 subjects kept in a reclined position in a rotating centrifuge. Respiration rates and volume, pulmonary ventilation, oxygen intake, carbon dioxide discharge, and the respiratory coefficient were determined during the experiments. The shifts in respiration and gas metabolism observed under accelerations are linked to an upset oxygen balance which becomes more pronounced with accelerations. Also the pulmonary ventilation and pulmonary gas metabolism were upset markedly at accelerations of 13 g and above. V.Z.

A71-42796 # **Effect of accelerations on the reactivity of the gastrointestinal tract to pharmacological agents (Vliianie uskorenii na reaktivnost' zheludochno-kishechnogo trakta k farmakologicheskim veshchestvam).** P. V. Vasil'ev, I. G. Krasnykh, V. E. Potkin, and L. A. Tiutin. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 65-71. 11 refs. In Russian.

Subcutaneous injections of atropine sulfate, acetylcholine, and carbocholine were given to albino rats immediately after and on the 3rd, 7th, 10th, 12th, and 14th day following exposures to 5-min accelerations of 20 g at a rate of 0.2 g/sec. Roentgenograms taken immediately after injections showed distinct changes of gastrointestinal reactions in exposed rats to acetylcholine and carbocholine. V.Z.

A71-42797 # **Interactions of analysors and the intensity of vestibular reactions to extrastimuli (K voprosu vzaimodeistviia analizatorov i vyrazhennosti vestibuliarnykh reaktsii na vozdeistvie ekstrarazdrazhitelei).** S. S. Markarian. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 76-93. 70 refs. In Russian.

Light of 0.1, 100, and 260 lux inhibited the function of vestibular nystagmus in two groups of 12 subjects who participated in 220 experiments in a study of interactions between the visual and vestibular analysors. The duration of counterrotation illusion and the amplitude and duration of the postrotation nystagmus were reduced when the subjects were exposed to acoustic stimuli of 100 to 110 dB at 1000 Hz. Muscular stresses on a manual and especially on a stand dynamometer also reduced the duration of counterrotation illusion. V.Z.

A71-42798 # **The state of the vestibular analysor in dogs after prolonged exposure to small radiation doses (Sostoianie vestibuliarnogo analizatora u sobak posle dlitel'nogo oblucheniia v malykh dozakh).** P. I. Kumets. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 93-97. 10 refs. In Russian.

Dogs were exposed to continuous radiation at daily rates of 0.07 to 0.21 r up to total doses of 25 to 225 r for a year. Some of the dogs received prophylactic medication. The vestibular analysors in dogs with 225 r/year radiation doses showed a higher excitability than in control dogs. Medication reduced this effect and increased the reactivity of the analysor. V.Z.

A71-42799 # **The state of metabolism during extended confinement of man in a small-volume chamber with a gas medium varying in cycles (Sostoianie obmena veshchestv pri dlitel'nom prebyvanii cheloveka v pomeshchenii malogo ob'ema s tsiklicheski izmeniaiushcheisia gazovoi sredoi).** I. G. Popov, Iu. K. Syzrantsev, P. P. Lobzin, I. A. Romanova, S. A. Bugrov, and R. V. Kudrova. In: Problems of cosmic biology. Volume 16.
Moscow, Izdatel'stvo Nauka, 1971, p. 98-108. 12 refs. In Russian.

Nitrogen and water-salt metabolisms were studied in two subjects confined for 35 days in a small sealed chamber in which the composition of air varied from normal to 110 mm pO2 and 15 mm pCO2 according to a certain law over 7-day periods. The negative balance of nitrogen metabolism of the subjects tended to decrease when the hypoxic air in the chamber contained some excess carbon dioxide. The increased activity of respiratory muscles is believed to account for this finding. V.Z.

A71-42800 # **Conditions for recognition and the training of human capability in distinguishing the composition of the respiratory medium (Usloviia vyiavleniia i trenirovka sposobnosti cheloveka razlichat' sostav dykhatel'noi sredy).** I. S. Breslav, A. G. Zhironkin, and A. M. Shmeleva. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 109-117. 9 refs. In Russian.

It is shown that an individual's capacity for sensing changes in the composition of the inspired air can be evaluated in tests involving the selection of a preferred respiratory mixture. The resolution of changes in mixture composition is improved when a constant level of pulmonary ventilation is maintained. Individual peculiarities in the reactions of different people to hypoxic and hypercapnic media are discussed, and it is shown that the sensory differentiation among various mixtures improves with subsequent exposures. This demonstrates that training can improve such capabilities and should be considered in crewmember training programs. T.M.

A71-42801 # **Influence of a hyperoxic medium on the cells, tissues, and organs of experimental animals (Vliianie giperoksicheskoi sredy na kletki, tkani i organy eksperimental'nykh zhivotnykh).** E. F. Kotovskii and L. L. Shimkevich. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 118-129. 21 refs. In Russian.

Survey of orginal and published data on the morphology, infrastructure, and histochemistry of different organs from experimental animals subjected to hyperoxia. Emphasis is placed on the effects of pure oxygen at atmospheric pressure. An initial period of 6 hr is characterized by an activated cellular metabolism without apparent morphological changes. Pathological changes observed after 12 hr include cellular adiposis, reduced RNA and protein contents in cells, disrupted infrastructure of the mitochondria, and suppression of oxidizing enzymes. A compensatory increase in the activity of glycolytic enzymes occurs in connection with the occurrence of secondary hypoxia. Reaction features specific to various tissues and organs are described. T.M.

A71-42802 # ***Influence of hyperoxia on the connective tissue (Deistvie giperoksii na soedinitel'nuiu tkan').*** L. L. Shimkevich. In: Problems of cosmic biology. Volume 16.
Moscow, Izdatel'stvo Nauka, 1971, p. 130-137. 8 refs. In Russian.

Morphological, electron-microscopic, and cytochemical studies of the subcutaneous connective tissue of albino rats subjected to increased oxygen partial pressure. A 6-hr exposure to pure oxygen at 1 atm activates the metabolism of connective-tissue cells (accumulation of glycogen and increased activity of oxidizing enzymes) without disturbing the infrastructures. Significant pathological changes occur after 12 hr; progressing further, these changes are evidenced by the destruction of cellular organelles, the suppression of the cellular metabolism, and the depression of the activity of oxidizing enzymes. Destructive changes in collagen fibers are observed. Results are also given for 50, 70, and 100% oxygen atmospheres at an equivalent height of 2400 m. T.M.

A71-42803 # **Gaseous metabolism and electrical activity of animal skeletal muscles in a helium/oxygen medium (Gazoobmen i elektricheskaia aktivnost' skeletnoi muskulatury zhivotnykh v geliokislorodnoi srede).** G. V. Troshikhin. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 137-143. 22 refs. In Russian.

The thermoregulating tonus and the rectal temperature were studied for rats kept for one hour in an atmosphere of air, one hour in a helium-oxygen atmosphere, and again in an atmosphere of air. A distinct increase in electrical activity and the gas exchange level, and a drop in the rectal temperature were observed for animals placed in a helium-oxygen mixture at room temperature. The functions normalized when the animals were made to breathe air; however, heat balance was not completely restored after one hour. V.P.

A71-42804 # **Study of the physiological effect of substituting inert gases for atmospheric nitrogen under conditions of anoxia and high carbon dioxide concentrations (Izuchenie fiziologi-**

cheskogo effekta zameny azota vozdukha inertnymi gazami v usloviiakh nedostatka kisloroda i povyshennykh kontsentratsii uglekislogo gaza). M. M. Osipova and A. G. Dianov. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 143-148. In Russian.

Experiments with rats are described, showing that substitution of argon for atmospheric nitrogen in hermetically sealed chambers at 22 C does not affect the physiological functions nor the life span of the animals. Since the heat conductivity of argon differs only slightly from that of nitrogen, the result obtained is seen to support the assumption that the higher conductivity of helium is responsible for the increased life span of animals in hermetically sealed chambers with a helium/oxygen atmosphere. V.P.

A71-42805 # **Possibility of using adaptation of hypoxial hypoxia in a training system (O vozmozhnosti ispol'zovaniia adaptatsii k gipoksicheskoi gipoksii v sisteme trenirovki).** A. V. Eremin, A. N. Azhaev, V. I. Stepantsov, P. V. Buianov, V. S. Fomin, and D. Iu. Arkhangel'skii. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 148-153. 7 refs. In Russian.

Training in an altitude chamber is studied as a means of increasing the resistance of the human organism to extremal factors. Tests were performed under three conditions: (1) a 'height' of 4000 m, a myogenic load of 300 kgf/min, and optimal air temperature, (2) a height of 4000 m, a myogenic load of 300 kgf/min, and +50 C, and (3) a height varying from 2000 to 5000 m, a myogenic load varying from 315 to 440 kgf/min, and optimal air temperature. The training cycle was 20 days. It is found that the third condition is the most effective one for increasing resistance to high temperatures, transverse loads, and similar factors. V.P.

A71-42806 # **Effect of some toxic gaseous compounds on the stability of animals under acute hypoxic hypoxia (Vliianie nekotorykh gazoobraznykh toksicheskikh veshchestv na ustiochivost' zhivotnykh k ostroi gipoksicheskoi gipoksii).** B. I. Abidin, N. M. Asiamolova, and A. K. Sgibnev. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 154-164. 7 refs. In Russian.

Pressure chamber experiments were carried out in a study of the low pressure tolerance of albino rats to an atmosphere containing esters, aldehydes, ketones, volatile organic acids, alcohols, carbon monoxides and other volatile products of the thermooxidative decomposition of a synthetic polymer. The tolerance of the rats was markedly lower at lower pressures than at normal pressure. Disorders of motor, cardiac, respiratory and nervous activities were already apparent under pressures corresponding to altitudes of 3000 m. V.Z.

A71-42807 # **Some characteristics of the biological action of gaseous toxic substances evolving from urine and feces into air (Nekotorye osobennnosti biologicheskogo deistviia gazoobraznykh toksicheskikh veshchestv, vydeliaemykh v atmosferu iz mochi i fekalii).** V. V. Kustov, V. I. Mikhailov, and L. T. Poddubnaia. In: Problems of cosmic biology. Volume 16.
Moscow, Izdatel'stvo Nauka, 1971, p. 164-170. 11 refs. In Russian.

Sealed vessel experiments were carried out on albino mice to determine the physiological action of aldehydes, aliphatic amines, ketones, volatile organic acids, indole, mercaptans, hydrogen sulfide and other toxic compounds liberated from new urine and feces into air. Increased motor activity, excitement and higher respiration rates were observed in the mice for a period of 30 to 35 min after the start of exposure. Increased carboxyhemoglobin contents and a higher choline esterase activity in the blood were also established after exposures. V.Z.

A71-42808 # **Effect of a chemical preservative on the evolution rates of some gaseous toxic substances from stored urine (Vliianie khimicheskogo konservanta na intensivnost' vydeleniia nekotorykh gazoobraznykh toksicheskikh veshchestv iz khraniashcheisia mochi).** L. T. Poddubnaia, L. N. Rogatina, V. V. Kustov, and V. I. Mikhailov. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 170-173. In Russian.

A phenol derivative was tested to check the evolution of toxic gases from urine stored for 10 days at room temperature in sealed vessels. Acetone, organic acids, nitrogen oxides, carbon monoxide, carbohydrates, phenols, ammonia and aliphatic amines were determined in air samples and microflora in the urine. Preservative additions reduced the ammonia, ketone, fatty acid and nitrogen oxide contents in air samples without changing carbon monoxide and organic compound contents. V.Z.

A71-42809 # **Urine preservation in a system for urine water recovery (Konservatsiia mochi v sisteme regeneratsii vody iz nee).** L. N. Rogatina, A. M. Karagodina, and V. A. Panchenko. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 173-177. In Russian.

A total of 32 candidate compounds and their combinations were studied as urine preservatives at 18 to 20 C for two weeks. Five formulas were selected and investigated in a urine water recycling system. Ammonia and organic compound contents in the condensate were lower than in control samples when preservatives were added to the urine. V.Z.

A71-42810 # **Tolerance of animals to the toxic effects of certain gases after adaptation to hypoxia (Ustoichivost' zhivotnykh k toksicheskomu deistviiu nekotorykh gazov posle adaptatsii k gipoksii).** G. A. Vasil'ev, L. A. Tiunov, and V. V. Kustov. In: Problems of cosmic biology. Volume 16.
Moscow, Izdatel'stvo Nauka, 1971, p. 178-182. 25 refs. In Russian.

Experimental study of the tolerance of hypoxia-adapted albino mice to the toxic effects of carbon monoxide, nitrogen oxides, triethylamine, and Freon-12. Results show that preliminary adaptation to hypoxia increases the tolerance of the animals to poisoning by carbon monoxide, nitrogen oxides, and Freon-12, but does not affect their sensitivity to the toxic influence of triethylamine. T.M.

A71-42811 # **Toxic effects of gaseous products of the organism's vital activity (Toksicheskoe deistvie gazoobraznykh produktov zhiznedeiatel'nosti organizma).** T. S. Kolosova, L. A. Tiunov, V. V. Kustov, L. V. Ivanova, G. A. Vasil'ev, G. A. Lemesh, and M. A. Akhmatova. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 182-190. 16 refs. In Russian.

The biological effects of the gaseous products of life functions were studied in 26-day experiments on albino rats confined in sealed chambers. The living environment was monitored for the level of pollution by various compounds, but only the carbon dioxide and oxygen levels were maintained at constant values of 1% and 19%, respectively. Results show that the accumulating chemical pollutants damage pulmonary tissue, induce anemia, increase oxygen consumption, increase the weight of the thyroid gland, inhibit animal growth, and change the activity of the blood catalase. T.M.

A71-42812 # **Problem of studying the toxicity of indole (K voprosu izucheniia toksichnosti indola).** A. K. Sgibnev and T. A. Orlova. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 190-195. 20 refs. In Russian.

Inhalation of indole vapors (concentrations of 9 to 10 mg/cu m) over a period of 2 to 3 hr does not produce substantial changes in the organism of mice, rats, and rabbits. Direct injection of a 10 mg alcohol solution of indole in rabbits showed that the indole is quickly rendered harmless and removed from the organism. A vapor concentration of 0.45 mg/cu m is the threshold for perception of the

unpleasant odor of indole. Inhalation of indole vapors in concentrations greater than 1 mg/cu m can produce negative subjective sensations such as headache and nausea. T.M.

A71-42813 # **Problem of the toxicity of expired air (K voprosu o toksichnosti vydykhaemogo vozdukha).** V. V. Kustov, L. T. Poddubnaia, and V. I. Mikhailov. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 196-198. 15 refs. In Russian.

Male albino mice were placed in an atmosphere consisting of air expired by humans. In order to distinguish effects attributable only to the elevated carbon dioxide content, some animals were subjected to a control run involving a higher concentration of this gas as the only deviation from normal air. It is shown that a number of gaseous toxic products present in air expired by humans induce neurohumoral changes which stimulate some inhibitory reactions in the central nervous system. T.M.

A71-42814 # **Features of determining the oxidizability of water in the process of its regeneration (Osobennosti opredeleniia okisliaemosti vody v protsesse ee regeneratsii).** V. A. Kriuchkov and N. S. Mareeva. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 199-205. 9 refs. In Russian.

Measurements were made on the degree of oxidation of organic impurities in condensates of atmospheric vapors within an inhabited cabin. Possible errors arising in such measurements are analyzed, and recommendations are given for the use of available oxidation-analysis methods in the evaluation of water regenerated under spacecraft conditions. T.M.

A71-42815 # **Studies of the technology of decontamination of water regenerated from liquid human waste products (Issledovaniia po tekhnologii obezzarazhivaniia vody, regeneriruemoi iz zhidkikh produktov zhiznedeiatel'nosti cheloveka).** V. A. Kriuchkov and L. N. Rogatina. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 206-211. 8 refs. In Russian.

Description of a series of experiments performed on test stands and in an airtight chamber to determine methods of decontaminating water regenerated from urine under space flight conditions. It is shown that the initial products can contain a large amount of microflora. A complex of technological procedures for ensuring decontamination of regenerated water is recommended, involving urine conservation, filtration of the water condensate through sorbents, and making the components of the system out of materials possessing antimicrobial properties. A.B.K.

A71-42816 # **Effect of the frequency of change of the nutrient solution on the productivity of plants grown on keramzit (Vliianie chastoty smeny pitatel'nogo rastvora na produktivnost' rastenii, vyrashchivaemykh na keramzite).** I. V. Tsvetkova, V. P. Zamota, and E. V. Maksimova. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 211-218. 8 refs. In Russian.

Study of the effect of the replacement time of the nutrient solution on its regenerative power in the cultivation of higher plants by the hydroponic method with a substrate of keramzit (a porous clay filler). It is shown that to ensure the functioning of a greenhouse with a given productivity it is necessary to change the nutrient solution once every 90 days. Longer use of the solution leads to an increase in the area of the greenhouse. Then the need for frequent regeneration of large quantities of nutrient solution and the high absorptive capacity of the substrate make its use in closed-cycle greenhouses questionable. A.B.K.

A71-42817 # **Certain indices of the material balance of man as a component of a closed ecological system (Nekotorye pokazateli material'nogo balansa cheloveka, kak zvena zamknutoi ekologicheskoi sistemy).** E. I. Pokrovskaia and A. P. Tereshchenko. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 219-225. 9 refs. In Russian.

Demonstration of the lack of stability in the process of elimination of elements from the human organism during feeding on a constant diet. In experiments lasting up to six months the ratio of minimum to maximum values of eight elements excreted in the urine is found to range from 1:1.3 to 1:2.0. This pattern must be borne in mind when attempting to create, on the basis of human waste products, cultural media for autotrophic and heterotrophic organisms constituting components of bioengineering life-support systems. The presence of a correlation between certain elements excreted from the organism in the urine is established. It is shown that this correlation is attenuated when various stress factors act on the organism. A.B.K.

A71-42818 # **Studies of the stability of the chemical composition of a Chlorella biomass during prolonged cultivation with recycling of the medium in the form of nitrates (Issledovaniia ustoichivosti khimicheskogo sostava biomassy Khlorelly pri dlitel'nom kul'tivirovanii ee s vozvratom sredy na nitratakh).** E. K. Lebedeva, G. I. Meleshko, T. B. Galkina, and N. N. Egorova. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 225-235. 15 refs. In Russian.

Study of the variation of the percentage composition of elements contained in a Chlorella biomass cultivated for 164 days with direct recycling of the medium in the form of nitrates. It is shown that the chemical composition of the biomass with such recycling remains fairly stable over a long period of time. Fluctuations in the carbon and nitrogen content in the biomass amounted, respectively, to 1.5 and 5%, while fluctuations in the other main elements did not exceed 10% of the mean value. Fluctuations in chemical composition were both spontaneous and related to the cultivation conditions. The real fluctuations in the chemical composition of the biomass as a biological characteristic of the strain employed fit into narrower limits than the fluctuations caused by the cultivation conditions. A.B.K.

A71-42819 # ***Use of products of biological mineralization* for the cultivation of higher and lower autotrophs (Ispol'zovanie produktov biologicheskoi mineralizatsii dlia kul'tivirovaniia vysshikh i nizshikh avtotrofov).** S. I. Tsitovich, I. V. Tsvetkova, M. I. Beliakova, V. F. Varlamov, V. P. Zamota, E. V. Maksimova, I. L. Chernovich, and V. N. Faleeva. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 235-239. In Russian.

Evaluation of experiments on the use of human waste products mineralized by a biological method in nutrient solutions for the cultivation of higher and lower autotrophs. It is shown that the productivity of the experimental plants does not differ from that of the control variants - i.e., the nutrient mixtures do not contain toxic materials, and can therefore be used in a solution serving as a corrective for deficient elements of root nutrition in the cultivation of higher and lower plants. A.B.K.

A71-42820 # **The possibility of using human waste products mineralized by the 'wet combustion' method (K voprosu o vozmozhnosti ispol'zovaniia produktov zhiznedeiatel'nosti cheloveka, mineralizovannykh metodom 'mokrogo szhiganiia').** V. P. Zamota, I. V. Tsvetkova, E. V. Maksimova, A. [illegible] Arge, B. G. Gusarov, and T. V. Nol'de. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 239-245. 7 refs. In Russian.

Evaluation of experimental data on the cultivation of higher plants under artificial conditions by the hydroponic method on keramzit (alumoferrosilicate) using fecal masses mineralized by the

'wet combustion' method in the composition of the correcting solution. During the course of a year no reduction in the productivity of the plants was noted either with moist or dry material. It is established that underoxidized organic compounds of the mineralized products did not accumulate in the nutrient solution during the experiment, but were absorbed by the substrate or were completely mineralized by biological means and had no toxic effect on the plants. A.B.K.

A71-42821 # Mineralization of the vegetable wastes of a biocomplex by the thermal combustion method (K voprosu o mineralizatsii rastitel'nykh otkhodov biokompleksa metodom termicheskogo szhiganiia). I. V. Tsvetkova, B. G. Gusarov, V. P. Zamota, E. V. Maksimova, and L. A. Filatkina. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 245-249. 9 refs. In Russian.

Comparative study of the effect of mineralization of various kinds of vegetable wastes by thermal combustion on the working surfaces of the furnaces employed. When plants are raised on keramzit (alumoferrosilicate), owing to the action of root excretions, heavy metals are washed out and are stored in the root systems. Out of all the plants studied the maximum quantity of metals is stored in the economically useless part of cabbage, a consequence of which is damage to the oxide film of the working surfaces of the furnaces. Since these plants figure in the human diet, it is necessary to impose a number of special requirements on furnaces used for thermal mineralization of vegetable wastes. A.B.K.

A71-42822 # Study of a method of urine conservation under space flight conditions (Izuchenie metoda konservatsii mochi primenitel'no k usloviiam kosmicheskogo poleta). V. V. Borshchenko, V. I. Vashkov, and L. N. Rogatina. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 249-253. 12 refs. In Russian.

Study of seven phenol-containing preparations for use in the conservation of urine stored in the sanitation facilities of spacecraft cabins. The most effective of the preparations studied was found to be a preparation calle PNF, which dissolves well in urine and makes it possible to conserve urine for a period of up to 100 days by adding it to the urine at a rate of 0.2 g per 100 ml of urine. When introduced into the filler of a sanitation facility, PNF caused practically no changes in the physicomechanical properties of the facility and imparted an antimicrobe activity to the filler. A.B.K.

A71-42823 # A food link based on stocks of dehydrated products in the life-support systems of manned spacecraft during long flights (Pishchevoe zveno, osnovannoe na zapasakh obezvozhennykh produktov, v sistemakh zhiznennogo obespecheniia ekipazhei kosmicheskikh korablei pri dlitel'nykh poletakh). V. P. Bychkov, M. I. Kozar', N. N. Boiko, I. I. Borodulina, V. N. Griaznova, V. S. Dupik, A. G. Kasatkina, E. V. Kolchin, M. V. Markarian, T. V. Fedofova, and O. S. Khokhlova. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 254-269. 15 refs. In Russian.

Study of the state of health, the metabolism processes, and the immunoreactivity of the organisms of six subjects living for 120 days on a ration consisting of dehydrated food products. It is shown that the experimental data obtained on the level of excretion of a number of substances from the organism and on the balance of certain elements can be used in a calculation of a food link based on stocks of dehydrated products during long flights with daily energy expenditures on the part of the astronauts of about 3000 kcal. Adaptation of the organism to such a ration generally occurs within the first two months. A.B.K.

A71-42824 # Evolution and the problem of detecting organic material of the solar system (Evoliutsiia i problema obnaruzheniia organicheskogo veshchestva solnechnoi sistemy). L. M. Pozharitskaia, B. A. Starostin, and R. B. Zezin. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 270-281. 36 refs. In Russian.

Consideration of the origin of the organic compounds which served as the initial materials for primitive forms of life. The problem of detecting and identifying organic material of the solar system is directly related to the problem of evolution of cosmic organic material. A unified scheme of evolution of organic material is proposed which includes both biogenic and abiogenic forms of the material. A comparison is made of the element and isotope composition, the pigment composition, the optical activity, the polymerization, and the degree of structuredness in the main lines of evolution of organic material of the solar system. A.B.K.

A71-42825 # The effect on Infusoria of physical conditions simulating the medium on the surface of the planet Mars (Vliianie na Infuzorii fizicheskikh uslovii, imitiruiushchikh sredu na poverkhnosti planety Mars). L. K. Lozina-Lozinskii, V. N. Bychenkova, and E. I. Zaar. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 281-292. 29 refs. In Russian.

Demonstration of the ability of Infusoria to adapt to extreme environmental conditions and, in particular, to the conditions existing on the planet Mars. It is shown that the Infusoria Colpoda maupasi can multiply at low atmospheric pressure (5 to 10 mm Hg) in a gaseous medium consisting of nitrogen and in a carbon dioxide atmosphere at a pressure of 15 to 60 mm Hg and with an oxygen content of less than 1%. Studies were carried out in sealed ampules, in anaerostats, and in a 'photostat' with an atmosphere flowing through it. The Infusoria C. maupasi survived in a dormant cyst state when placed in the 'photostat' in moist sand in the trophon stage with daily variations of temperature from +25 to -30 C (up to two weeks) in a CO2 atmosphere at a pressure of 10 mm Hg and with eight hours daily irradiation with ultraviolet and visible light. Daily variable temperatures above 0 C increase the rate of fission of Infusoria in comparison with constant temperature, provided that the temperature sums are the same. It is concluded that under certain conditions not only dormant but also active forms of Protozoa, adapted to life under variable temperatures and possessing a short life cycle, can exist on the planet Mars. A.B.K.

A71-42826 # Problem of the survival of microorganisms under simulated Martian conditions (K voprosu o vyzhivanii mikroorganizmov v usloviiakh, modeliruiushchikh Marsianskie). V. M. Rumiantseva, V. L. Levin, and M. A. Rybin. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 292-296. 5 refs. In Russian.

A water suspension of microorganisms was poured into sand enriched with organic compounds. Open test tubes containing the sand were placed within a Martian environmental simulation chamber where they were kept for periods ranging from 2 to 14 days in a carbon dioxide atmosphere at a pressure of 10 mm Hg. The temperature was varied daily between +25 and -25 C. Mycococcus luteus strains were the most stable of several cultures taken from a microbiological museum, while two unidentified forms were the most stable of several types of microorganisms taken from Antarctica. The cell concentrations of these three cultures increased by 1 to 2 times during the test period. T.M.

A71-42827 # The Fotostat-1 facility for studying the reactions of organisms to the physical conditions of the planet Mars (Ustanovka 'Fotostat-1' dlia izucheniia reaktsii organizmov na fizicheskie usloviia planety Mars). E. I. Zaar, V. G. Zelikson, M. G. Kitaigorodskii, I. V. Koshelev, L. K. Lozina-Lozinskii, and M. A. Rybin. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 296-302. 16 refs. In Russian.

Temperature in the described Mars environmental simulation chamber can be varied from -35 to +30 C at various heating and cooling rates. Temperature can be held constant within 0.5 deg of the desired value, and pressure can be set to an accuracy of plus or minus 2 mm Hg in the range from 5 to 95 mm Hg. A circulation of air or any other nonaggressive mixture can be achieved within this pressure range. A system of UV filters permits irradiation at 280 and 356 nm and over spectral intervals from 1 to 253.7 nm and from 220 to 320 nm. Power can be varied from 2 to 3500 microwatts/sq cm, and illumination can be controlled from 5000 to 60,000 lux, with plus or minus 10% nonuniformity. All settings can be automatically monitored and regulated by special programs. T.M.

A71-42828 # **Tolerance of unicellular organisms to UV radiation in connection with the problem of the existence of extraterrestrial life (Ustoichivost' odnokletochnykh organizmov k UF-izlucheniiu v sviazi s voprosom sushchestvovaniia zhizni vne zemli).** L. K. Lozina-Lozinskii. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 302-313. 51 refs. In Russian.

A widely accepted notion holds that life is limited by short-wave UV radiation. An analysis of original and published data is used to show that terrestrial organisms and cells exhibit properties and means which enable them to resist short-wave UV radiation and to increase their tolerance to this factor. The ability of unicellular organisms to repair damage in the dark is discussed, together with the screening role played by pigments and protective compounds. It is concluded that various different methods of protection against UV radiation can be developed in the course of evolution and, as a consequence, the extent of life is not limited by this radiation. T.M.

A71-42829 # **Influence of ultraviolet radiation on amino acids and peptides in different gas atmospheres in the presence of salts and metal oxides (Deistvie ul'trafioletovoi radiatsii na aminokisloty i peptidy v razlichnykh gazovykh atmosferakh v prisutstvii solei i okislov metallov).** M. A. Khenokh, N. P. Bogdanova, and E. M. Lapinskaia. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 313-324. 18 refs. In Russian.

UV irradiation of solutions of amino acids and peptides (sensitized by different cations, metal oxides, and polyphosphoric acid) produces various reactions such as disruption of the carbon chain, hydroxylation of the aromatic ring, deamination, formation of organic acids and carbonyl compounds, and production of new amino acids. A proposed hypothesis argues that initially synthesized peptides in the prebiological planetary epoch consisted of amino acids with a shorter chain of carbon atoms. The present results demonstrate that some minerals and cations may have exerted a catalytic influence on the photochemical transformations of abiogenically synthesized amino acids. Low temperatures did not prevent photolysis. T.M.

A71-42830 # **Influence of a set of extremal factors on ribonuclease (Deistvie na ribonukleazu kompleksa ekstremal'nykh faktorov).** G. S. Komolova, E. V. Belikova, and I. A. Egorov. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 324-331. 6 refs. In Russian.

Experimental study of the combined and individual effects of ultraviolet light, X-ray irradiation, and freezing-thawing cycles on ribonuclease. Ultraviolet light and X-ray radiation lead to inactivation of the ribonuclease through complex mechanisms which are probably caused by chemical modification of thyroxine groups in the molecule. Combined irradiation by both ultraviolet light and X rays produces additive summation of their individual effects. Freezing and thawing produces denaturation changes in the ribonuclease molecule which differ from those observed during photolysis. Irradiation of the enzyme increases its sensitivity to subsequent freezing and thawing. T.M.

A71-42831 # **Influence of the gaseous medium on the cryolysis of catalase (Vliianie gazovoi sredy na krioliz katalazy).** G. S. Komolova. In: Problems of cosmic biology. Volume 16. Moscow, Izdatel'stvo Nauka, 1971, p. 331-335. 9 refs. In Russian.

Catalase becomes inactivated after multiple freezing and thawing of its solutions. The effect is dependent on the freezing temperature and on the composition of the gaseous medium. Inactivation does not take place during freezing and thawing in an argon atmosphere. At a freezing temperature of -180 C, other gases stimulate inactivation of the catalase in the following order of decreasing severity of the effect: hydrogen, oxygen, helium, and nitrogen. A gas mixture of nitrogen and oxygen exhibits additive summation of the effects of both gases. A 1:1 mixture (by volume) of hydrogen and argon exhibited a much stronger inactivation of the enzyme than expected by simple summation of the individual effects of both gases. T.M.

A71-42860 **The removal and restoration of stimulus control.** L. T. Stoddard and Murray Sidman (Massachusetts General Hospital, Boston, Mass.). *Journal of the Experimental Analysis of Behavior,* vol. 16, Sept. 1971, p. 143-154. 16 refs. NIH Grants No. MH-05408; No. NS-03535.

When a well-learned circle vs ellipse discrimination was made impossibly difficult for the subjects (rhesus monkeys), the controlling stimulus-response topographies were replaced by competing topographies. The identification of two training conditions sufficient to reinstate the original discrimination permitted the following inferences: the original controlling topography had merely decreased in probability of occurrence, whereas the 'strength' of the stimulus-response relation remained unchanged; discriminations along the apparently continuous circle-ellipse dimension actually involved several distinct stimulus-control topographies. M.M.

A71-42861 * ***Observing behavior in squirrel monkeys under a multiple schedule of reinforcement availability.*** John O. de Lorge (U.S. Naval Aerospace Medical Research Laboratory) and Fogle C. Clark (North Carolina, University, Chapel Hill, N.C.). *Journal of the Experimental Analysis of Behavior,* vol. 16, Sept. 1971, p. 167-175. 15 refs. Grants No. NGR-15-002-001; No. NGR-34-003-041.

Lever (observing) responses produced either a stimulus indicating the availability of food or another stimulus indicating food was not available. Key responses in the presence of the food-available stimulus produced food on a continuous reinforcement schedule. In the absence of food-available stimuli, responding on the key had no scheduled consequences. Observing responses produced food-available stimuli according to three different random-interval schedules with mean interstimulus availability times of 1, 2, and 4 min. In the fourth component of the multiple schedule (observing extinction) food-available stimuli never occurred. Each component of the schedule was correlated with a distinctive auditory stimulus. Observing rates decreased with decreasing frequency of the food-available stimulus. M.M.

A71-42862 ***Stimulus control of skin resistance responses on an escape-avoidance schedule.*** William A. Greene and Linda T. Sutor (Eastern Washington State College, Cheney, Wash.). *Journal of the Experimental Analysis of Behavior,* vol. 16, Sept. 1971, p. 269-274. 15 refs.

The effects of discrimination and avoidance training on the skin resistance response were studied in eight humans. Responses occurring during one stimulus delayed the interruption of music for 30 sec; responses during a second stimulus either had no effect or interrupted the music for 15 sec. The results showed stimulus control in all subjects and an increased discrimination between the first one-half and last one-half of the sessions for seven of the eight subjects. (Author)

STAR ENTRIES

N71-34050*# Stanford Univ., Calif. Cardiology Div.
ULTRASOUND IN THE EARLY DETECTION AND STUDY OF POST-TRANSPLANTATION CARDIAC REJECTION
Richard L. Popp, John S. Schroeder, Edward B. Stinson, Norman E. Shumway, and Donald C. Harrison [1970] 13 p refs
(Grant NGL-05-020-305)
(NASA-Cr-121642) Avail: NTIS CSCL 06P

The application of ultrasonic techniques to the early detection of heart transplant rejection is discussed. Physiological changes in the structure of the heart may be detected by ultrasonic measurements and action taken to reduce the risk of rejection. P.N.F.

N71-34051*# Stanford Univ., Calif. Cardiology Div.
CIRCULATORY RESPONSES TO HYPOXIA IN EXPERIMENTAL MYOCARDIAL INFARCTION
Marianne Schroll, Sherilyn C. Robison, and Donald C. Harrison [1971] 26 p refs
(Grant NGL-05-020-305; HE-09058; HE-5709; HE-5866)
(NASA-CR-121665) Avail: NTIS CSCL 06P

Three levels of decreased arterial oxygen saturation elicited a graded circulatory response in dogs, manifested by stepwise increases in cardiac output, left ventricular dp/dt, and stroke volume. Responses to similar hypoxia challenges following experimental myocardial infarction were qualitatively similar but quantitatively less. Although the circulatory compensation for hypoxia was less effective following myocardial infarction, no further deterioration of the hemodynamics was noted. Author

N71-34052*# Stanford Univ., Calif. Cardiology Div.
EVALUATION OF THE CARDIOVASCULAR SYSTEM DURING VARIOUS CIRCULATORY STRESSES Progress Report, 1 Jun. 1970 - 31 May 1971
Harrison Donald C. 31 May 1971 21 p refs
(Grant NGL-05-020-305)
(NASA-CR-121666) Avail: NTIS CSCL 06P

The research in developing hardware and techniques for studying man's circulatory performance in the space environment is reported, and research proposals for the next year are presented. The areas of accomplishments reported include: (1) testing a noninvasive method for measuring venous pressure, (2) computer graphic techniques for studying the function of the left ventricle, (3) the validity of new intravascular pressure sensors, and (4) ultrasound techniques for determining ventricular volume and cardiac output. The proposals include work in developing improvements in noninvasive techniques for measuring cardiovascular performance, and studies to understand more precisely the way in which the circulatory system responds to stresses. Abstracts of papers published during the reporting period are presented. F.O.S.

N71-34053*# Avco-Everett Research Lab., Everett, Mass.
THE FLUID MECHANICS OF THROMBUS FORMATION Final Technical Report
Jul. 1971 69 p refs
(Contract NASw-1894)
(NASA-CR-121668) Avail: NTIS CSCL 06P

Experimental data are presented for the growth of thrombi (blood clots) in a stagnation point flow of fresh blood. Thrombus shape, size, and structure are shown to depend on local flow conditions. The evolution of a thrombus is described in terms of a physical model that includes platelet diffusion, a platelet aggregation mechanism, and diffusion and convection of the chemical species responsible for aggregation. Diffusion-controlled and convection-controlled regimes are defined by flow parameters and thrombus location, and the characteristic growth pattern in each regime is explained. Quantitative comparisons with an approximate theoretical model are presented, and a more general model is formulated. Author

N71-34054*# Food and Drug Administration, Cincinnati, Ohio. Div. of Microbiology.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Oct. 1970 - 31 Dec. 1970
A. L. Reyes and J. E. Campbell Mar. 1971 12 p
(NASA Order R-36-015-001)
(NASA-CR-121727; QPR-23) Avail: NTIS CSCL 06M

A continuing investigation in identifying the thermal inactivation curve of B. subtilis var. niger spores is reported. Several experiments were conducted to determine the nature of the curve under 0.25, 2.6,10,100, and 500 micrograms of water per ml of headspace. The conventional plate count method was used in assaying spore survivors ranging from 1 million to less than 10 spores per cup. The data obtained are given along with discussions as to their significance. In addition, the results of tests conducted on the hardware and equipment to be used for the evaluation of a terminal sterilization process for unmanned landers are presented. D.L.G.

N71-34055*# Miami Univ., Coral Gables, Fla.
CUEBS NEWS, VOLUME 7, NO. 3
Feb. 1971 19 p refs
(Grant NGR-10-007-008)
(NASA-CR-121726) Avail: NTIS CSCL 06C

Articles concerning undergraduate education in the biological sciences are presented. Individual titles include: (1) The Investigative Laboratory in an Introductory Biology Course for Nonscience Majors at Marquette University; (2) An Introductory Investigative Laboratory at a Two-Year Community College; (3) Biology for Physicists: Two views on Working papers No. 2; (4) The Three i's - Interdisciplinary, Investigative, and Independent Study; and (5) Reflections on a Visit to the Minicourse Project at Purdue. In addition, a continuation of a previously published article 'Biology in the Next Two Decades' is presented. The continuation deals with new generalizations concerning life and its origins. D.L.G.

N71-34056*# Boeing Co., Seattle, Wash. Aerospace Group.
RELEASE OF MICROORGANISMS FROM SOLID MATERIALS Final Report
E. A. Gustan and R. L. Olson Jul. 1971 86 p
(Contract NAS7-100)
(NASA-CR-121707) Avail: NTIS CSCL 06M

Information on the release of microorganisms by hard impact and the effect of aeolian erosion on the release of microorganisms are discussed. The efficiency of grinding, as compared to dissolution, for recovery of microorganisms from solids was determined. An adjustment constant of 20 was derived from the data that can be used to equate bacterial spore

counts obtained by grinding with those obtained by dissolution. The percentage of microorganisms released due to hard impact of Eccobond onto sand was determined. Eccobond was impacted onto sand at velocities of 168, 457, 945 and 1554 m/sec. The results showed that less than 1 percent of the available organisms was released by impact. The percentage of bacterial spores released from methyl methacrylate and Eccobond by aeolian erosion was determined. Sand, accelerated by air or carbon dioxide, was used to erode 0.25 grams of material from one gram discs. The results showed that less than 1 percent of the available organisms was released by the erosion process.
Author

N71-34057*# Becton, Dickinson and Co., Raleigh, N.C. Microbiological Science Dept.
DEVELOPMENT OF PARAMETRIC DATA FOR THE ESTABLISHMENT OF AN ETHYLENE OXIDE CYCLE FOR THE DECONTAMINATION OF SPACECRAFT Final Report
D. J. Daley and J. L. Sliger Jul. 1971 170 p refs Prepared in cooperation with JPL
(Contract NAS7-100; JPL-952169)
(NASA-CR-121764) Avail: NTIS CSCL 06A

A decontamination chamber with the capability of maintaining set parameters of temperature, relative humidity, pressure and gas concentration was designed and fabricated. After establishing proper operation of the chamber, a sufficient number of cycles were conducted to gain some insight into the operation of the chamber and the effects of varying parameters and cycle phases on the efficiency of sterilization of spacecraft-type materials. The test pieces included glass, plastic, and stainless steel strips, capillary tubing, and open and Morton-capped test tubes, which were inoculated in all but one test series with spores of Bacillus subtilis var. niger. Morton-capped and capillary tubes were the most difficult test pieces to decontaminate. Stainless steel strips were the easiest test pieces to decontaminate. With respect to the individual parameters investigated, relative humidity appeared to have the most pronounced effect on sterilizing efficiency. An improved spore kill was observed when relative humidity was increased from 30% to 50% in the 50 C cycles. Effects of gas concentration, time and temperature might have been manifest with further testing.
Author

N71-34058*# Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
DETERMINATION OF THE RADIONUCLIDE CONTENT OF FECES AND URINE FROM ASTRONAUTS ENGAGED IN SPACE FLIGHT Quarterly Research Report, 1 Jul. - 5 Oct. 1969
R. L. Brodzinski and L. A. Rancitelli 15 Oct. 1969 25 p refs
(Contract AT(45-1)-1830; Proj. Apollo)
(NASA-CR-121861; BNWL-1183-2) Avail: NTIS CSCL 06R

Research efforts were directed primarily toward activation analysis of the astronauts' excreta to initiate studies involving the effects of the space environment on the mass balance of various elements by the body and delineate the future research in this area. The concentrations of 17 elements in the astronaut fecal samples from Apollos 7 and 9 and the calcium concentrations from Apollos 8 and 10 are reported. The search for possible Pm-147 contamination in the space capsule environment continued with an investigation of some filter media from the Apollo 10 air purification cannister. No Pm-147 contamination was observed in the spacecraft. A search for the presence of gaseous decay products of lunar uranium and thorium in the lunar atmosphere which might have become imbedded in the spacecraft skin during the lunar orbiting of Apollo 10 was attempted. The concentrations of the thorium and uranium daughter products in the sampled spacecraft skin were below detectable limits.
Author

N71-34059*# Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
DETERMINATION OF THE RADIONUCLIDE CONTENT OF FECES AND URINE FROM ASTRONAUTS ENGAGED IN SPACE FLIGHT Quarterly Research Report, 8 Apr. - 30 Jun. 1969
R. L. Brodzinski, H. E. Palmer, and L. A. Rancitelli 15 Jul. 1969 49 p refs
(Contract AT(45-1)-1830; Proj. Apollo)
(NASA-CR-121860; BNWL-1183-1) Avail: NTIS CSCL 06R

The results are presented of a study to evaluate radiation activation during the course of Apollo 7, 8, 9, and 10 missions by counting the radionuclides excreted in the feces and urine of the astronauts. Observed radioisotopes were Be-7, Na-22, Na-24, K-40, Cr-51, Fe-59, Co-60, and Cs-137. The Cr-51, Fe-59, and Co-60 were from preflight injection; the K-40 and Cs-137 are naturally occurring or normally present; the Be-7 and Na-22 were both of normally occurring and cosmogenic origins; the Na-24 was cosmogenic. An evaluation of the data indicates that: (1) the Apollo 7 astronauts were exposed to protons with an average effective energy of 38 to 40 MeV, and that the radiation dose was 480 + or - 310 mrads at the 65% confidence level; (2) the Apollo 8 astronauts were exposed to protons of less than 38 MeV; (3) the radiation dose received by the Apollo 9 astronauts was less than 315 mrads; and (4) the radiation dose received by the Apollo 10 astronauts was 870 + or - 550 mrads. Other studies are reported which include: neutron activation analysis of feces and urine of astronauts, induced radioisotopes in spacecraft, promethium 147 in the space capsule environment, and calibration of the NASA whole-body counter.
D.L.G.

N71-34060*# Technology, Inc., San Antonio, Tex. Life Sciences Div.
RESEARCH ON PHYSICAL AND PHYSIOLOGICAL ASPECTS OF VISUAL OPTICS IN SPACE FLIGHT Final Report, 28 May 1970 - 28 May 1971
Brian Ward, Stanley Collyer, Clarke A. Burnham, Patrick W. Wilson, Stanley A. Dunbar et al 30 Jul. 1971 96 p refs
(Contract NAS9-11085)
(NASA-CR-115120) Avail: NTIS CSCL 06P

Individual research projects reported include: (1) retinal temperature calculations for the specification of adequate eye protection at the lunar surface; (2) a survey of hazardous visual perceptions in space flight; (3) measurement of the optical properties of new and used visual transparencies; (4) analysis of visual problems in space flight; and (5) analysis of problems in the general areas of vision, audition, and neurophysiology.
D.L.G.

N71-34061*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PROCESS FOR CONTROL OF CELL DIVISION Patent Application
Clarence D. Cone, Jr., inventor (to NASA) Filed 17 Mar. 1971 20 p
(NASA-Case-LAR-10773-1; US-Patent-Appl-SN-125235) Avail: NTIS CSCL 06M

A method of controlling mitosis of biological cells by inducing a change in the intracellular ionic hierarchy accompanying the cellar electrical transmembrane potential difference (E sub m) of the cells, is described. The ionic hierarchy may be varied by imposing changes on the relative concentrations of Na(+), K(+), and Cl(-), or by directly imposed changes of the physical E sub m level across the cell surface.
NASA

N71-34062# Joint Publications Research Service, Washington, D.C.
STOMATOLOGIC CARE IN SPACE FLIGHTS
G. M. Ivashchenko et al 24 Aug. 1971 13 p refs Transl. into ENGLISH from Stomatologiya (USSR), no. 4, 1971 p 89-93
(JPRS-53894) Avail: NTIS

An analysis was made of the position of stomatologic illnesses within the complex of pathologic changes in the human body during long space flights. Reports on stomatologic illnesses of humans in unusual conditions are summarized and the principal tasks faced by stomatologists in providing care during space flights and the simulating ground experiments are outlined. J.G.M.

N71-34063# Joint Publications Research Service, Washington, D.C.

SHIFTS IN THE BLOOD OF POLAR WORKERS IN THE ANTARCTIC

B. B. Ventsenostsev 23 Aug. 1971 8 p refs Transl. into ENGLISH from Klin. Med. (Moscow), no. 6, 1971 p 40-44 (JPRS-53884) Avail: NTIS

Human adaptive reactions and possible explanations for the distinctions in the clinical course of some diseases were investigated by studying the changes in the peripheral blood of individuals during acclimatization to the extreme conditions of the Antarctic. The influence of geographic and cosmic factors on hematopoiesis was also considered. Results of the few available studies dealing with blood tests on polar workers in coastal Antarctic stations are reviewed and detailed statistical data are provided on blood shifts among members of the 11th Soviet Antarctic expedition to the Molodezhnaya Station. J.G.M.

N71-34064# Cincinnati Univ., Ohio.

NOISE DISTURBANCE AND SLEEP. THE RELATIONSHIP OF NOISE DISTURBED SLEEP TO POST-SLEEP BEHAVIOR: AN EXPLORATION STUDY Final Report

Milton Kramer, Thomas Roth, John Trindar, and Alexander Cohen Jan. 1971 176 p refs Prepared in cooperation with PHS, Cincinnati, Ohio

(Contracts DOT-FA-WAI-164; CPE-69-132)

(FAA-NO-70-16) Avail: NTIS

The effects of noise on sleep and post-sleep behavior in two 25, 50, and 70 year-old males is discussed. The subjects were run for 15 consecutive nights, the first five and the fifteenth serving as controls. Following each night's sleep, subjects completed a series of performance and psychological tests. Threshold sound levels for sleep disturbance were obtained for an impulse and a continuous test noise and discussed in terms of type of sleep disturbance, stage of sleep, time of night, adaptation, and age of subjects. The sleep profile results indicated that the pattern of noise-induced sleep disruption was related to age. The 25-year olds showed an increase in stage 1 and movement time. The 70-year olds showed an increase in time awake and a decrease in time spent in stage 3-4. The 50-year old subjects were intermediate with respect to each measure. The daytime performance data revealed no effects of noise-induced sleep disruption on pursuit rotor and reaction time tasks but some decrements were found in time estimation, arithmetic, and memory task measures. In addition, verbal sample scores demonstrated an increase in cognitive impairment and a decrease in human relations. Author

N71-34065# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

OBJECT RECOGNITION IN AIDED AND UNAIDED NIGHT VISION

A. van Meeteren and F. W. Zonneveld 1971 26 p refs

(IZF-1971-7; TDCK-57805) Avail: NTIS

The recognition of 20 military objects with and without a three-stage image intensifier was studied as a function of luminance. The objects, photographed in the center of a landscape mock-up, were presented to 20 subjects by slide projection. They were recognized with the image intensifier at a 600 times lower luminance than with the naked eye. An information score is defined such that along with object identifications of individual objects it also evaluates recognitions of object classes and thus provides a good performance measure. A clear-cut relation was found between the information score and the percentage of correct object identifications. The supposedly realistic collection of 20 test objects did not lead to invariant confusion classes and consequently did not allow a precise definition of class-recognition. Author

N71-34066# Oak Ridge National Lab., Tenn.

NEUTRON DEPTH DOSE DISTRIBUTIONS IN HETEROGENEOUS PHANTOMS

John W. Poston (Ph.D. Thesis - Georgia Inst. of Tech.) Apr. 1971 127 p refs

(Contract W-7405-eng-26)

(ORNL-TM-3329) Avail: NTIS

The design and operational characteristics of extrapolation ionization chambers intended to measure analogous distributions due to fast neutrons are described. Measured distributions due to fission spectrum and 14-MeV neutrons are presented and discussed. Results from measurements with fission spectrum neutrons indicate that the high voltage electrodes attached to the front of the detectors were too thick to allow the measurement of the changes in dose distributions very near the interface. However, distributions due to 14-MeV neutrons indicate a reduction in the predicted homogeneous depth dose distribution due to the presence of bone. The reduction is about 20% at a distance in bone of about 2 cm. In tissue at the rear of bone, a buildup or increase in the dose deposited was demonstrated which is about 50% more than the interface value at a depth in tissue of 0.8 to 1.0 cm. These results are discussed and compared with available theoretical descriptions. Also included is a discussion of the problems associated with the use of these detectors, the sources of error in the experiment, and a set of recommendations for improvement and further study in this area. Author (NSA)

N71-34067# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.

AFFECT ADJECTIVE CHECK LIST ASSESSMENT OF MOOD VARIATIONS IN AIR TRAFFIC CONTROLLERS

Roger C. Smith, C. E. Melton, and Jess M. Mc Kenzie Apr. 1971 9 p refs

(FAA-AM-71-21) Avail: NTIS

Three groups of subjects completed Composite Mood Adjective Check Lists (CMACL) before and after selected shifts at two air traffic control (ATC) facilities as part of a multi-discipline study of stress in ATC work. At one facility, a high traffic density tower (HDT), 22 air traffic control specialists (ATCS) were sampled before and after five evening (1500 to 2300) shifts and five night (0000 to 0800) shifts. At the second facility, a moderate traffic density tower (MDT), 16 ATCSs were assessed on three day (0800 to 1600) and three night (0000 to 0800) shifts. In addition, four non-ATC individuals involved in monitoring the MDT ATCSs for other aspects of the general stress study served as controls. It was found that all subjects, both ATCSs and controls, showed a considerable increase in feelings associated with fatigue and tiredness as a function of working an eight-hour shift. These effects were generally more pronounced for night shifts. There were no differences between subject groups on the variables predicted to be most sensitive to variations in stress. Findings are discussed in terms of expected work effects and the lack of significant stress variations. Author

N71-34068# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.

THE EFFECTS OF SIMULATED SONIC BOOMS ON TRACKING PERFORMANCE AND AUTONOMIC RESPONSE

Richard I. Thackray, R. Mark Touchstone, and Karen N. Jones Jun. 1971 16 p refs

(FAA-AM-71-29) Avail: NTIS

Subjects were exposed to four simulated indoor sonic booms over an approximate thirty-minute period. The overpressure levels were 1.0, 2.0 and 4.0 psf (as measured outdoor) with durations of 295 milliseconds. Subjects performed a two-dimensional compensatory tracking task during the exposure period and continuous recordings were obtained of heart rate and skin conductance. No evidence of performance impairment was found for any of the overpressure levels. Rather, performance improved significantly following boom stimulation along with heart-rate deceleration and skin conductance increase. The obtained pattern suggests that the simulated booms may have elicited more of an orienting or alerting response than a startle reflex. The results are discussed in terms of the possible importance of rise time as a determinant of the physiological and performance effects which may be produced by sonic booms. Author

N71-34069# Army Edgewood Arsenal, Md.
RESPONSES OF SINGLE CELLS WITHIN THE CAT MEDULLA DURING PROLONGED CONSTANT ANGULAR ACCELERATION Technical Report, Feb. 1968 - Jan. 1970
George H. Crampton and Kenneth J. Gall Apr. 1971 33 p refs
(AD-724628; EA-TR-4505) Avail: NTIS CSCL 06/19

Single cell discharges from within the vestibular nuclei were recorded during constant angular accelerations of up to 5-min duration and during sinusoidal angular acceleration. The forms of discharge patterns are described and emphasis is placed on analyses of adaptation to long term constant stimuli. The great majority of the units will show a discharge increase and then a decline during the first 45 sec of acceleration. Results from longer accelerations, however, lead to the conclusion that a simple model based on a slightly underdamped cupular mechanism does not conform to the responses and neither does an adaptation explanation. It is speculated that a substantial processing of the sensory input takes place at the level of the second-order neuton and what is often seen in these recordings are functions more closely correlated with various response requirements than with one-to-one events at the sense organ.
Author (GRA)

N71-34070*# Southwest Research Inst., San Antonio, Tex.
SOUTHWEST RESEARCH INSTITUTE ASSISTANCE TO NASA IN BIOMEDICAL AREAS OF THE TECHNOLOGY UTILIZATION PROGRAM Semiannual Report, 25 Aug. 1970 - 28 Feb. 1971
David F. Culclasure and Linda Eckhardt 28 Feb. 1971 160 p
(Contract NASw-1867; SwRI Proj. 13-2538)
(NASA-CR-121627) Avail: NTIS CSCL 06B

Significant transfers of technology are described. They include an improved method for taking EEG in infants and children with a NASA-developed helmet and electrode system, an infant apnea alarm, an electro-optical call signal for quadriplegic patients activated by head movement, a low cost signal conditioning system which permits recording and playback of ECG signals on a home tape recorder, and a system which permits totally paralyzed patients to use eye movements to control such assist devices as page turners. Significant progress toward several transfers of aerospace technology was made through an in-house applications engineering program. Present efforts are being concentrated upon the completion of a catheter-mounted radiation detector for monitoring cerebral blood flow in head injury patients and probe designed to permit precise measurement of radioactive isotope uptake by eye tumors. Author

N71-34071*# University of Southern Calif., Los Angeles. Dept. of Electrical Engineering.
A STOCHASTIC MODEL FOR EYE MOVEMENTS DURING FIXATION ON A STATIONARY TARGET
R. Vasudevan, A. V. Phatak, and J. D. Smith May 1971 27 p refs
(Grant NGL-05-018-022; GM-16197-03; RR-0712-04; NSF GK-1834X)
(NASA-CR-121640; TR-7I-23) Avail: NTIS CSCL 05E

A stochastic model describing small eye movements occurring during steady fixation on a stationary target is presented. Based on eye movement data for steady gaze, the model has a hierarchical structure; the principal level represents the random motion of the image point within a local area of fixation while the higher level mimics the jump processes involved in transitions from one local area to another. Target image motion within a local area is described by a Langevin-like stochastic differential equation taking into consideration, the microsaccadic jumps pictured as being due to point processes and the high frequency muscle tremor, represented as a white noise. The transform of the probability density function for local area motion is obtained, leading to explicit expressions for their means and moments. Evaluation of these moments based on the model are comparable with experimental results. A physiologically based criterion for the occurrence of local area changes is assumed and the renewal density of these transitions is obtained. Author

N71-34072*# George Washington Univ., Washington, D.C. Technology Application Group.
APPLICATIONS OF AEROSPACE TECHNOLOGY IN THE PUBLIC SECTOR. AN ANNUAL REVIEW OF THE BIOMEDICAL AND PUBLIC SECTOR TECHNOLOGY APPLICATION TEAM PROGRAM FOR THE PERIOD 1 JUNE 1970 - 31 MAY 1971 Final Report, 19 Jun. 1970 - 20 Jun. 1971
Jun. 1971 199 p refs
(Contract NASw-2055)
(NASA-CR-121638) Avail: NTIS CSCL 06B

The development of mechanisms for facilitating a systematic transfer of NASA technology to nonaerospace sectors is discussed. Major emphasis was placed on establishing viable methodologies and mechanisms for ensuing successful applications of technology in the public sector. The biomedical and public sector team work is reported. E.H.W.

N71-34073*# Dunlap and Associates, Inc., Santa Monica, Calif. Western Div.
VISUAL PERFORMANCE WITH HIGH CONTRAST CATHODE RAY TUBES AT HIGH LEVELS OF AMBIENT ILLUMINATION
W. B. Knowles and J. W. Wulfeck 30 Jun. 1971 74 p refs
(Contract NAS12-2262)
(NASA-CR-114361) Avail: NTIS CSCL 05E

Gap-detection thresholds and working level preferences were determined for one standard and three experimental high-contract cathode-ray tubes under four levels of ambient illumination, 100, 1,000, 5,000, and 10,000 ft.-c.; two angles of incidence, 30 deg and 60 deg; and two angles of regard, 0 and -45 deg. The trace brightnesses required to perform the visual tasks were primarily a function of the reflectances and resulting background brightnesses of the cathode-ray tube faces. The results are related to classical psychophysical data on brightness discrimination, earlier work on masking luminance for radar displays, and a recent study on visual performance using electroluminescent displays under high ambient illumination.
Author

N71-34074*# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
SOME SEQUENTIAL, DISTRIBUTION FREE PATTERN CLASSIFICATION PROCEDURES WITH APPLICATIONS
J. L. Poage Jul. 1971 173 p refs
(Grant NGL-22-007-143)
(NASA-CR-121750; TR-2) Avail: NTIS CSCL 06B

Some sequential, distribution-free pattern classification techniques are presented. The classification procedures proposed make use of the theory of order statistics. One of the methods

presented is an estimated version of Wald sequential probability ratio test (SPRT). The other method is a sequential version of the separating hyperplane approach to pattern classification. The procedures were tested on Gaussian samples and on the EEG responses. Smaller error rates were easier to obtain with the estimated SPRT. In particular, error rates as low as 0.1% were obtained. With sequential tests, it is possible to specify the probability of error decisions before the test is conducted, and the experimental error rates of the procedures agree with the specified error probabilities. Author

N71-34075*# Missouri Univ., Columbia. Dept. of Biochemistry.
APOLLO DIET EVALUATION, VOLUME 1 Final Report, 7 Jun. 1970 - 7 Jun. 1971
T. D. Luckey [1971] 147 p refs 2 Vol.
(Contract NAS9-10955)
(NASA-CR-115124) Avail: NTIS CSCL 06P

Evaluations of Apollo diets and experimental work on mice to look at morphologic changes are reported. A new approach was developed for the determination of the exact nutrient intake of astronauts during space flights. A comparison of biological and analytical methods, including bioisolation of mice and gamma radiation of diets, indicates that Apollo diet is adequate for mice in isolation and that sterilization of the diet shows no adverse effect. A gnotobiological study revealed adverse reactions in mice when they are fed a diet with limited microflora. These reactions are decreases in body weight, growth rate, adult size, white blood count, and hemoglobin. Other studies include evaluation of health and disease status of the astronaut through fecal indices, the effects of fiber in diets of mice, food preparation time, nutrient indicators, markers in nutrition, and astronaut nutritition for 1, 2, or 3 month space flights. N. E. N.

N71-34076*# Missouri Univ., Columbia. Dept. of Biochemistry.
AN EVALUATION OF NUTRITIONAL MARKERS, VOLUME 2 Final Report, 7 Jun. 1970 - 7 Jun. 1971
A. R. Kotb and T. D. Luckey [1971] 158 p refs 2 Vol.
(Contract NAS9-10955)
(NASA-CR-115125) Avail: NTIS CSCL 06P

The use of markers in nutrition is reviewed, and their characteristics and usefulness are discussed for studies of food intake, food passage, and food absorption in the gastrointestinal tract of man and animals. The techniques of feces sampling, when markers are used, are also discussed. Both external and internal markers are studied. Among the conclusions are the following: The stained particle technique widely used in food studies in ruminants is laborious and questionable. Several dyes have been successfully used to color the feces of ruminants, and a brilliant blue methyl cellulose mixture is recommended for humans. The use of (Cr-51)203, barium sulfate, rare earths, inert metals, soluble markers have been used sucessfully. Of the internal markers, only chromogen and fecal nitrogen seem to be reliable indices to predict digestibility of forage in ruminants it is recommended that the use of glass beads, small seeds, rubber, charcoal, and metal particles in studies of the rate of food passage, and iron oxide, silica, anthraquinone violet, and monastral blue in digestibility studies should cease. N.E.N.

N71-34077*# General Electric Co., Houston, Tex.
CONTROL OF A LIQUID COOLING GARMENT FOR EXTRAVEHICULAR ASTRONAUTS BY CUTANEOUS AND EXTERNAL AUDITORY MEATUS TEMPERATURES
Clay W. G. Fulcher 8 Dec. 1970 328 p refs
(Contract NAS9-10963)
(NASA-CR-115122) Avail: NTIS CSCL 06Q

An improved temperature control concept is developed for liquid cooling garments used during astronaut extravehicular activity. Several modifications and extensions to previously known physiological parameter measurement techniques and control approaches are implemented to provide an automatic controller which responds directly to man's thermoregulatory requirements for cooling during work. The temperature of the wall of the external auditory meatus and four averaged, unweighted skin temperatures are used as input signals to a controller of liquid cooling garment inlet water temperature. The absolute change in derived mean body temperature from a setpoint and its time rate of change are sensed and used to control the temperature of water to an Apollo liquid cooling garment. A crewman metabolic transient thermal computer simulation is conducted to demonstrate feasibility and to supply design parameters for a prototype system. The prototype controller is described and unmanned and manned test data are provided. Author

N71-34078# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
CLIMATIC CONDITIONS OF WORK IN PRESSURIZED SUITS [CONDITIONS CLIMATIQUES DE TRAVAIL EN VETEMENT VENTILE]
Louis Chretien, Yvon Le Bourdonnec, and Bernard Werderer Feb. 1971 45 p refs In FRENCH
(CEA-N-1407) Avail: AEC Depository Libraries

The climatic conditions which exist, under different degrees of work, inside a pressurized suit, usually worn at the Centre d'Etudes Nucleaires de Saclay, are described. After a brief review of the physical conditions influencing the gain or loss of metabolic heat from human body, the various relations concerning heat convection and absorption are given, as well as those related to sweat removal. The equations are solved by a graphic method that lead to diagrams which, for a given work situation, and as a function of air flow, give the index of thermal stress. This index indicates the thermal environment to which the wearer is exposed. The diagrams are in agreement with published experimental observations. NSA

N71-34079*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTOMATIC INSTRUMENT FOR CHEMICAL PROCESSING TO DETECT MICROORGANISMS IN BIOLOGICAL SAMPLES BY MEASURING LIGHT REACTIONS Patent Application
Burton N. Kelbaugh, inventor (to NASA), Grace L. Picciolo, inventor (to NASA), Emmett Chappelle, inventor (to NASA), and Maurice E. Colburn, inventor (to NASA) Filed 30 Apr. 1971 p
(NASA-Case-GSC-11169-2; US-Patent-Appl-SN-139094) Avail: NTIS CSCL 06B

An automated apparatus for sequentially assaying urine samples for the presence of bacterial adenosine triphosphate (ATP) is described. The apparatus comprises a rotary table which carries a plurality of sample containing vials; a dispensing means which automatically dispense fluid reagents into the vials at predetermined times preparatory to injecting a light producing luciferase-luciferin mixture into the samples; and an indicating means which automatically measures the light produced in each urine sample by a bioluminescence reaction of the free bacterial adenosine triphospate with the luciferase-luciferin mixture. The light measured is proportional to the concentration of bacterial adenosine triphosphate which, in turn, is proportional to the number of bacteria present in the respective urine sample. After the light measurement is performed, the vials are ejected from the table. NASA

N71-34080*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RESTRAINT SYSTEM FOR ERGOMETER Patent Application
Raymond L. Gause, inventor (to NASA) and Raymond A. Spier, inventor (to NASA) Filed 25 Jun. 1971 10 p

(NASA-Case-MFS-21046; US-Patent-Appl-SN-156725) Avail: NTIS CSCL 06B

A restraint system for securing a person to an ergometer while exercising under zero gravity conditions or while operating the ergometer in earth environment in a position other than the upright position is described. A padded, form-fitting body belt fits around the operator's waist and suspenders are attached to the body belt. The body belt is secured to the ergometer forwardly and rearwardly of the ergometer seat by adjustable belts joined to the body belt and releasably hooked to the ergometer frame. NASA

N71-34081# RAND Corp., Santa Monica, Calif.
APPLICATIONS OF ADVANCED TECHNOLOGY TO UNDERGRADUATE MEDICAL EDUCATION
J. A. Farquhar, R. Bretz, A. S. Ginsberg, T. L. Lincoln, R. J. Mellone et al Apr. 1970 90 p refs Sponsored by NIH
(RM-6180-NLM) Avail: NTIS

Undergraduate medical education and the ways in which advanced technology might bring about substantial changes in both the quantity and quality of graduates are discussed. Five such applications are described including computer-assisted instruction; computer-assisted self-evaluation; an ultra-microfiche retrieval and display system; electronic video recording; and two multimedia aids known as the clinical encounter simulator and the patient management decision aid. The goals of applying technology to medical education are summarized, and questions are raised that must be answered prior to any attempt at widespread implementation of the systems described. Author

N71-34082# RAND Corp., Santa Monica, Calif.
BIOSCIENCES AT RAND
Edward C. DeLand, ed., Carl Gazley, Jr., ed., and Linda Colbert, ed. Jun. 1970 76 p refs
(RM-6047-RC) Avail: NTIS

Research in the biosciences-biochemistry, biophysics, biomathematics, and bioengineering are described. Data cover (1) physiological modeling projects, (2) mechanisms and neurophysiology of human vision, pattern recognition, and enhancement, and (3) clinical application and diagnostic techniques. An extensive bibliography is included. E.H.W.

N71-34083# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.
EVALUATION OF AN IMPROVED FLOTATION DEVICE FOR INFANTS AND SMALL CHILDREN
Ernest B. McFadden and Joseph W. Young Jul. 1971 10 p refs
(FAA-AM-71-37) Avail: NTIS

A simple, lightweight, life-support infant flotation device incorporating reliable self-righting, thermal protection and automatic self-ventilation is described. This design concept utilizes prior data relative to the centers of gravity of infants and small children and exhibits excellent self righting. Thermal protection is incorporated through the use of insulative neoprene foam in construction of the submerged porton of the device. Anesthetized adolescent primates exhibiting body weights and metabolic requirements equivalent to that of an infant or small child were used to test and confirm ventilatory capability as induced by air or water motion. An evaluation of the capability of the device to deter shark attack indicated that the infant flotation device, when occupied by anthropomorphic dummies or anesthetized primates, was less attractive to sharks than anthropomorphic dummies wearing a standard yellow color inflatable life vest. Author

N71-35236*# Baylor Univ., Houston, Tex. Dept. of Psychiatry.
PHYSIOLOGICAL CORRELATES OF OPTIMAL PERFORMANCE Final Report
Robert Roessler 22 Jul. 1971 50 p refs
(Grant NGR-44-003-031)
(NASA-CR-121903) Avail: NTIS CSCL 05E

The potential utility of psychological and physiological variables in predicting human performance during extended periods of stress was investigated under laboratory conditions. One phase was directed toward defining baselines on the psychological, physiological, and performance variables and the determination of their stability over time. The second phase consisted of a situation in which the subject experienced rest-alert periods over a seventy-two hour period to determine the physiological effects. Detailed information concerning types of measurements made on subjects and results of the tests are presented. Author

N71-35237*# Miami Univ., Coral Gables, Fla. Center for Theoretical Studies.
A MECHANISM FOR THE EVOLUTION OF THE GENETIC CODE
Michael Conrad Apr. 1970 12 p refs
(Grant NGL-10-007-010)
(NASA-CR-121896; CTS-B-70-3) Avail: NTIS CSCL 06C

Multiple coding is proposed as a mechanism facilitating the evolution of the genetic code. Multiple coding can occur when several information storing molecules share the same cytoplasm. These molecules may code for different construction machinery, that is, for different coding systems. Initially this will reduce the efficiency of the systems but will not be lethal if good proteins are still produced. An alternative coding system is retained if it can lead to the production of one useful protein. Under certain conditions the information in the genetic molecules associated with the alternate coding system will be rectified, and this coding system will become predominant. Author

N71-35238*# Republic Aviation Div., Fairchild Hiller Corp., Farmingdale, N.Y. Manned Space Systems.
A BASELINE PROTOCOL FOR PERSONAL HYGIENE Final Report
31 Aug. 1971 206 p refs
(Contract NAS9-11509)
(NASA-CR-115181; FRD-3989) Avail: NTIS CSCL 06I

A personal hygiene protocol was promulgated to encompass the needs, desires, and realities of keeping man clean in a confined space. Based on an in depth review of previous personal hygiene involvements, an analysis of cleansing agents, clothing interactions, water requirements and desirable skin conditions, a day-by-day schedule has evolved. It is hoped that by employing bacteriological sampling, psychological questionnaires, and various subject or observer rating schemes, a pattern of acceptable limits and techniques can emerge. Approximately 80 respondees with confinement experience replied to a questionnaire concerned with their confinement. Their responses have formed the basic data pool for this protocol. Baseline conditions will be obtained from a combination of previous inputs and refined by virtue of data contributions to be obtained from upcoming flights and chamber studies. Author

N71-35239*# Food and Drug Administration, Cincinnati, Ohio. Div. of Microbiology.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Apr. 30 Jun. 1971
J. E. Campbell Aug. 1971 8 p
(NASA Order R-36-015-001)
(NASA-CR-121920; QPR-25) Avail: NTIS CSCL 06M

An investigation of thermal inactivation of microbial spores under various moisture temperature conditions is described. It was found that when the moisture level was below 0.5 ml (250 micrograms H2O/ml headspace) at 90 C about 1-1/2 logs of inactivation was observed. Between 250 and 500 micrograms H2O/ml headspace at 90 C, the moisture value had a profound effect on the number of spore survivors, with the greatest effect at 495 micrograms H2O/ml headspace. It is speculated that these conditions encourage the initiation of germination, which in turn renders the organisms sufficiently sensitive to heat so that they are killed almost instantaneously at 90 C. J.M.

N71-35240# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.

COLOR DEFECTIVE VISION AND THE RECOGNITION OF AVIATION COLOR SIGNAL LIGHT FLASHES

Mark F. Lewis and Jo Ann Steen Jun. 1971 11 p refs
(FAA-AM-71-27) Avail: NTIS

Subjects of varying type and degree of color deficiency were tested on a battery of color tests, including the American Optical H-R-R plates, the Dvorine plates, the Color Threshold Tester, the Farnsworth Lantern, the Farnsworth-Munsell 100-hue, the Farnsworth Panel D-15, the Titmus Vision Tester Color Plate, and an anomaloscope examination. Correlations with a practical test of the ability of subjects to discriminate aviation signal red, white, and green were obtained. The results generally indicated that the Farnsworth Lantern was a superior predictor of performance on the practical test. Author

N71-35241# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.

AUTOMATED DIFFERENTIAL FLUOROMETRIC ANALYSIS OF NOREPINEPHRINE AND EPINEPHRINE IN BLOOD PLASMA AND URINE

Vincent Fiorica and Russell Moses Apr. 1971 22 p refs
(FAA-AM-71-15) Avail: NTIS

An automated fluorometric trihydroxyindole procedure is described for the measurement of norepinephrine (NE) and epinephrine (E) in blood plasma or urine. The method employs conventional techniques for isolation of the catecholamines by alumina column chromatography. Column eluates are analyzed in an AutoAnalyzer system incorporating two fluorometers. Differentiation of the amines is based on differences in the fluorescence characteristics of the lutines of NE and E. The accuracy (as estimated by recoveries of added amines) and precision of the method are comparable to those reported for other trihydroxyindole techniques. Representative values for urinary excretion and for plasma levels of NE and E compare favorably with values stated in the literature. Author

N71-35242# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.

COMBINED EFFECTS OF ALTITUDE AND HIGH TEMPERATURE ON COMPLEX PERFORMANCE

W. D. Chiles, P. F. Iampietro, E. A. Higgins, J. A. Vaughan, Georgetta West et al Apr. 1971 14 p refs
(FAA-AM-71-17) Avail: NTIS

Nine well-trained subjects were tested on a complex performance device designed to assess functions of relevance to aircrew activities. The tests, which involved tracking, monitoring, and mental arithmetic, were performed during exposure to altitude (14,000 feet) and heat (60 deg C) both singly and in combination. Several physiological measures were taken. Exposure durations were 30 minutes for each condition with both preand post-testing. The only clear-cut effects of the conditions were significant differences across the environmental conditions on a perceptual-motor tracking task related to manual aircraft control. Altitude was clearly a more powerful variable than temperature in this study. This was evidenced by the fact that performance under the temperature-plus-altitude and the altitude-only conditions were approximately the same; performance under the temperature-only condition was significantly better than performance for either of the other two conditions. Author

N71-35243# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Institute.

CHANGES IN CARDIOVASCULAR HEALTH PARAMETERS OVER AN EIGHT-YEAR INTERVAL IN AN ATC POPULATION SEGMENT

Michael T. Lategola Apr. 1971 20 p refs
(FAA-AM-71-19) Avail: NTIS

During 1960 to 1963, the Civil Aeromedical Research Institute (CARI) conducted a broad spectrum of biomedical evaluations on a large number of air traffic control (ATC) students. Approximately 1270 of these students (20-50 years of age) underwent biodynamic evaluation of physical fitness. From these data, the relationships of maximum oxygen uptake (MVO2/Kg bw), resting SBP and DBP to age and the FRWI (an obesity indicator) were examined. General data trends indicated an increase in SBP and DBP with age and the FRWI. The MVO2/Kg bw showed a general trend of decrease as both age and the FRWI increased. Relevant data from the current aeromedical certification files were examined. The average weight gain was approximately nine percent. The 1970 resting SBP and DBP also increased with both age and the FRWI. The percent incidence of the 400 pathology code, as well as resting exercise and recovery heart rates, increased with age and the FRWI. Author

N71-35244# Federal Aviation Administration, Washington, D.C. Aeromedical Standards Div.

THE PHILOSOPHY AND LIMITATIONS OF FAA AEROMEDICAL STANDARDS, POLICIES AND PROCEDURES

Gordon K. Norwood Jun. 1971 11 p
(FAA-AM-71-25) Avail: NTIS

Designated Aviation Medical Examiners need available basic information concerning the FAA medical certification system, the philosophy which underlies standards, policy and procedures and certain limitations of the system. It is through such information that errors adverse to safety can be forestalled and differences in opinions between equally dedicated and knowledgeable physicians can be best averted. Regulatory medicine must have orientation different from that in the private practice of medicine. Insofar as these necessary differences and limitations are recognized, the FAA mission of safety and promotion of aviation should be enhanced by a more effective and equitable system of medical certification. Author

N71-35245# Joint Publications Research Service, Washington, D.C.

THE STRUCTURE OF HUMAN THINKING ACTIVITY

O. K. Tikhomirov 3 Sep. 1971 218 p refs Transl. into ENGLISH from the book "Struktura Myslitelnoy Deyatelnosti Cheloveka" Moscow, Univ. Printing House, 1969 p 5-231 See JPRS-52199, 18 Jan. 1971 for Foreword, Chapters 9-11, Conclusion, and Bibliography
(JPRS-53983; JPRS-52199) Avail: NTIS

CONTENTS:

1. THE DEVELOPMENT OF THE GENERAL THEORY OF ACTIVITY p 1-26 refs
2. PSYCHOLOGICAL INVESTIGATIONS AND THE THEORY OF THINKING p 27-49 refs
3. THINKING AND THE THEORY OF INFORMATION p 50-74 refs
4. GAMES AND THEIR PROGRAMMING p 75-109 refs

5. THE MOVEMENT OF THE EYES AND THINKING p 110-144 refs

6. MANUAL THINKING p145-182 refs

7. EMOTIONS AND THOUGHT p 183-209 refs

8. FACTORS CREATING THE OBJECTIVE COMPLEXITY OF HUMAN PROBLEM SOLUTION p 210-219 refs

N71-35246# Joint Publications Research Service, Washington, D.C.
THE DEVELOPMENT OF THE GENERAL THEORY OF ACTIVITY
In its The Struct. of Human Thinking Activity 3 Sep. 1971 p 1-26 refs
Avail: NTIS

Three theories of human behavioral patterns are generalized, including habits, perception, and latent learning capacity. The stage and memory of afferent synthesis are discussed. Formalism of actions and prediction is also considered, along with reverse afferentation and mismatching between goals. J.A.M.

N71-35247# Joint Publications Research Service, Washington, D.C.
PSYCHOLOGICAL INVESTIGATIONS AND THE THEORY OF THINKING
In its The Struct. of Human Thinking Activity 3 Sep. 1971 p 27-49 refs
Avail: NTIS

Various concepts and definitions of the term, thinking, are presented. The psychological concept of thinking as a form of mental activity is analyzed, emphasizing structural unit changes. Four types of intellectual associations are differentiated: (1) similarity, (2) contrast, (3) closeness in time and space, and (4) relationship between concepts. Various psychological studies are briefly summarized. J.A.M.

N71-35248# Joint Publications Research Service, Washington, D.C.
THINKING AND THE THEORY OF INFORMATION
In its The Struct. of Human Thinking Activity 3 Sep. 1971 p 50-74 refs
Avail: NTIS

A wide spread tendency in cybernetics was noted during mental process studies. Visual differential difficulty, degree of training of subject, and compatibility of stimulus and reaction were determined. Objective and subjective information from search acts of individuals was found to be the basis of the thought process. The selectivity of mental activity which is manifested as noncorrespondance of subjective and objective data content was studied, using a difference model and a broad range of theoretical problems. J.A.M.

N71-35249# Joint Publications Research Service, Washington, D.C.
GAMES AND THEIR PROGRAMMING **c08**
In its The Struct. of Human Thinking Activity 3 Sep. 1971 p 75-109 refs
Avail: NTIS

An analogy between a communications channel and human mental activity is discussed in relation to cybernetics. Chess and the activity of the chess player are characterized. Psychological studies of chess are described, along with computer programming of the game. Games between men and machines are also evaluated. J.A.M.

N71-35250# Joint Publications Research Service, Washington, D.C.
THE MOVEMENT OF THE EYES AND THINKING
In its The Struct. of Human Thinking Activity 3 Sep. 1971 p 110-144 refs
Avail: NTIS

Functions of eye motion, characteristics of orientation zone, and factors determining the zone's volume are discussed. Search tactics in problem solving situations are analyzed, along with mean-end relationships during the solution process of mental problems. Changes in structural activity during memorization are examined, as well as move-selection problems in isolated positions, solution searching with insufficient time, and mechanism development of visual search. J.A.M.

N71-35251# Joint Publications Research Service, Washington, D.C.
MANUAL THINKING
In its The Struct. of Human Thinking Activity 3 Sep. 1971 p 145-182 refs
Avail: NTIS

Human thinking was investigated through problem solving in chess. Tactile activity of blind chess players was studied, using cyclographic method. Game analysis, merging mechanisms, intention predictions, and general structure of the problem solving process are presented, along with verbalized sense in tactile activity and types of semantic formations. Search selectivity and game tree and man and machine searches for problem solutions are also considered. J.A.M.

N71-35252# Joint Publications Research Service, Washington, D.C.
EMOTIONS AND THOUGHT
In its The Struct. of Human Thinking Activity 3 Sep. 1971 p 183-209 refs
Avail: NTIS

Skin resistance during the solution of mental problems is analyzed. Emotional activation and functions are discussed. Time relationships between the beginning of change and appearance of emotional exclamations, beginning of GSR shift (central nervous system mechanism) and verbal statement, and beginning of GSR shift and evaluation of solution attempts by subjects are also presented. J.A.M.

N71-35253# Joint Publications Research Service, Washington, D.C.
FACTORS CREATING THE OBJECTIVE COMPLEXITY OF HUMAN PROBLEM SOLUTION
In its The Struct. of Human Thinking Activity 3 Sep. 1971 p 210-219 refs
Avail: NTIS

The objective complexity of human problem solutions was found difficult to reduce to information processes. The natural and artificial conditions of the problem are given. The cybernetic interpretation is limited to the formal characteristics of the problem structure, abstracting itself from the characteristics of the problem which represents the primary determining factors in human activity for problem solving. J.A.M.

N71-35254# Federal Aviation Administration, Washington, D.C. Civil Aeromedical Inst.
THE SPIRAL AFTEREFFECT. 3: SOME EFFECTS OF PERCEIVED SIZE, RETINAL SIZE, AND RETINAL SPEED ON THE DURATION OF ILLUSORY MOTION
Kevin D. Mehling, William E. Collins, and David J. Schroeder Jul. 1971 12 p refs
(FAA-AM-71-31) Avail: NTIS

Many safety problems encountered in aviation have been attributed to visual illusions. One of the various types of visual illusions, that of apparent motion, includes as an aftereffect the apparent reversed motion of an object after it ceases real movement. Some effects of perceived size, perceived distance, and perceived stimulus speed on the persistence of illusory motion in the spiral aftereffect are discussed. Durations of the illusion were significantly affected by low retinal speeds, by small visual angles, and by perceived size per unit of retinal size. The results suggest that complex interactions of physical and perceptual factors can significantly alter the presence and the magnitude of visual illusions of motion. Author

N71-35255# National Research Council of Canada, Ottawa (Ontario).
THE METABOLISM OF MAGNESIUM-DEFICIENT CELLS OF ESCHERICHIA COLI [UEBER DEN STOFFWECHSEL MAGNESIUMARM GEWACHSENER ZELLEN VON ESCHERICHIA COLI]
T. Guenther et al 1971 21 p refs Transl. into ENGLISH from Z. Physiol. Chem. (Berlin), v. 349, no. 5, 1968 p 623-631
(NRC-TT-1472) Avail: NTIS

Under aerobic and anaerobic conditions, the amount of glucose degraded by Mg(+2) deficient cells of E. coli is decreased to about half that degraded by Mg(+2) rich control cells. This is the result of a decreased permease activity. In Mg(+2) deficient cells of E. coli, the activities of phosphofructo kinase and pyruvate kinase are increased and respiration is decreased. These metabolic changes are specific for Mg(+2) deficiency; they are reversible and disappear after growth on media containing Mg(+2). Author

N71-35256# International Inst. for Scientific Cooperation, Ulm an der Donau (West Germany).
SEMINAR ON CELL AND CELL SYSTEM ECOLOGY
Theodor M. Fliedner Dec. 1970 39 p refs Seminar held in Paris, 13-15 Jun. 1969
(Grant DA-ERO-591-69-G-01)
(AD-720601; ERO-E-14-41-p) Avail: NTIS CSCL 06/3

Contents: Cellular ecology - a new branch of cell physiology; Relevance of cellular ecology for military medicine; Ecological examples of relevance to military medicine at the level of the whole organism (interaction between atmospheric environment and the mammalian organism, interaction between microbial environment and the mammalian organism, interaction between the physico-chemical environment and the mammalian organism); Ecological examples of relevance to military medicine at the cell system level (Wound healing, Ecological problems in cell transplantation). GRA

N71-35257# Research Inst. of National Defence, Stockholm (Sweden).
OBSERVATION DISTANCE AND PROBABILITY OF DETECTION [OBSERVATIONSAVSTAND OCH UPPTAECKTSSANNOLIKHET]
Boerje Danebrink and Rune Johansson Mar. 1970 20 p In SWEDISH
(FOA-2-C-2375-72) Avail: NTIS

The probability of target detection with respect to the observation distance is discussed. The target was photographed on a terrain model and pictures were displayed by a tachiscope. The time for detection of the photographed target was measured using 32 persons viewing the film from various distances. Results of the trials are presented in tables and graphs. Author

N71-35258# SysteMed Corp., Dayton, Ohio.
PROCEEDINGS OF THE 1ST ANNUAL CONFERENCE ON ENVIRONMENTAL TOXICOLOGY
Dec. 1970 384 p refs Conf. held at Fairborn, Ohio, 9-11 Sep. 1970
(Contract F33615-70-C-1046)
(AD-727022; AMRL-TR-70-102) Avail: NTIS CSCL 06/20

The report is a compilation of the papers presented and the Proceedings of the 1st Annual Conference on Environmental Toxicology, sponsored by the SysteMed Corporation and held in Fairborn, Ohio on 9, 10, and 11 September 1970. Major technical areas discussed included toxicological evaluation of carbon monoxide, methodology, pathology, atmospheric contaminants, and toxicology of propellants and other military chemicals. Author (GRA)

N71-35259# Oregon State Univ., Corvallis. Science Research Inst.
EFFECTS OF MONOMETHYLHYDRAZINE UPON CARBOHYDRATE METABOLISM Final Report, 1 Dec. 1968 - 30 Oct. 1969
F. N. Dost, D. E. Johnson, and C. H. Wang Apr. 1971 21 p refs
(Contract F33615-67-C-1787)
(AD-727008; AMRL-TR-70-61) Avail: NTIS CSCL 06/16

MMH and UDMH in single, high, nonlethal doses and MMH infused at 0.5 mmole/kg/12 hrs cause depression of glucose-14C oxidation apparently at a point prior to entry of glucose into the catabolic sequence. Inhalation of pure oxygen increases the rate of conversion of glucose-6-14C to 14CO2, but does not alter the rate of conversion of other labels of glucose. Author (GRA)

N71-35260*# Montana Univ., Missoula. Cooperative Wildlife Research Unit.
DEVELOPMENT OF SATELLITE-RELATED BIOTELEMETRY EQUIPMENT Progress Report
J. J. Craighead, F. C. Craighead, Jr., and Joel R. Varney 31 Jul. 1971 111 p refs
(Grant NGR-27-002-006)
(NASA-CR-121893) Avail: NTIS CSCL 06B

The radiolocation system developed for use on elk and grizzly bear was used in the Interrogation Recording Location System (IRLS) elk tracking experiment conducted during the spring and summer of 1970. Experience was gained in integrating this equipment with the IRLS collar and in using it to locate the elk both on the ground and from the air to check satellite location data. Techniques were tested for interrogating the IRLS collar from an aircraft which may prove useful as a supplement to satellite interrogations or in helping to locate an animal with a malfunctioning collar. An improved directional antenna and location technique were developed which facilitate location of instrumented animals by aircraft. Physiological instrumentation work was directed toward experiments with black bears in their winter dens. This approach allows efforts to be concentrated on equipment and instrumentation techniques without requiring the expenditure of a large number of man-hours locating and following instrumented animals. At the same time it is providing information on the life history of wild bears. Author

N71-35261*# Michigan Univ., Ann Arbor. Inst. for Social Research.
TIME PRESSURE AND PERFORMANCE OF SCIENTISTS AND ENGINEERS: A FIVE-YEAR PANEL STUDY
Frank M. Andrews and George F. Farris (MIT) [1971] 31 p refs
(Grant NGR-23-005-395)
(NASA-CR-121884) Avail: NTIS CSCL 05E

Time pressure experienced by scientists and engineers predicted several aspects of performance including usefulness innovation, and productivity. Higher time pressure was

associated with above average performance during the five year study, even when supervisory status, education, and seniority were controlled. Performance, however, did not predict well to subsequent reports of time pressure, suggesting a possible causal relationship from pressure to performance. Innovation and productivity (but not usefulness) were low if the pressure experienced was markedly above that desired. The five-year panel data were derived from approximately 100 scientists in a NASA laboratory. Some theoretical and practical implications of the results are discussed. Author

N71-35262*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CREW RADIATION DOSE FROM THE PLUME OF A HIGH IMPULSE GAS-CORE NUCLEAR ROCKET DURING A MARS MISSION
Charles C. Masser 1971 11 p refs Proposed for presentation at 2d Symp. on Uranium Plasmas: Res. and Appl., Atlanta, Nov. 15-17, 1971; sponsored by AIAA
(NASA-TM-X-67927; E-6576) Avail: NTIS CSCL 06R

Analytical calculations were performed to determine the radiation dose rate and total dose to the crew of a gas-core nuclear rocket from the fission fragments located throughout the plume volume. The rocket plume is generated by the products of the reactor and consists of hydrogen, uranium, and fission fragments. The mission chosen is a manned courier trip to the planet Mars. Five centimeters of lead shielding would reduce the radiation dose by two orders of magnitude thereby protecting the crew. Also additional attenuation is available in the form of liquid hydrogen propellant, spacecraft structure, nuclear fuel, equipment, and stores. Author

N71-35263*# Baylor Univ., Houston, Tex. Coll. of Medicine.
EVALUATION OF THE NEUROPHYSIOLOGICAL ELECTRODE-AMPLIFIER-HARNESS SYSTEM FOR PHYSIOLOGICAL DATA ACQUISITION Final Report
Peter Kellaway [1970] 50 p refs
(Contract NAS9-7237)
(NASA-CR-115132) Avail: NTIS CSCL 06B

The development of a special electrode and harness system for the acquisition of electroencephalogram and other neurophysiologic data during space missions is discussed. The head cap, electrodes, preamplifiers, and harness have the following characteristics: (1) easy application and removal, (2) repeated on-off use during extended periods, (3) comfort when worn for periods up to 24 hours, including 9 hours of continuous sleep, and (4) detection of artifacts produced by such factors as sweating, eye movement, and muscle potentials. Author

N71-35264*+ Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.
IODINE COLORIMETER Final Report
Jul. 1971 23 p refs
(Contract NAS9-11879)
(NASA-CR-115134; FR-1090-101) Avail: NTIS CSCL 06K

The design and development of an instrument for making rapid, accurate measurements of low concentrations of iodine in spacecraft potable water supplies are described. A direct spectrophotometric technique is used which eliminates the need for additional reagents or complexing agents. This approach offers substantial advantages over the reagent-addition methods commonly used--especially where storage room and reagent degradation (with time) militate against the use of the usual techniques. An advantage of the instrument described is that of requiring very little effort on the part of the operator to make the aqueous iodine measurement as compared with other methods. Author

N71-35266*# Space Age Control, Inc., Palmdale, Calif.
HIGHLY ARTICULATE FULL PRESSURE GLOVE Final Report
Norman B. Foster May 1971 35 p
(Contract NAS2-6154)
(NASA-CR-114365) Avail: NTIS CSCL 06Q

A highly articulate full pressure glove providing maximum digital dexterity, tactility, and stability at an operating pressure of 5 psid was developed. The program encompassed thumb/finger development, glove development, and glove fabrication and assembly. A mini-convoluted nylon/neoprene laminated fabric was developed for the fingers. Axial restraints located in conduits are used to compensate for pneumatic return force in the fingers. Author

N71-35266*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
SPACE SHUTTLE TECHNOLOGY CONFERENCE. VOLUME 2: BIOTECHNOLOGY
3 May 1971 153 p refs Presented at the Space Shuttle Technol. Conf., Phoenix, Ariz., 18 Mar. 1971
(NASA-TM-X-67265; KSC-TR-1114-Vol-2) Avail: NTIS CSCL 06K

CONTENTS:

1. SPACE SHUTTLE ORBITER ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS O. T. Stoll (North Am. Rockwell Corp., Downey, Calif.) and A. O. Brouillet (Hamilton Std., Windsor Locks, Conn.) p 1-17

2. EVALUATION OF AN ENERGY ABSORBING CREW SEAT INTEGRATED WITH A ROCKET EXTRACTION SYSTEM R. Carpenter (NASA. Flight Res. Center) p 19-34 refs

3. THE FLASH EVAPORATOR FOR TRANSIENT HEAT LOADS J. L. Gaddis (Vought Missiles and Space Co., Dallas, Tex.) p 35-65

4. RECENT RESULTS FROM ZERO 'G' CARGO HANDLING STUDIES G. P. Beasley (NASA. Langley Res. Center) p 67-82

5. SUBSYSTEM TRADE-OFF ENVIRONMENTAL CONTROL AND LIFE SUPPORT FOR ORBITER PHASE B CONTRACTOR J. Jasin (McDonnell-Douglas, St. Louis, Mo.) and R. Augusti (Hamilton Std., Windsor Locks, Conn.) p 83-95

6. PRELIMINARY RESULTS OF SPACE SHUTTLE EC/LSS STUDIES L. G. Clark and R. S. Osborne (NASA. Langley Res. Center) p 97-121

7. DEVELOPMENT OF A BLADDERLESS TANK FOR SPACE SHUTTLE C. Feindler (Grumman Aerospace Corp.) p 123-155

N71-35267*# North American Rockwell Corp., Downey, Calif. Space Div.
SPACE SHUTTLE ORBITER ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS
O. T. Stoll and A. O. Brouillet (Hamilton Standard, Windsor Locks, Conn.) *In* NASA. Kennedy Space Center Space Shuttle Technol. Conf., Vol. 2 . 3 May 1971 p 1-17 refs

Avail: NTIS CSCL 06K

The space shuttle orbiter environmental control and life support system is presented. The rationale leading to selection of concepts is stressed. Concept trades were based on an anticipated 1977 initial orbiter flight, ten years operation, and a baseline mission support requirement of four men for seven days. The system must provide the following functions: (1) shirtsleeve environment for the crew and passenger compartment; (2) food, water, oxygen, storage and disposal of trash and human waste; and (3) where required, provide environmental control of equipment in and outside the crew compartment. The system can be refurbished and maintained using airline maintenance concepts, and state-of-the-art concepts will be used and a system will be provided at costs below previous space vehicle systems. Author

N71-35268*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
EVALUATION OF AN ENERGY ABSORBING CREW SEAT INTEGRATED WITH A ROCKET EXTRACTION SYSTEM
Richard Carpenter *In its* Space Shuttle Technol. Conf., Vol. 2 3 May 1971 p 19-34 refs
Avail: NTIS CSCL 06K

Consideration has been given to equipping the scaled prototype shuttle vehicle with a lightweight energy absorbing seat integrated with a crew extraction rocket. Such a system would provide protection for low velocity vehicle impacts and also offer a means of escape during higher velocity conditions. This system has been developed and fabricated at the Flight Research Center. The energy absorbing seat has been tested in a dynamic impact laboratory with satisfactory results. The escape system has been evaluated by extracting dummies by tractor rockets from a typical cockpit configuration. These tests indicate unsatisfactory performance during high roll rates. Author

N71-35269*# *Vought Missiles and Space Co., Dallas, Tex.*
THE FLASH EVAPORATOR FOR TRANSIENT HEAT LOADS **c33**
J. L. Gaddis *In* NASA. Kennedy Space Center Space Shuttle Technol. Conf., Vol. 2 3 May 1971 p 35-65

Avail: NTIS CSCL 06K

The feasibility of developing a liquid spray flash evaporator for thermal control in the space shuttle was investigated. Results indicated: (1) high efficiency capability; (2) operation without active back pressure control; (3) control by supply rate modulation for heat load transients; (4) capability to assume dormant operation with instant reactivation; and (5) operation with multiple evaporants in a single device. A.L.

N71-35270*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
RECENT RESULTS FROM ZERO g CARGO HANDLING STUDIES
Gary P. Beasley *In its* Space Shuttle Technol. Conf., Vol. 2 3 May 1971 p 67-82
Avail: NTIS CSCL 22C

Water immersion simulation techniques were used to determine the limits of manual cargo handling and transfer under weightlessness conditions. Package masses from 3 to 50 slugs, volume of 1.5 to 142 cubic feet, moments of inertia up 900 slug sq ft, and various other aspects such as maneuvering aid, pressure suit effects and one-man versus two-man transfers were considered. Preliminary results obtained indicated that manual cargo transfer, in an IVA mode, can be easily accomplished for packages of 50 slugs or more. This appears to preclude the requirement for automated systems for cargo transfer. However, considerations of practical limitations related to the shuttle configuration and time constraints are necessary before final decision is made. A.L.

N71-35271*# McDonnell-Douglas Co., St. Louis, Mo.
SUBSYSTEM TRADE-OFF ENVIRONMENTAL CONTROL AND LIFE SUPPORT FOR ORBITER PHASE B CONTRACTOR
John Jasin and Ronald Augusti (Hamilton Standard, Windsor Locks, Conn.) *In* NASA. Kennedy Space Center Space Shuttle Technol. Conf., Vol. 2 3 May 1971 p 83-95

Avail: NTIS CSCL 06K

The environmental control and life support (ECLS) subsystem in the orbiter provides a habitable environment for crew and equipment in the hostility of space. The ECLS must provide for the functions of: (1) shirtsleeve environment; (2) water management; (3) atmosphere gas supply; (4) atmosphere revitalization; (5) waste management; and (6) equipment thermal control. The ECLS is active during the mission phases of launch, ascent, on-orbit, entry and landing, and supports two pilots and two cargo handlers. Ground support equipment is utilized during prelaunch, launch, and post landing activity. The four man capacity allows for a wide latitude of mission capability ranging from seven days to thirty days. ECLS extended mission capability is achieved by the addition of modular equipment that is the same as the equipment provided in the orbiter. Provisions for this equipment addition are provided in the initial subsystem design. Author

N71-35272*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PRELIMINARY RESULTS OF SPACE SHUTTLE EC/LSS STUDIES
Lenwood G. Clark and Robert S. Osborne *In its* Space Shuttle Technol. Conf., Vol. 2 3 May 1971 p 97-121

Avail: NTIS CSCL 06K

The overall status of the Langley Research Center program on space shuttle environmental control and life support systems is presented, along with preliminary results of studies being conducted and assessments of technology advancements required. Author

N71-35273*# Grumman Aerospace Corp., Bethpage, N.Y.
DEVELOPMENT OF A BLADDERLESS TANK FOR SPACE SHUTTLE
Clauss Feindler *In* NASA. Kennedy Space Center Space Shuttle Technol. Conf., Vol. 2 3 May 1971 p 123-155

Avail: NTIS CSCL 06K

Results of studies and present state of development of bellows-type tanks for long-term storage of potable water for space shuttles are summarized. Investigations revealed that: (1) mixed cultures and waste waters represent a valid microbiological challenge; (2) steam is effective in sterilizing during launch preparations and after system failure; (3) frequent withdrawals do not affect tank sterility if proper protocol adhered to; (4) sterility can be retained for 100-day periods which are sufficient for shuttle, Skylab 2, and space station applications; (5) tank is suitable for both use by crew onboard launch vehicle and delivery to orbit as part of resupply mission; (6) no adverse odor, taste, or coloration effects noted; (7) volume metering by means of a linear potentiometer is both simple and accurate; (8) design and operation superior to bladder tank in all respects except weight effectiveness; and (9) tank considered as an acceptable development risk for the space shuttle. A.L.

N71-35274# Japan Atomic Energy Research Inst., Tokyo.
CHARACTERISTICS OF PERSONAL MONITORING DOSIMETER
Tatsuo Nishi, Tamizo Motizuki, and Yoshinobu Ashikagaya Jan. 1971 65 p refs In JAPANESE; ENGLISH summary (JAERI-Memo-4292) Avail: AEC Depository Libraries

Characteristics of personal monitoring dosimeters to estimate external exposure doses are described. Dosimeters described include: film badges; pocket dosimeters and alarm meters; film ring and finger dosimeters; glass dosimeters; thermoluminescence dosimeters; and emergency dosimeters. Author (NSA)

N71-35275# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.
ALCOHOL AND DISORIENTATION-RELATED RESPONSES. 4: EFFECTS OF DIFFERENT ALCOHOL DOSAGES AND

DISPLAY ILLUMINATION ON TRACKING PERFORMANCE DURING VESTIBULAR STIMULATION
Richard D. Gilson (Naval Aerospace Med. Inst.), David J. Schroeder, William E. Collins, and Frederick E. Guedry (Naval Aerospace Med. Inst.) Jul. 1971 13 p refs
(FAA-AM-71-34) Avail: NTIS

The effects of alcohol on the ability of men to suppress vestibular nestagmus while visually fixating on a cockpit instrument, thus degrading visual tracking performance (eye-hand coordination) during angular acceleration are discussed. Reduced display illumination, independently, has also been shown to degrade tracking performance during vestibular stimulation. The way in which low and moderate dosages of alcohol and two levels of instrument-display illumination combined to affect tracking performance in a static (on motion) environment, and in a dynamic (whole-body motion) environment is presented. Mean blood alcohol levels as low as .027 per cent significantly decreased tracking performance during whole-body motion, yet caused little change in performance in a stationary environment. Impairment was much more pronounced with dim display lighting than with bright lighting. These results suggest that serious problems may be encountered by the pilot who drinks even lightly and who considers flying, especially at night. Author

N71-35276# Bureau of Mines, Pittsburgh, Pa.
INVESTIGATION OF PULSATION DAMPERS FOR PERSONAL RESPIRABLE DUST SAMPLERS
J. A. Lamonica and H. N. Treaftis Aug. 1971 16 p refs
(BM-RI-7545) Avail: NTIS

A pulsation damping device designed to smooth pulsating flow in personal respirable dust samplers was evaluated. The effect on the pulsation dampener efficiency of six parameters was investigated, including volume, diaphragm elasticity, diaphragm area, center orifice area, inlet-outlet orifice area, and geometry (L/D ratio). The results indicate that volume predominates in determining snubber efficiency, while the other parameters become important at small volumes. Geometry has no effect on snubber efficiency. Criteria for an efficient pulsation dampener construction were obtained. Author

N71-35277# *Naval Medical Field Research Lab., Camp Lejeune, N.C.*
DEVELOPMENT OF THE NMFRL TELEMETRY SYSTEM, VOLUME 21, NO. 11 Interim Report
Philip J. Rasch Jun. 1971 15 p refs
(AD-726406; NMFRL-Vol-21-No-11;
NAVMED-MF12.524.007-IR-3) Avail: NTIS CSCL 06/2

The program involves efforts to convert the Naval Medical Field Research Laboratory's prototype telemetry equipment to a low-duty cycle tone burst system. A proprietary modulated by a series of 700 Hz tone bursts originating from especially designed equipment provided the best telemetered data yet recorded in this series of studies. It is recommended that further studies be conducted using monolithic and hybrid fabricated electronic circuits. GRA

N71-35278# School of Aerospace Medicine, Brooks AFB, Tex.
EVALUATION OF PHOTOCHROMIC GOGGLE SYSTEM FOR NUCLEAR FLASH PROTECTION Final Report, Dec. 1970 - Mar. 1971
William R. Thursby, Jr., Everett O. Richey, Roger V. Bartholomew, and Robert W. Ebers Jun. 1971 49 p
(AD-726544; SAM-TR-71-20) Avail: NTIS CSCL 06/17

The EG and G SY-116 A photochromic goggle system was evaluated to delineate any problem areas associated with it before Category III testing. The following features are presented and discussed: (1) physical characteristics of the goggle, such as closure time and peak optical density; (2) effect of the goggle upon the basic visual functions, such as visual acuity and color vision; (3) aircrew ability to visually detect various targets through the goggle; (4) comparative flashblindness recovery times for both operative and inoperative goggle situations under day and night conditions, utilizing FOT simulator systems; and (5) protection afforded by the goggle from various nuclear environments in terms of safe separation distances. Author (GRA)

N71-35279# Human Factors Research, Inc., Santa Barbara, Calif.
OPERATOR TARGET DETECTION PERFORMANCE AS A FUNCTION OF THE NUMBER OF SONAR ECHOES, INTERVAL BETWEEN TRANSMISSIONS, AND SIGNAL-TO-NOISE RATIO
Charles Abrams, William Doobenen, Salena K. Kerr, and Donald N. Buckner Jun. 1971 18 p refs
(Contract N00014-70-C-0186)
(AD-726741; TR-1700-1) Avail: NTIS CSCL 05/10

A major goal of designers of active sonar systems is to obtain longer target detection ranges. One consequence of longer ranges is longer time intervals between transmissions. Another is lower signal-to-noise ratios and thus fewer transmissions that produce perceptible echoes from a target. The purpose of the study was to investigate the effects of these variables on operator target detection performance. The results indicated the desirability of history or memory type displays with long-range sonar systems to enhance operator detection performance. Author (GRA)

N71-35280# Air Force Human Resources Lab., Williams AFB, Ariz. Flying Training Div.
AIRBORNE AUDIO-VIDEO RECORDING DESIGN CONSIDERATIONS
Milton E. Wood and William V. Hagin Nov. 1970 20 p
(AD-727025; AFHRL-TR-70-33) Avail: NTIS CSCL 14/3

A brief summary of recent airborne audio-video recording research is presented. Based on this research, and recent Air Training Command requirements for an operational airborne audio-video recording system, discussion is presented which considers the several design goals which are involved in the design of any airborne audio-video recording system. Further, an engineering development philosophy is provided which weighs current requirements against various aspects of the state of the art in audio-video technology. Author (GRA)

N71-35476# Paris Univ. (France). Faculty of Sciences.
PRIMARY PRODUCTION IN OCEAN BIOLOGY [LA PRODUCTION PRIMAIRE DANS LA BIOLOGIE DES OCEANS]
Bougis and Dallot *In* Assoc. Franc. pour l'Etude et la Develop. des Appl. de l'Energie Solaire Meas. of Solar Energy in Ocean Waters and Ocean Productivity 23 May 1970 19 p In FRENCH
Avail: NTIS

Some factors, like the wavelength, the euphotic zone depth, and mineral salts, controlling the plankton primary production, are reviewed. ESRO

N71-35477# Paris Univ. (France). Faculty of Sciences.
METHODS OF MEASURING PHYTOPLANKTON PRODUCTION [LES METHODES DE MESURE DE LA PRODUCTION DU PHYTOPLANCTON]
P. Nival *In* Assoc. Franc. pour l'Etude et le Develop. des Appl. de l'Energie Solaire Meas. of Solar Energy in Ocean Waters and Ocean Productivity 23 May 1971 37 p In FRENCH

Avail: NTIS

An electrical analogy model is given for the ocean ecological system. Some direct and indirect methods are listed, the former permitting the estimation of gross production of phytoplankton, the latter giving an estimation of the net production of the ecological system. ESRO

N71-36204*# *National Aeronautics and Space Administration.* Marshall Space Flight Center, Huntsville, Ala.
A PROPOSED INCIPIENT FIRE AND TOXIC GAS CAUTION AND WARNING FOR SHUTTLE
A. C. Krupnick *In its* Space Shuttle Technol. Conf., Vol. 1 3 May 1971 p 261-276
Avail: NTIS CSCL 06K

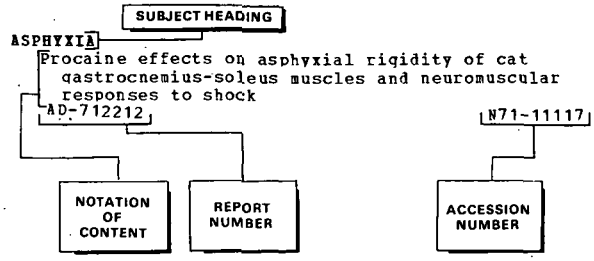
Based on present evidence, the gas filter cell offers the ultimate in background rejection. Not only does the gas filter cell offer sensitivity as good as the other systems, but its inherent throughput advantage offers more ultimate sensitivity at the expense of some source power. The most difficult problem in implementing the gas filter cell is making stable reference samples for the two-year lifetime. It is believed that the individual gas cell sensor can be made into a small, compact, and reliable instrument. However, multiple gas monitoring will probably require parallel optical systems. Based upon present data, the amount of toxic gas required to implement the system will be insufficient to be a significant hazard in the spacecraft. Also, this approach is believed to offer the most convenient changes in gas of interest by simply adding a sensor for the new species without changing any of the existing system. Author

N71-36205*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
FIRE PROTECTION DESIGN FOR SHUTTLE
G. F. Ard *In its* Space Shuttle Technol. Conf., Vol. 1 3 May 1971 p 277-284
Avail: NTIS CSCL 06K

The priority of the fire protection systems at KSC are reviewed along with the specific restrictions to the systems. The proposed fire protection measures and systems for the space shuttle as it moves through the vehicle assembly building launch pad, landing area, and safing area are described. A.L.

Subject Index

Typical Subject Index Listing



The Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

B

C

D

E

F

G

H

J

K

L

M

N

O

P

R

S

T

U

V

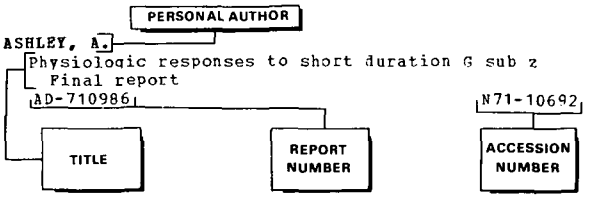
W

X

Z

Personal Author Index

Typical Personal Author Index Listing



The title of the document is used to provide the user with a brief description of the subject matter. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

W

Y

Z

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA deposits its technical documents and bibliographic tools in eleven Federal Regional Technical Report Centers located in the organizations listed below. Each center is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley

COLORADO
University of Colorado, Boulder

DISTRICT OF COLUMBIA
Library of Congress

GEORGIA
Georgia Institute of Technology, Atlanta

ILLINOIS
The John Crerar Library, Chicago

MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge

MISSOURI
Linda Hall Library, Kansas City

NEW YORK
Columbia University, New York

PENNSYLVANIA
Carnegie Library of Pittsburgh

TEXAS
Southern Methodist University, Dallas

WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library

COLORADO
Denver Public Library

CONNECTICUT
Hartford Public Library

DELAWARE
Wilmington Institute Free Library, Wilmington

MARYLAND
Enoch Pratt Free Library, Baltimore

MASSACHUSETTS
Boston Public Library

MICHIGAN
Detroit Public Library

MINNESOTA
Minneapolis Public Library
James Jerome Hill Reference Library, St. Paul

MISSOURI
Kansas City Public Library
St. Louis Public Library

NEW JERSEY
Trenton Public Library

NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library

OHIO
Akron Public Library
Cincinnati Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library

OKLAHOMA
Oklahoma County Libraries, Oklahoma City

TENNESSEE
Cossitt-Goodwin Libraries, Memphis

TEXAS
Dallas Public Library
Fort Worth Public Library

WASHINGTON
Seattle Public Library

WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, New York, 10017.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the National Lending Library for Science and Technology, Boston Spa, Yorkshire, England. By virtue of arrangements other than with NASA, the National Lending Library also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols "#" and "*", from: ESRO/ELDO Space Documentation Service, European Space Research Organization, 114, av de Neuilly, 92-Neuilly-sur-Seine, France.

"The aeronautical and space activities of the United States shall be conducted so as to contribute . . . to the expansion of human knowledge of phenomena in the atmosphere and space. The Administration shall provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

—NATIONAL AERONAUTICS AND SPACE ACT OF 1958

NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS

TECHNICAL REPORTS: Scientific and technical information considered important, complete, and a lasting contribution to existing knowledge.

TECHNICAL NOTES: Information less broad in scope but nevertheless of importance as a contribution to existing knowledge.

TECHNICAL MEMORANDUMS: Information receiving limited distribution because of preliminary data, security classification, or other reasons.

CONTRACTOR REPORTS: Scientific and technical information generated under a NASA contract or grant and considered an important contribution to existing knowledge.

TECHNICAL TRANSLATIONS: Information published in a foreign language considered to merit NASA distribution in English.

SPECIAL PUBLICATIONS: Information derived from or of value to NASA activities. Publications include conference proceedings, monographs, data compilations, handbooks, sourcebooks, and special bibliographies.

TECHNOLOGY UTILIZATION PUBLICATIONS: Information on technology used by NASA that may be of particular interest in commercial and other non-aerospace applications. Publications include Tech Briefs, Technology Utilization Reports and Technology Surveys.

Details on the availability of these publications may be obtained from:

SCIENTIFIC AND TECHNICAL INFORMATION OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington, D.C. 20546