NASA SP-7011 (89)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 89)

MAY 1971

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NASA SP-7011 (89)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 89)

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

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

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists **439** reports, articles, and other documents announced during January 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 per document up to a maximum of 20 pages. The charge for each additional page is $0.25. 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. 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):

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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.

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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 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.

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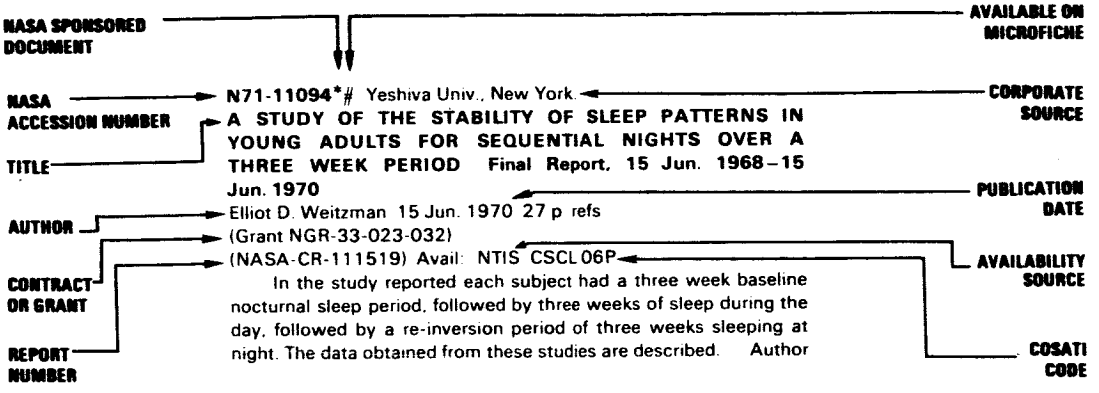

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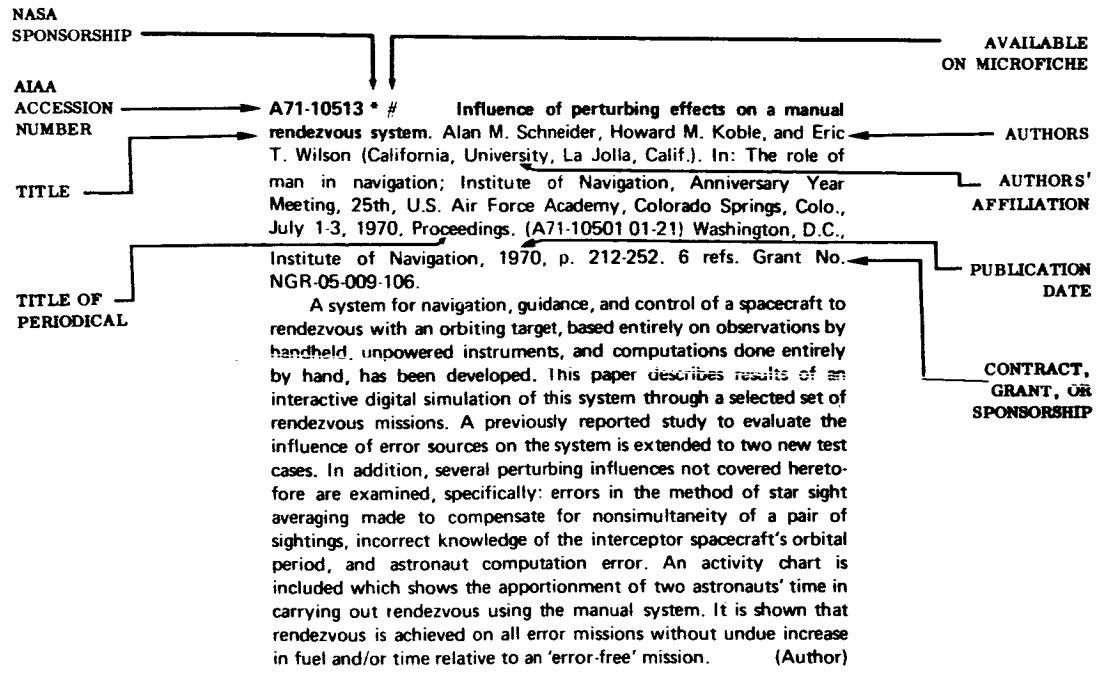

NASA

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 89) MAY 1971

IAA ENTRIES

A71-18736 # **Aircraft display media research.** H. B. Lyon, Jr. (U.S. Navy, Office of Naval Research, Washington, D.C.). *Naval Research Reviews,* vol. 23, Dec. 1970, p. 1-5.

Discussion of the significance of the contrast ratio and the average brightness for aircraft display media. The contrast ratio (CR) is defined, and CR relationships are examined in order to demonstrate some of the inherent capabilities of thin-film electroluminescent devices. The meaning of the expression 'Five Shades of Gray' is explained, and acceptable performance for gray scale displays is shown. The requirement to maintain a high average brightness when a large number of elements must be sequentially addressed is discussed. Intensity as a function of time for three classes of display drives is considered. G.R.

A71-18803 * **The role of man in an Observatory/Laboratory Spacecraft.** Arch B. Park (NASA, Washington, D.C.). In: EASCON '70; Institute of Electrical and Electronics Engineers, Electronics and Aerospace Systems Convention, Washington, D.C., October 26-28, 1970, Record. (A71-18801 07-07) New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 21-23.

Discussion of experiments for investigating fundamental questions that relate to the value of manned Earth Observations Programs. Various immediate objectives of the experiments are considered giving attention to the principal aim which is to determine the unique capabilities that man can contribute to earth observations and to test and document the degree of improvement or unique capability that can be obtained by the presence of man. An experiment plan for determining the role of man in an operational Observatory/Laboratory Spacecraft in near-earth orbit is examined taking into consideration the sensor payload to be provided, equipment for onboard analysis, and aspects of special astronaut training. G.R.

A71-18805 **An automated vision tester.** M. Berkowitz, W. Poteate, and S. Hunt (General Electric Co., New York, N.Y.). In: EASCON '70; Institute of Electrical and Electronics Engineers, Electronics and Aerospace Systems Convention, Washington, D.C., October 26-28, 1970, Record. (A71-18801 07-07) New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 33-41.

A laboratory model of an automated vision tester was developed on the Integrated Medical and Behavioral Laboratory Measurement System program for NASA. The unit is designed to measure visual system functional capability of a human subject necessary for evaluating the effect of space environment. The tests which can be performed are described and the electrical, mechanical and optical configurations discussed. The concept can be modified to include essentially any test required for checking visual capabilities. This concept can be used for clinical and research evaluation of visual system functions as well as multi phasic health screening tests.

(Author)

A71-18926 **Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969.** Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson (Sloan-Kettering Institute for Cancer Research, Rye, N.Y.) and Marcello Quintiliani (Istituto Superiore di Sanità, Rome, Italy). London, Taylor and Francis, Ltd., 1970. 493 p. $19.20.

The discussion is from various points of view, from the physicochemical level to clinical application. Review articles on the repair of DNA, radiosensitization by the halogenated pyrimidine analogs, and radioprotection by sulfur-containing and sulfurless compounds are presented. The radioprotective effect of cysteine, selenium-containing compounds, and aminothiols is described. The results of other investigations are presented, dealing with protection and sensitization in single cells and multicellular systems, the biochemistry and pharmacology of protective and sensitizing compounds, and clinical treatment. A subject index and an author index are included together with a list of participants by countries.

Individual items are abstracted in this issue. A.B.K.

A71-18927 **Molecular mechanisms of cellular radiosensitization and protection.** G. E. Adams (Mount Vernon Hospital, Northwood, Middx., England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 3-14. 49 refs.

Discussion of some aspects of bacterial radiosensitization and radioprotection in the light of recent data from both cellular and radiation chemical model systems. A convenient classification of possible mechanisms of radiosensitization is proposed. The general features of mechanisms involving interaction with radiation-produced free radicals are considered. Results from some recent experiments using pulse radiolysis and other techniques are used to shed light on molecular aspects of radioprotection. A.B.K.

A71-18928 **The repair of DNA and the mode of action of sensitizers and protectors in biological systems of different complexity.** P. Alexander, C. J. Dean, A. R. Lehmann, M. G. Ormerod, P. Feldschreiber, and R. W. Serianni (Chester Beatty Research Institute, Sutton, Surrey, England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European

Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 15-34. 28 refs.

Examination of the mode of action of radiosensitizers and radioprotectors in altering the effect of X rays on the DNA of murine lymphoma cells and Micrococcus radiodurans (M.r.). It is noted that X rays produce single-strand breaks with approximately equal efficiency in the DNA of murine lymphoma cells and M.r. However, production of double-strand breaks is 2.5 times greater in lymphoma cells than in M.r. It is suggested that variations in cellular radiosensitivity are not determined by the magnitude of the primary lesions in DNA. Since the dose of X rays needed to produce a single break in the DNA of the cells studied is very similar to that found when isolated DNA is irradiated under conditions where the contribution of indirect action is minimal, it is concluded that in the cells direct action is largely responsible for the observed damage to DNA. The presence of oxygen does not alter the efficiency of single-strand breakage, but studies of the rejoining of breaks in M.r. indicate that oxygen may alter the chemical nature of the ends at the radiation-induced breaks. Both lymphoma cells and M.r. are capable of repairing single-strand breaks and for M.r. it is noted that there is both a fast and a slow enzymatic rejoining process and that irradiation in the presence of oxygen prevents repair at 0 C but not at 30 C. A.B.K.

A71-18929 Radiosensitization by the halogenated pyrimidine analogues - Laboratory and clinical investigations. Henry S. Kaplan (Stanford University, Stanford, Calif.). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 35-42. 62 refs. NIH Grants No. CA-06437; No. CA-03353; No. CA-05838; No. CA-05008; No. CA-06135.

Summary of work during the period from 1960 to 1970 on the sensitization of cells and viruses by halogenated pyrimidine analogs to the effects of ionizing radiations. The relation between the chemical structure of some of the halogenated pyrimidine analogs and that of the natural pyrimidines, uracil and thymine, is illustrated. A number of lines of evidence are reviewed which show that the increased sensitivity of halogenated pyrimidine analog-grown cells and viruses to reproductive death and chromosome injury induced by ionizing radiation is attributable to the incorporation of the halogenated analogs into cellular or viral DNA. Some suggested molecular mechanisms of radiosensitization by the halogenated pyrimidine analogs are summarized. Certain limitations of a technique employed in the clinical radiotherapeutic investigation of two kinds of neoplasms (advanced epidermoid carcinomas and malignant gliomas) are noted. A.B.K.

A71-18930 Chemical protection against ionizing radiation by sulphur-containing agents. A. Pihl and T. Sanner (Norwegian Radium Hospital, Oslo, Norway). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 43-55. 43 refs. PHS-supported research.

Study of the mechanism of action of thiols and disulfides against ionizing radiation of bacterial and mammalian cells. A simplified scheme of protection by radiochemical mechanisms is outlined. The relative significance of direct and indirect action in cells is considered, and the results of experiments on the effect of various OH scavengers on the radiation sensitivity of E. coli B irradiated under anoxic conditions are cited as tending to support the view that indirect action plays an important role in radiation protection. The question of hydrogen transfer as a mechanism for bringing about radiation protection is also evaluated. Three mechanisms whereby biochemical reactions may conceivably induce radioprotection are discussed - namely, release of endogenous protective agents, increase in cellular radioresistance, and increase of repair. A.B.K.

A71-18931 Radioprotective action of compounds not containing sulphur. L. F. Semenov (Akademiia Meditsinskikh Nauk Gruzinskoi SSR, Sukhumi, Georgian SSR). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 57-61. 35 refs.

Review of experimental findings regarding two large classes of radioprotectors which do not include the thiol group in their molecular structure - namely, amines and hypoxic agents. Among the various amines, only biologically active amines with stimulating neurotropic properties protect mammals. These compounds produce many different reactions in living organisms but above all cause a reduction of tissue oxygen partial pressure. This effect is a selective one. It develops in muscles, lymphatic nodes, and bone marrow and is accompanied by a second small reduction of the redox potential in these tissues. It is regarded as highly probable that the protective activity of amines depends on hypoxia of the blood-forming organs. It is assumed that the hypoxic agents block at various levels the transport of oxygen to tissues, producing similar changes in oxygen partial pressure and redox potential in every tissue. A.B.K.

A71-18932 The radioprotective effect of cysteine on lysozyme in dilute aqueous solution. T. Brustad (Norsk Hydro's Institute for Cancer Research, Montebello, Norway) and W. B. G. Jones. In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 95-101. 8 refs.

Use of rapid mixing techniques to elucidate mechanisms by which cysteine protects lysozyme irradiated in dilute anoxic solutions. No protection is observed when cysteine is admitted to irradiated lysozyme 5 msec or longer after irradiation. Full protective effect is obtained when irradiation is performed 6 msec or longer after mixing of lysozyme and cysteine. The most likely mechanism by which cysteine exerts its protective effect is regarded to be by scavenging water radicals (presumably OH). Restitution of enzymatic activity by hydrogen donation from cysteine to radiation-induced enzyme transients having lifetimes exceeding a few milliseconds does not occur. Protection by mixed disulfide formation between unirradiated lysozyme and cysteine is not involved. A.B.K.

A71-18933 Radioprotection by selenium-containing compounds. Roberto Badiello (CNR, Laboratorio di Fotochimica e Radiazioni d'Alta Energia, Bologna, Italy) and Alberto Breccia (Bologna, Università, Bologna, Italy). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale

per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 103-107. 8 refs.

The present communication deals with the chemical radioprotection afforded by selenium-containing compounds in biological and chemical systems. Radioprotection, in the biological experiments, was evaluated by the ability of compounds to alleviate the mortality and the leucopenia occurring in irradiated rats. As chemical model systems, amino acids, either in the solid state or in aqueous solutions, have been studied. The results, both in biological and in chemical systems, show that these compounds have a powerful radioprotective action. The order of reactivity of selenium compounds with radicals appears to parallel their known radioprotective ability in biological systems and emphasizes the need for an understanding of radiation chemical processes to aid the understanding of radiobiological ones. (Author)

A71-18934 **Radiation chemistry of selenium-containing protective agents.** Roberto Badiello and E. Martin Fielden (Institute of Cancer Research, Sutton, Surrey, England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 109-115. 8 refs.

Results of measurements of the reactivity of the protective agent selenourea toward the primary radicals of water radiolysis. The radical reactivity of the selenium-, sulfur-, and oxygen-containing ureas is compared with the radioprotective efficiencies of these compounds, and it is found that the most efficient radical scavenger, selenourea, is the most efficient protective agent. Both the OH radical and the hydrogen atom give rise to the same radical species when reacting with selenourea. The radical formed by this reaction has a strong absorption band at 410 nm, and it is shown to be a charged complex involving two selenourea molecules. The formation and decay kinetics of this radical ion are measured, together with the association/dissociation constant of the complex. A.B.K.

A71-18935 **Charge transfer complexes and the mechanism of action of cysteamine and penicillamine.** Wolfgang Lohmann (Iowa, University, Iowa City, Iowa; Gesellschaft für Strahlenforschung, Institut für Strahlenschutz, Munich, West Germany). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 117-120. Research supported by the American Cancer Society; PHS Grants No. PH-00474; No. FR-5342.

Investigation of the effect of cysteamine and penicillamine on aqueous Cu(2+) solutions by means of electron spin resonance and optical absorption measurements. It is found that copper ions form a charge-transfer complex with both cysteamine and penicillamine. The sulfhydril-containing substances act as an electron donor, resulting in a reduction of the cupric form. This effect is reversed by the addition of oxygen, while nitrogen has no effect. From these results it is concluded that the radioprotective effect of the two substances investigated is due to their reducing abilities. A.B.K.

A71-18936 **Structure-function studies of the aminothiol radioprotectants.** H. M. Swartz, E. C. Richardson, E. S. Copeland, R. T. Lofberg, and R. J. Jandacek (U.S. Army, Walter Reed Army Institute of Research, Washington, D.C.). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 121-131. 12 refs.

Description of an extensive structure-function study of the aminothiols with the goal of obtaining information on basic radiation injury processes. The selection of compounds for the study was based on systematic variations of beta mercaptoethylamine, including chain length variations and substitutions on the sulfur and nitrogen nuclei. The basic biological system was Escherichia coli B/r. The radiation response of these bacteria was studied at 274 and 77 K. The results obtained are consistent with a theory that aminothiols and disulfides act selectively on radiation-induced radicals, accelerating their transformation and decay. The radical species observed in the bacteria were found to be affected by the presence of aminothiols, annealing temperature, and pH. A.B.K.

A71-18937 **Damaging radiation chemical events.** M. Ebert (Christie Hospital; Holt Radium Institute, Manchester, England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 133-136. 8 refs.

Study of fast chemical reactions which follow the initial absorption of ionizing radiation in HeLa cells at liquid nitrogen temperatures and in spores of the fern Osmunda regalis in the dry state at room temperature. On the basis of a comparison of the radiosensitivity of HeLa cells at 20 and -196 C it is suggested that 30% of the damage is caused by the direct effect. From an analysis of the radiation damage to dry fern spores the mode of action of oxygen on the direct effect is determined. The molecular configuration of macromolecules and other factors determining radiation sensitivity are discussed. A.B.K.

A71-18938 **The influence of sulphur-containing protective agents on bacteriophage survival curve shapes.** D. L. Dewey (Mount Vernon Hospital, Northwood, Middx., England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 139-145. 8 refs.

Study of the effect of the sulfhydril cysteamine and the disulfide cystamine on the survival rate of Serratia marcescens when subjected to radiation doses up to 80,000 rad. At these high anaerobic doses, in the presence of cystamine, no protection was observed, but a lowering in the extrapolation number. In the case of phage T sub 7 the protection afforded by the disulfide is the same as that afforded by the sulfhydril even at doses well below 80,000 rad, either in the absence or in the presence of oxygen. With phage T sub 4 cystamine does not have much effect in oxygen and protects in nitrogen only at higher doses where there has been some reduction to sulfhydril by radiation. It is concluded that protection by cystamine cannot be explained by reduction of disulfide to sulfhydril with high radiation doses. The major effect is the ability of different organisms to use disulfide compound for protection from radiation damage. A.B.K.

A71-18939 **Modification of DNA in Escherichia coli exposed to X-rays by triacetoneamine N-oxyl and oxygen.** Peter T.

Emmerson (Yale University, New Haven, Conn.). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 147-154. 14 refs. PHS Grants No. CA-06519; No. GM-11014.

Study of the ability of an X-irradiated Flac super + (donor) strain on E. coli to produce Lac super + colonies when mated with F super minus (recipient) strains carrying rec super + or recAl3. Experiments are described in which the transfer of the episomal DNA to the recipient has been used to demonstrate that the sensitizing agents - i.e., triacetoneamine N-oxyl (TAN) and oxygen - present during the irradiation of the donor modify the episomal DNA and affect its ability to function on subsequent transfer to the recipient. O.H.

A71-18940 Modification of post-irradiation DNA degradation in E. coli B/r. W. A. Cramp (Hammersmith Hospital, London, England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 155-158. 12 refs.

Investigation of the problem of whether some compounds which modify the lethal effects of ionizing radiation on bacteria would also affect radiation induced breakdown of DNA. The effects of thiourea, glycerol, dimethyl sulfoxide, N-ethyl maleimide, and indane trione, used in the optimum concentrations for protection or sensitization of E. coli B, were examined. It is suggested that DNA is not the only or most important target for the killing of bacteria by ionizing radiation. O.H.

A71-18941 Chelation and radiation protection. Seymour S. Block, James P. Weidner (Florida, University, Gainesville, Fla.), David G. Doherty (Oak Ridge National Laboratory, Oak Ridge, Tenn.), and David D. Mulligan. In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 163-166. 13 refs. NIH Grants No. 5 RO1 RH-0429-03; No. 5 RO1 CA-10853-02.

Investigation of various sulphur-containing organic chelating compounds as potential radiation protective agents. The bacteria E. coli B and mice were used in the experiments. In a series of para substituted phenylthioacetic acids and in a series of para substituted N-phenyldithiocarbamates, the substituents changed the nature of the compound from radioprotectant to radiosensitizer in bacterial tests. In tests with mice, 8-mercaptoquinoline showed radioprotection. O.H.

A71-18942 X-ray sensitivity of E. coli B cells as affected by cysteine. Zs. Nagy and M. Quintiliani (Istituto Superiore di Sanità, Rome, Italy). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 171-176. 5 refs.

Experimental investigation of the incorporation of cysteine in bacterial cells in different physiological states and its radioprotection. Escherichia coli B was used in the experiments. It is found that the radiosensitivity of growing E. coli B was significantly decreased when actively metabolizing cells were incubated with a growth inhibiting concentration of cysteine, which was washed away before irradiation. When the cell metabolism was reduced, or when cysteine was added to metabolizing cells in a concentration not interfering with their growth, the radiosensitivity remained unchanged. O.H.

A71-18943 The influence of cycloheximide on the radiosensitivity of Saccharomyces cerevisiae. G. Stehlik and E. Cabela (Reactor Centre Seibersdorf, Seibersdorf, Austria). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 177-181. 6 refs.

Investigation of the influence of cycloheximide, which is antibiotically effective against yeasts and fungi, on the radiosensitivity of the very radioresistant yeast strain Saccharomyces cerevisiae var. ellipsoideus, using a semisynthetic culture medium. Growth curves for Saccharomyces cerevisiae in this medium with different concentrations of cycloheximide and gamma-irradiation treatment were investigated over a period of 72 hr. It is found that if the antibiotic treatment is combined with gamma-radiation, a synergistic effect occurs whereby for instance a concentration of 1 ppm and an irradiation dose of 200 krad is sufficient to inhibit growth completely for this period of time. O.H.

A71-18944 Radiosensitization of bacterial and mammalian cells with carbonyl compounds and ketoaldehydes with special reference to properties of phenylglyoxal. M. J. Ashwood-Smith, J. Barnes, J. Huckle, and Bryn A. Bridges (Medical Research Council, Harwell, Berks., England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 183-188.

Investigation of the ability of phenylglyoxal and of a variety of carbonyl compounds, such as diacetyl, ninhydrin, isatin, acetylisatin, cyclohexane dione, and phthalimide, to sensitize bacteria and mammalian cells in tissue culture to ionizing radiation. Sensitization results are presented and compared, showing particularly the high sensitization effect of phenylglyoxal. O.H.

A71-18945 Endogenous non-protein sulphydryl and cellular radiosensitivity. J. W. Harris (California, University, San Francisco, Calif.). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 189-194. 18 refs. AEC-supported research.

Investigation of the reasons for the observed age-dependent changes in radiosensitivity of mammalian cells, with particular emphasis on the contribution of endogenous nonprotein sulphydryl (NPSH) to cellular radiosensitivity. The observed differential protective effect of cysteamine on cells irradiated during the radiosensitive

S period and those irradiated during the more resistant G1 and G2 periods is considered. The possibility that this differential protection by cysteamine might be due to replenishment of an endogenous NPSH pool which is normally lower during G1 and G2 than during S is examined. O.H.

A71-18946 Drug-radiation damage interaction and its relevance to radiosensitization in mammalian cells. M. M. Elkind, E. Kano, and K. Sakamoto (National Cancer Institute, Bethesda, Md.). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 195-200. 5 refs.

Demonstration that the intuitive expectation that radiosensitization would be the net effect of drug-radiation damage interaction regardless of the detailed nature of the lesions produced in the primary sites of radiation damage may not always be borne out insofar as the radiation killing of mammalian cells is concerned. The point emerges that even when a common locus of action of a drug and radiation is involved, this by itself may not be a sufficient condition to ensure sensitization. In a given instance, drug and radiation lesions may be registered in the same molecular species, but they may be of such a nature that independent action results. F.R.L.

A71-18947 Sensitization by hydroxyurea and protection by cysteamine of Chinese hamster cells during the cell cycle. Warren K. Sinclair (Argonne National Laboratory, Argonne, Ill.). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 201-210. 15 refs. AEC-supported research.

Experimental investigation of whether, and to what extent, cysteamine protects mammalian cells sensitized by hydroxyurea against cell irradiation. The cells examined were sublines of the V79 Chinese hamster lung cells. The contrasting effects exhibited by hydroxyurea and cysteamine in their capacity to modify cellular response to X-radiation are described and compared. The interaction between hydroxyurea and cysteamine is analyzed. O.H.

A71-18948 Radiation protection by disulphides in tissue culture. O. Vos, L. Budke (National Defence Research Organization TNO, Medical Biological Laboratory, Rejswijk, Netherlands), and G. A. Grant (Defence Chemical, Biological and Radiation Establishment, Ottawa, Canada). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 211-215. 5 refs.

The protective capacity of a number of thiol and disulphide compounds was studied at the cellular level in tissue culture. Reproductive integrity was used as parameter for protection. Cysteamine (and other thiol compounds) provide protection in the usual growth medium, whereas disulphide compounds only protect when rat blood is added to the medium. The influence of the concentration of blood and pre-incubation times have been studied. The results are explained by the inference that rat blood cells contain a reductase that converts some disulphide compounds to thiols. (Author)

A71-18949 The composite radioprotective and radiosensitizing effect of an organic free radical. L. Révész and B. Littbrand (Kungliga Karolinska Institutet, Stockholm, Sweden). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 217-224. 9 refs. Research supported by the Swedish Cancer Society, the Sir Samuel Scott of Yews Trust, and the Swedish Medical Society.

Study of the radioprotective and radiosensitizing effect of Triacetoneamine-N-oxyl (TAN), a highly water soluble stable free radical of low toxicity, and the possibility of its application to radiotherapy of tumors. A Chinese hamster cell line was treated with TAN and subsequently exposed to single or divided doses of X-rays to study the animal survival characteristics. The results show that TAN sensitizes by a similar mechanism as the sensitization due to oxygen, that it substitutes for oxygen in the recovery process, and that, at high concentrations, it scavenges radiation induced radicals. O.H.

A71-18950 Indanetrione, menadione, Synkavit, and N-ethylmaleimide tested as radiosensitizers on murine ascitic tumour irradiated in vitro and grown in vivo. G. Di Vita and D. H. Marrian (Cambridge University, Cambridge, England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 225-231. 13 refs.

Description of the results of the testing of various chemical compounds, already described as radiosensitizers, on a strain of murine ascitic tumor. It was found that mice with growing ascitic tumor show a standard increase in body weight of at least 5 g in 3 days; the tumor time between day of inoculation and day of completed standard increase is inversely proportional to the logarithm of the number of viable cells inoculated. Suspensions of ascitic tumor cells were incubated in vitro with chemical compounds, irradiated in vitro, and then inoculated intraperitoneally into mice; the tumor time was used to estimate the radiosensitizing effect of the compound. Indanetrione produced a marked radiosensitization; also N-ethylmaleimide and menadione bisulphite enhanced the effect of radiation; Synkavit did not show any radiosensitizing effect in this test. M.M.

A71-18951 Effect of polycation on tumour cells in vivo. M. Furlan and H. Moroson (Sloan-Kettering Institute for Cancer Research, Rye, N.Y.). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 233-242. 12 refs. Research supported by the Damon Runyon Memorial Fund; NIH Grant No. CA-08748.

Preliminary testing of the hypothesis that polycations might act as radiosensitizers selective for tumor cells in mice. Preliminary experimental results suggest that polycations can interact with tumor cell surfaces in such a way as to: (1) inhibit their growth rate when injected at a dosage nontoxic to the host; (2) interact with X-ray treatment to enhance tumor cell killing at dosages not toxic to the host; and (3) interfere with alkali dissociation between cell membrane and desoxyribose nucleic acid (DNA) in an alkaline sucrose density gradient. M.M.

A71-18952 **Radiosensitizing effect of L-erythro-alpha, beta-dihydroxybutyraldehyde on Ehrlich ascites tumour cells - Cytokinetic analysis of tumour growth.** A. Perin, A. Arnaboldi, A. Sessa, G. Scalabrino, E. Ciaranfi (Milano, Università, CNR, Centro di Studio per la Patologia Cellulare, Milan, Italy), and A. Castellani (Comitato Nazionale per l'Energia Nucleare, Laboratorio di Radiobiologia Animale, Rome, Italy). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 243, 244.

An in vivo/in vitro technique was used for measuring the kinetics of in vivo growth of adrenocarcinoma Ehrlich ascites cells in the ascitic fluid, by injecting cells pretreated in vitro with: (1) dihydroxybutyraldehyde (DIBA), (2) X rays, and (3) DIBA plus X rays. The kinetics of untreated tumor cell growth shows an exponential increase in cell number up to the 3rd-4th day from inoculation, followed by a progressive decrease of growth. Treatment with DIBA or X rays leads to a slowdown or blockage of tumor growth in relation to the concentration, length of treatment with DIBA, or X-ray dose. Treatment with DIBA at 37 deg C for 30 min or irradiation with 750 rad leads, within the first three days, to a slowdown of tumor growth, while the tumor afterwards develops in a similar way as the control. M.M.

A71-18953 **Co-60 gamma-ray effect on mouse Ehrlich ascites tumour cells in the presence of some coumarin derivatives.** L. Musajo, F. Bordin, L. Busulini, F. Baccichetti, and R. Bevilacqua (Padova, Università, Padua, Italy). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 245-249. 12 refs.

Study of the influence of 5,8-dihydroxypsoralen on the transmissibility of Ehrlich ascites tumor cells under the action of Co 60 gamma rays. The drug at concentrations nontoxic to cells has shown a marked radiosensitizing activity. Following the injection of tumor cell suspensions irradiated in its presence, mice have shown a decrease in mortality and an increase in mean survival time in comparison with controls. This effect was greatly reduced or absent when the 5,8-hydroxypsoralen was added after irradiation of cell suspensions. Therefore 5,8-dihydroxypsoralen can be considered a new radiosentisitizing substance for Ehrlich ascites tumor cells. M.M.

A71-18954 **Radioprotection and modification of glycolysis in Ehrlich ascites tumour cells.** P. Ciccarone (Comitato Nazionale per l'Energia Nucleare, Laboratorio di Radiobiologia Animale, Rome, Italy), F. Palitti, and L. Seganti. In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 251-255. 13 refs. Consiglio Nazionale delle Ricerche Grant No. 115.22.44.0/4721.

In order to investigate whether changes in carbohydrates metabolism induced by the administration of some radioprotective drugs may play a role in the mechanism of radioprotection, the possible radioprotective action of oxamic acid which inhibits lactic acid dehydrogenase, was investigated. Tests were carried out on diploid Ehrlich ascites tumour cells, the survival of which after irradiation in the presence or absence of oxamic acid was evaluated by measuring the number of them which had to be injected in the brain of C 57B1 mice to cause the death of 50 percent of animals at 30 days by brain tumour. The metabolic conditions of cells have also been evaluated and the assay of intermediate metabolites showed that glycolysis was deeply disturbed. Under such conditions evidence of a radioprotective effect of oxamic acid was obtained. (Author)

A71-18955 **Methyl hydrazine radiosensitized Ehrlich ascites tumour cells.** H. Moroson and M. Furlan (Sloan-Kettering Institute for Cancer Research, Rye, N.Y.). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 257-263. 8 refs. NIH Grant No. CA-08748; AEC Contract No. AT (30-1)-910.

Discussion of the results obtained from the application of a modified version of the method of Lett, Caldwell, et al. (1967) to a study of the influence of radiosensitizers upon DNA in Ehrlich ascites tumor cells layered on alkaline sucrose density gradients. The evidence from these gradients indicates that both X radiation and methyl hydrazine treatment of tumor cells in vivo and in vitro results in DNA single-strand breaks. It also appears that in the nonsensitized cell DNA breaks can be rejoined, while in the sensitized cell more breaks are introduced than rejoined. M.V.E.

A71-18956 **Cell membrane characteristics of Ehrlich ascites tumour cells irradiated with small doses of ionizing radiations in the presence of radioprotective and radiosensitizing drugs.** J. N. Mehrishi (Cambridge University; Addenbrooke's Hospital, Cambridge, England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 265-273. 29 refs. Research supported by the British Empire Cancer Campaign.

The effect of 15 MeV X rays and electrons and 210 kV X rays on the cellular electrophoretic mobility and potassium loss of Ehrlich ascites tumor cell membrane was investigated in vitro in the presence and absence of oxygen, radiosensitizing and radioprotecting drugs. The measured losses of intracellular potassium plotted as a function of each of the numerous experimental conditions varied are evaluated and discussed in regard to their potential implications. M.V.E.

A71-18957 **In vitro radiosensitization of Ehrlich ascites tumour cells and pure enzymes by iodine compounds.** G. Cancelliere, P. Misiti-Dorello, and J. Shejbal (Istituto Superiore di Sanità, Rome, Italy). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 275-280. 13 refs.

Study of the radiosensitizing effect of several iodine compounds in dilute solution on two experimental models: Ehrlich ascites cells and SH-enzymes. The release of potassium ions from Ehrlich ascites tumor cells after irradiation of suspensions by low doses of X rays was observed. Iodoacetic acid (IAA), sodium iodide, iodopropionic acid (IPA), and methyl iodide (MeI) in concentrations of the order of 0.0001 M, enhanced post-irradiation potassium release from cells

into the medium, their dose-modifying effect diminishing in the order IAA greater than NaI greater than IPA greater than MeI. The dose-modifying capacity of NaI, IPA, and MeI was further studied on four enzymes. M.M.

A71-18958 Radiosensitizing effect of Mitomycin C on haematopoietic colony forming cells. J. F. Duplan and J. Fuhrer (Paris, Université, Institut du Radium, Paris, France). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 281-287. 13 refs. Direction de Recherches et Moyens d'Essais Contract No. 68-34-487.

Evaluation of the radiosensitizing activity of Mitomycin C (MC), 5-Fluorouracil (5-FU), and Actinomycin D (AD) with the technique based on the ability of bone marrow cells to form spleen colonies. Dose-effect curves demonstrate that MC is a true radiosensitizer while both 5-FU and AD add only their lethal effect to that of X rays. Investigations were carried out to study the early repair of radiosensitized colony forming cells (CFC). These cells, when irradiated with 100 R, have recovered 70% of their normal radiosensitivity (early cell repair) 5 hr after exposure to X rays. Cellular alterations induced by MC alone have not shown any spontaneous recovery within the same period of time. M.M.

A71-18959 The protective effect of para-aminopropiophenone and propylene glycol on the haematopoietic stem cells of mice. A. Vacek and E. Davidová (Československá Akademie Věd, Biofyzikální Ústav, Brno, Czechoslovakia). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 289-293. 7 refs.

The method of counting endogenous and exogenous spleen colonies was used in estimating the protective effect of para-aminopropiophenone (PAPP) and propylene glycol (PG). The protective effect of PAPP and PG was established when injected intraperitoneally 15 min prior to exposure to X rays. Administration of PAPP in PG or PG alone reduced the proliferative capacity of hematopoietic stem cells and 6 hr (59)Fe uptake in femur and spleen of nonirradiated mice. M.M.

A71-18960 Radioprotective action of haematoporphyrin on endogenous spleen colony-forming units. G. Cittadini, L. Lanfredini, and G. Mancini (Siena, Università, Siena, Italy). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 295-298. 17 refs.

Hematoporphyrin chlorhydrate was administered to mice 72 plus 48 plus 24 hr or 30 min before whole-body irradiation. On the tenth day the animals were bled, the spleens were removed, weighed, and fixed for hematopoietic colonies count. When administered 72 plus 48 plus 24 hr, hematoporphyrin caused no difference in spleen weights and colony counts in regard to control animals treated with saline. When administered 30 min, hematoporphyrin induced a significant increase in the number of colonies. This effect seems indicative of a radioprotective action. The dissociation between the general radiosensitization demonstrated by survival tests and the radioprotection of hematopoietic stem cells is briefly discussed. M.M.

A71-18961 Sensitization of anoxic fern spores to X rays by chemicals known to be effective in bacteria. J. L. Foster (Christie Hospital; Holt Radium Institute, Manchester, England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 299-303.

A number of compounds belonging to the high electron affinity group, as defined by Adams and Dewey (1963), and capable of sensitizing anoxic bacteria to the cell killing effect of X rays, have been tested for their ability to sensitize anoxic spores of the fern Osmunda regalis in aqueous suspension. Of nine chemicals tested only two, diacetyl and isatin, had a sensitizing effect in the initial set of experiments made at room temperature. The ability of these compounds to sensitize anoxic fern spores is not clearly related to their ability to sensitize other systems. M.M.

A71-18962 Dose-modifying factors and inhibitors of repair. Alma Howard (Christie Hospital; Holt Radium Institute, Manchester, England). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 305-308. 6 refs.

Experimental investigation of radiobiological dose modification and repair process in the alga Oedogonium cardiacum. In this plant, split-dose experiments show that survival does not increase if the cells are kept hypoxic after the first dose. On the other hand, survival increases promptly provided O2 is present; therefore hypoxia blocks repair. At low dose rates, hypoxia during irradiation will increase the lethal effect. Hypoxia thus acts as a sensitizer. If the respiratory inhibitor KCN is present between the two fractions of a split dose, survival is even lower than if hypoxia is present. M.M.

A71-18963 Chemical sensitization of the damaging effects on embryos produced by low radiation doses - The role of energy metabolism and immediate repair. Hedi Fritz-Niggli and Chr. Michel (Zürich, Universität, Zurich, Switzerland). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 311-317. 5 refs.

Experimental assessment of embryo sensitization to small-dose-irradiation damage by iodoacetamide, a radiosensitizer known to be nonembryotoxic by itself in the absence of irradiation. The experiments show that the effect of small quantities of radiation in embryo tissue can apparently be potentiated by chemical agents in otherwise innocuous concentrations. The radiosensitizing mechanism is believed to consist in cell energy metabolism altering effects. M.V.E.

A71-18964 **Chemical protection of mice inflicted with irradiation and open skin wounds.** Otfried Messerschmidt and Eline Birkenmayer (Freiburg, Universität, Freiburg im Breisgau, West Germany). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 319-323. 6 refs.

Study of the effects of open skin wounds and protective chemical pretreatment on radiation sickness lethality in mice. Male mice were inflicted with whole body irradiations, combined with open skin wounds. If wounds (causing a lethality of 6 percent) were set at different intervals after irradiation, radiation lethality was increased from 20 up to 72 percent. The lethality of irradiated animals and of those inflicted with combined injuries could be reduced to less than 10 percent by pretreatment with 5-hydroxytryptamine or cysteamine. M.V.E.

A71-18965 **Radioprotective effect of N-substituted AET-derivatives having amino acid structure.** V. Várterész, B. L. Sztanyik, and K. Nádor (Országos Frédéric Joliot-Curie Sugárbiológiai és Sugáregészségügyi Kutató Intézet; Veterinary University, Budapest, Hungary). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 325-329.

Study of the possibilities of toxicity reduction in radioprotective AET compounds, in extension of previous attempts by Doherty (1960) and Szekerte, Wade, and Bergel (1965). The results obtained indicate that substitution by amino acids of dipeptides in the isothiuronium group of the AET molecule reduces the toxicity of the compound. The overwhelming majority of such derivatives are still radioprotective. The radioprotective activity of some of them is the same or only slightly less than that of the parent compound. However, to obtain a radioprotective effect equivalent to that of AET, the administered dose has to be increased roughly in proportion with the decrease of toxicity. M.V.E.

A71-18966 **Radioprotection by hypoxia and some chemical protectors.** T. S. Veninga and W. Lemstra (Groningen, University, Groningen, Netherlands). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 331-334. 6 refs.

Hypoxic treatment affording protection against ionizing irradiation stimulates the anaerobic glycolysis as can be deduced from the observed increase of lactic acid in blood and urine and the elevation of the blood glucose level immediately after hypoxia. In contrast, alloxan-diabetis, known to cause a blockade of glycolysis, abolishes the protective action of hypoxia. These observations may indicate that the protection afforded by hypoxia elapses through a recovery mechanism which is brough into action by the hypoxic treatment. (Author)

A71-18967 **Radioprotective effects of sodium fluoroacetate and its probable mechanism of action.** L. Novák (Československá Akademie Věd, Biofyzikální Ústav, Brno, Czechoslovakia). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 335-341. 24 refs.

Evaluation of the protection against the effect of ionizing radiation afforded by sodium fluoroacetate (FAc), and study of the mechanism of its action. Results of experiments carried out on mice indicate that the radioprotective effect of FAc is similar to that of cysteine, cysteamine, AET, or serotonine. The effect of FAc, however, is found to be dependent primarily on the selective blockade of a single enzyme, namely, aconitase. M.V.E.

A71-18968 **The importance of hypothermy in the mechanism of the protective action of sodium fluoroacetate.** J. Mišustová and L. Novák (Československá Akademie Věd, Biofyzikální Ústav, Brno, Czechoslovakia). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 343-347. 18 refs.

Study of the role of temperature in the mechanism of protective action of sodium fluoroacetate (FAc), on H-strain male mice aged 9 to 12 weeks. After FAc application (5 mg/kg body weight) the animals were kept at temperatures of 17, 23, and 30 C and irradiated at these temperatures with 800 R. A change in the ambient temperature in the course of intoxication by FAc significantly influences the body temperature of the experimental animals, but does not affect the degree of protection or its variation in time. These results correspond with the opinion that the degree of protection by FAc is determined by the consequences of blocking of aconitase, which is proportional to the FAc dose, rather than by hypothermy. (Author)

A71-18969 **The protective effect of cystamine, AET, serotonin and mexamine against fractionated lethal gamma-irradiation.** M. Dostál (Universita J. E. Purkyně, Hradec Králové, Czechoslovakia). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 349-353. 6 refs.

Study of the potency of various radioprotective compounds in reducing radiation sickness lethality in rats. Using the efficacy of Co-60 gamma irradiation, midlethal exposure, and rat lethality as criteria, the protection obtained by cystamine was found to be of significant value. At the midlethal and lethal exposure levels, serotonin and mexamine surpass the sulphur-containing compounds in their protective effects following fractionated irradiation. M.V.E.

A71-18970 **Reduction of short- and long-term radiation effects by mixtures of chemical protectors.** J. R. Maisin, G. Mattelin, and M. Lambiet-Collier (Centre d'Etude de l'Energie Nucléaire, Mol, Belgium). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 355-361. 7 refs. Research supported by

the Fonds de la Recherche Scientifique Fondamentale Collective, the Centre d'Etude de l'Energie Nucléaire, and EURATOM.

The advantages obtainable by administration of mixtures of chemical radioprotectors for short- and long-term survival following single or repeated doses of ionizing radiation were studied on mice. It was found that the degree of protection obtained for 30-day survival increased substantially in comparison with the results of individual radioprotector administration. Other advantages observed were noticeably diminished radiation-induced life-shortening effects and leukemia and cancer incidence. M.V.E.

A71-18971 Radioprotective effect of a mixture of AET and 5-methoxytryptamine in X-irradiated mice. B. L. Sztanyik and V. Várterész (Országos Frédéric Joliot-Curie Sugárbiológiai és Sugáregészségügyi Kutató Intézet, Budapest, Hungary). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 363-367. 9 refs.

The radioprotective potency and toxicity of simultaneously administered protective compounds was studied by means of methods described by Loewe (1959) for analyzing the cooperative effect of drugs, with the aim of quantitative determination of addition, potentiation, and antagonism. It has been established that the toxicity and radioprotective effect of mixtures containing various proportions of AET and MOT are by far higher than those of the single compounds alone. The synergism of both effects of the two compounds was quantitatively analyzed and found to be of potentiating character. The knowledge of the isobole of synergism permits the selection of combinations of optimum proportion, having the least toxic effect with the highest radioprotective potency. M.V.E.

A71-18972 The role of the CNS on the radioprotective effect of 5-hydroxytryptamine. Christian Streffer and Gerhard Konermann (Freiburg, Universität, Freiburg im Breisgau, West Germany). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 369-373. 7 refs.

An assessment of the radioprotective contribution of the central nervous system (CNS), elicited by the pharmacological action of 5-hydroxytryptamine (5-HT), has been attempted. An analysis of the brain by histo-autoradiography was performed 15 min after intraperitoneal injection of a 5-HT compound. The results obtained suggest that 5-HT triggers some regulatory function of the CNS which induces the radioprotective effect. Various hypotheses about the mechanism of this effect are discussed. M.V.E.

A71-18973 5-hydroxytryptamine protection of rat bone-marrow chromosomes against X-irradiation in vivo. Jyoti P. Chaudhuri (Ulm, Universität, Ulm, West Germany) and Hanns Langendorff (Freiburg, Universität, Freiburg im Breisgau, West Germany). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 375-379. 9 refs.

The action of a conventional radioprotective chemical against chromosome aberrations induced in vivo has been studied. Optimally high chromosome aberration frequencies in the bone marrow of rats were obtained 18 hr after 640-r X irradiation in vivo. Intraperitoneal pretreatment with 50 mg/kg of 5-hydroxytryptamine yielded dose reduction factors up to 3.4 with respect to chromatid breaks. M.V.E.

A71-18974 Survival-promoting effects of endotoxin in mice, dogs, and sheep. E. J. Ainsworth, R. M. Larsen, F. A. Mitchell, and J. F. Taylor (U.S. Naval Material Command, Naval Radiological Defense Laboratory, San Francisco, Calif.). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 381-388. 19 refs.

A preirradiation injection of bacterial endotoxin increases survival of irradiated mice, dogs, and sheep. The postirradiation leucocyte counts show an accentuated abortive rise. The mechanism involves haematopoietic stimulation, and an earlier, although transient reappearance of leucocytes. Endotoxin does not change the D sub 0 for colony-forming units in the femur or spleen, but the amount of surviving haematopoietic tissue in the spleen is increased. Repopulation of colony-forming units in the femur and spleen is transiently promoted, in endotoxin-treated mice. Speculations concerning the responses of the haematopoietic system to endotoxin are presented. (Author)

A71-18975 The influence of chemical radiosensitizing agents on organs and cell structures. Hildegard Braun (Freiburg, Universität, Freiburg im Breisgau, West Germany). In Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 389-395. 11 refs.

Investigation of the cytotoxic and radiosensitizing effect of the thiol-binding agents iodoacetamide (IAA), N-ethylmaleimide (NEM), and iodoacetic acid (IA) on the crypt cells of the duodenum in mice. With regard to mortality and mitotic activity, IA and NEM are found to be more effective than IAA. It is also found that the subcellular organelles in cells of pretreated and irradiated mice are more affected than after irradiation alone. O.H.

A71-18976 Radiosensitizing properties of some barenes (ortho-1,2 dicarbaclovododecaborane). E. F. Romantsev, V. I. Stanko, E. A. Romanova, G. A. Anorova, and E. V. Kozyreva (Ministerstvo Zdravookhraneniia SSSR, Biofizicheskii Institut, Moscow, USSR). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 397-400. 9 refs.

Experimental investigation of the effect of o-barenylacetic acid (BAA) and methyl-o-barencarboxylic acid (MBA), administered to mice, on the increase of their radiosensitivity to fast neutrons or gamma-rays. The distribution of BAA in animal tissues and organs and also in liver nuclei, mitochondria, and ribosomes was examined. The results are tabulated and discussed. O.H.

A71-18977 Protection of mice against ionizing radiations by adrenochrome monoguanylhydrazone methansulphonate - A promising agent for clinical use. T. Sugahara, T. Tanaka, and H. Nagata (Kyoto University, Kyoto, Japan). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 401-408. 7 refs. Research supported by Suntory, Ltd.

Experimental investigation of the radioprotective effect and toxicity of adrenochrome monoguanylhydrazone methansulphonate (AMM) administered to mice prior to irradiation. AMM is found to be a more effective radioprotective agent than any of the other adrenochrome derivatives studied so far. Since this effect was observed with very low doses, far below the toxic level, not only after intraperitoneal injection but even after oral administration, and since it protected against both acute and chronic irradiation, its future applicability to man seems to be promising. O.H.

A71-18978 The effect of 6-azauridine on irradiated tumours. E. Magdon (Robert-Rössle Klinik, Berlin, East Germany). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 409-414. 8 refs.

Study of the effect of 6-azauridine on radiation-induced inhibition of the growth of Yoshida sarcomas, Ehrlich carcinomas, benzopyrene-induced carcinomas, and of the growth and the transplantability of spontaneous mammary carcinomas. The maximum radiosensitizing effect was obtained when the substance was administered 24 hr prior to irradiation. It is suggested that the radiosensitizing effect of 6-azauridine is due to a partial synchronization, during which the cells pass through a phase with maximum radiation sensitivity. O.H.

A71-18979 Biochemical mechanism of radioprotective action of aminothiols. E. F. Romantsev, N. N. Koshcheenko, and I. V. Filippovich (Ministerstvo Zdravookhraneniia SSSR, Biofizicheskii Institut, Moscow, USSR). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 421-427. 19 refs.

Discussion of experimental data in favor of the authors' hypothesis of a complex biochemical mechanism of radioprotective action of aminothiols in mammals. To gain some insight into the character of radioprotector binding to the components of a biochemical system, the effect of powerful aminothiols on some control mechanisms of DNA and RNA biosynthesis in radiosensitive tissues was examined in rats. The correlation between the radioprotector accumulation in tissues, their radioprotective action, and inhibition of radiosensitive biochemical processes was established. O.H.

A71-18980 Blood redox potentials of rats and mice injected with cystamine. Claire Duyckaerts and Claude Liébecq (Liège, Université, Liège, Belgium). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 429-432. 12 refs. Research supported by the Fonds de la Recherche Scientifique Médicale of Belgium and EURATOM.

Investigation of the causes of the increased radioprotection in rats provided by the injection of cystamine 45 min before X irradiation. The results obtained indicate that this increased radioprotection may be due to hypoxia since the maximal changes in lactate/pyruvate ratio, redox potentials, and NADH/NAD(+) coincide with the radioprotection peak occurring at the 45-min injection-irradiation interval reported by Betz et al. (1967). M.V.E.

A71-18981 Radioprotectors and plasma enzymes. G. Plomteux, M. L. Beaumariage, Z. M. Bacq, and C. Heusghem (Liège, Université, Liège, Belgium). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 433-437. 14 refs.

Experimental investigation of the possibility that the cellular damage caused to the mitochondria and endoplasmic reticulum of rats by the injection of radioprotectors might be accompanied by the passage of various intracellular enzymes into the plasma. It was found that cysteamine, 5-mercaptopyridoxine, and hypoxia produce an increase in the concentration of various enzymes in rat plasma. These treatments protect against the effects of ionizing radiation. Treatment with beta-mercaptoethanol and 4-mercaptopyridoxine, both nonradioprotectors, does not affect these plasma enzyme levels. M.M.

A71-18982 Metabolic effects of sulphur-containing radioprotective drugs. E. H. Betz and P. Lelièvre (Liège, Université, Liège, Belgium). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 439-444. 23 refs.

Study of the metabolic effects of cysteamine, cystamine, and cysteine on oxygen uptake in the rat. The results were compared with those obtained after administration of amines. It was found that the three substances decrease the oxygen uptake and that cystamine is the most active in this regard. Cystamine and to a lesser degree cysteamine increase the respiratory quotient. This effect could be related to the tissular anoxia which is induced by these substances. Cystamine also inhibits anaerobic glycolysis of tissue homogenates whereas cysteamine is ineffective. Phosphoglyceraldehyde dehydrogenase and hexokinase are the only enzymes inhibited by cystamine. M.M.

A71-18983 Action of SH-containing radioprotectors on nucleic acid metabolism. R. Goutier (Liège, Université, Liège; Centre d'Etudes de l'Energie Nucléaire, Mol, Belgium) and L. Baugnet-Mahieu (Centre d'Etudes de l'Energie Nucléaire, Mol, Belgium). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd.,

1970, p. 445-451. 20 refs. Research supported by the Fonds de la Recherche Scientifique Fondamentale Collective of Belgium.

Description of the inhibition of desoxyribose nucleic acid (DNA) synthesis in rat thymus and spleen after injection of S.2-aminoethylisothiourea (AET) and mercaptoethylamine (MEA) and in regenerating liver when AET is injected before partial hepatectomy. The delay in DNA synthesis and in mitotic activity observed in regenerating liver arises from a delay in the synthesis of the relevant enzymes: nuclear ribonucleic acid (RNA)-polymerase and thymidine-phosphorylating kinases. The importance of these observations for understanding the mechanisms of radioprotection is discussed together with the possible occurrence of a protection of the DNA repair mechanisms. M.M.

A71-18984 Formation of ATP in nuclei and mitochondria and the influence of beta-mercaptoethylamine. Z. I. Zhulanova, E. F. Romantsev, E. E. Kolesnikov, and E. V. Kozyreva (Ministerstvo Zdravookhraneniia SSSR, Biofizicheskii Institut, Moscow, USSR). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 453-456. 6 refs.

Investigation of the effect of mercaptoethylamine (MEA) on the aerobic resynthesis of adenosinetriphosphate (ATP) in the nuclei of thymus, and oxidative phosphorylation in liver mitochondria of rats. It was found that adding MEA to mitochondria results in acceleration of the respiration of these organelles, followed by its slowing down. According to the pattern of the polarographic curves, MEA action is similar to the action of adenosine diphosphoric acid (ADP) on mitochondria. After addition of MEA during ADP phosphorylation, an increase in ADP phosphorylation time and a decrease in ATP synthesis were observed. M.M.

A71-18985 Kinetic investigations on the influence of radiosensitizing vitamin K3 on the haemoglobin-methaemoglobin equilibrium. Al. Cristea, R. Olinescu, E. Thomas, and Cl. Nicolaus (Academia Română, Institutul de Inframicrobiologie, Bucarest, Rumania). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 457-465. 22 refs. Research supported by the International Atomic Energy Agency.

Investigation of the effect of the radiosensitizing vitamin K3 on the redox equilibria in the red cell, conducted in an attempt to establish a representative mathematical model for these processes. The processes, reduced to a complex interaction of the different redox systems, are described by a kinetic scheme containing the main reactions. The indirect mechanism of action of the radiosensitizer is discussed. O.H.

A71-18986 Cardiovascular, biochemical, and haematological changes after the application of AET. Z. Dienstbier, M. Arient, J. Pospíšil, and K. Kouřílek (Karlova Universita; Central Military Hospital, Prague, Czechoslovakia). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 467-470.

Cardiovascular changes, the concentration of blood transaminases, bone marrow, and peripheral blood pictures were studied after the application of AET and irradiation in dogs and rats. It was found that the radioprotective effect of AET is caused to a great extent by the metabolic inhibition conditioned by toxic effects of this compound. (Author)

A71-18987 The prevention by cysteine of fatty liver induced by CCl4 and ethionine. Cesare Agostini and Paola Comi (Milano, Università, Milan, Italy). In: Radiation, protection and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 471-475. 22 refs.

Study of the feasibility of modifying fatty liver induced by CCl4 and ethionine by the administration of cysteine. The formation of substances capable of reacting with thiobarbituric acid (TBAS) by liver and kidney homogenates taken from rats treated with CCl4, ethionine, and cysteine was also examined. It is found that cysteine administration protects against fatty liver produced either by CCl4 or ethionine, and that cysteine does not act by an inhibition of TBAS formation in preventing fatty liver. O.H.

A71-18988 Disorientation response of chicks which survived 2-beta-aminoethylisothiouronium-Br-HBr (AET) administration during early embryogenesis. Walter Morgan (South Dakota State University, Brookings, S. Dak.), J. R. Maisin, M. Callebaut, and G. Mattelin (Centre d'Etude de l'Energie Nucléaire, Brussels, Belgium). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 477-481. 7 refs.

Experimental investigation of the circumstances leading to and the incidence of a disorientation response observed in some chicks hatched from eggs injected with radioprotective chemicals after incubation. Tests were carried out to assess tolerance levels of five different radioprotectors for chick embryos at ages ranging from four to eight days. Only in one group of survived chicks, those from embryos treated at seven days of age with AET, a disorientation syndrome was observed. The effects of AET on the central nervous system are discussed. O.H.

A71-18989 Clinical studies of intra-arterial infusion of 5-bromodeoxyuridine plus 5-fluorouracil and radiation. Yoshimasa Tanaka and Masaji Takahashi (Tenri Hospital, Tenri, Nara, Japan). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 485-489. 7 refs.

Study of the feasibility of increasing the relative incorporation of halogenated pyrimidines into the tumor DNA compared with the normal tissue DNA, and of applying them to patients with advanced untreated tumors of the head and neck. IUDR-I-125 (5-iododeoxyuridine-I-125), BUDR (5-bromo-2'-deoxyuridine), 5-FU (5-fluorouracil), and PE (Polycation), infused intra-arterially, were used as radiosensitizing agents improving the effectiveness of radiation therapy of tumor cells. The results are discussed and summarized. O.H.

A71-18990 **Bromouridine (BUdR) as a radiosensitizing agent of malignant brain tumours.** Takao Hoshino (California, University, San Francisco, Calif.), Masakatsu Nagai, Fumiaki Sato, Keiji Sano, and Tsutomu Watari (Tokyo, University, Tokyo, Japan). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 491-497. 22 refs. Research supported by the Japanese Ministry of Welfare and the H. C. Naffziger Surgical Guggenhime Fund.

Study of the application of bromouridine (BUdR) as a radiosensitizing agent improving the effectiveness of radiation therapy of tumor cells to the treatment of malignant brain tumors. A regimen of BUdR-antimetabolite-continuous intra-arterial infusion-radiation therapy, termed BAR, has been established and applied to patients with malignant brain tumors since 1965. The results of the therapeutical treatment are discussed. O.H.

A71-18991 **Studies on restorative effect of taurine in radiation injury and its clinical application.** Mitsuyuki Abe and Masasi Fukuda (Kyoto University, Kyoto, Japan). In: Radiation, protection, and sensitization; Proceedings of the Second International Symposium on Radiosensitizing and Radioprotective Drugs, Rome, Italy, May 6-8, 1969. (A71-18926 07-04) Symposium sponsored by the European Society for Biochemical Pharmacology and the Comitato Nazionale per l'Energia Nucleare. Edited by Harold Moroson and Marcello Quintiliani. London, Taylor and Francis, Ltd., 1970, p. 503-509. 6 refs.

Clinical demonstration of the existence of a significant increase in urinary taurine excretion in patients showing marked leucopenia induced by radiotherapy, and of the absence of such taurinuria in patients whose leucopenia was not significant. Three g per day of taurine was given orally to patients beginning on the day when the leucocyte count was depressed below 4000 cells per cu mm. The leucocyte count increased soon after the administration of taurine and reached a maximum value about two weeks later. No further decrease in leucocytes was observed, although radiotherapy was continued with no change of dose. The effectiveness of taurine on leucopenia induced by radiotherapy was demonstrated clinically in a statistically controlled study. M.M.

A71-19000 # **Acute inhalation toxicity of monomethylhydrazine vapor.** C. C. Haun, J. D. MacEwen, E. H. Vernot, and G. F. Eagan (SysteMed Corp., Dayton, Ohio). *American Industrial Hygiene Association Journal,* vol. 31, Nov.-Dec. 1970, p. 667-677. 15 refs. Contract No. AF 33(615)-70-C-1046.

Rats, mice, beagle dogs, squirrel monkeys, and rhesus monkeys were exposed to various measured concentrations of monomethylhydrazine (MMH) vapor for specified time periods. Rodents were exposed for 30-, 60-, 120-, and 240-minute periods; dogs and squirrel monkeys, for 15, 30 and 60 minutes; and rhesus monkeys for 60 minutes only. The toxicity of MMH for the five animal species was defined by determinations of LC(50) values, pathology, observations of responses, measurements of body weight in rats and mice, and blood chemistry and hematology tests on dogs and rhesus monkeys. Squirrel monkeys proved to be the most sensitive and rats the least sensitive to the lethal effects of MMH. MMH exposure produced definite but transient, hemolytic changes in dogs and, to a lesser extent, in rhesus monkeys. These experiments show MMH to be a highly toxic compound. (Author)

A71-19089 * # **Role of the scientist-astronaut.** Owen K. Garriott (NASA, Manned Spacecraft Center, Houston, Tex.). *(Society of Experimental Test Pilots, Symposium, 14th, Beverly Hills, Calif., Sept. 24-26, 1970.) Society of Experimental Test Pilots, Technical Review,* vol. 10, no. 2, 1970, p. 157-161.

Description of the work assigned to scientist-astronauts, with illustrations of its value to the manned space flight program. Scientist-astronauts have filled almost all posts, including support crew and backup crew assignments. They have acted as principal investigator or coinvestigator on various scientific and medical experiments to be performed on Skylab missions. F.R.L.

A71-19281 # **Formation of acetylcholine in the myocardium and its participation in the suppression of automatic activity of the heart ventricles by high-frequency excitations (Ob obrazovanii atsetilkholina v miokarde i ego uchastii v podavlenii avtomaticheskoi aktivnosti zheludochkov serdtsa vysokoi chastotoi vozbuzhdenii).** E. B. Babskii and S. K. Saidkarimov (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 195, Nov. 21, 1970, p. 746-749. 14 refs. In Russian.

Study of the possible role of acetylcholine forming endogenically in the myocardium of rabbits on the suppression of the automatism of the rhythm guides of the ventricles by high-frequency excitation. It is shown that externally applied 'pharmacological' acetylcholine slows down the frequency of excitation of the ventricles and lengthens the period of the poststimulation asystole, thus intensifying the suppression of the automatism of the ventricle rhythm guides. In a series of tests in which the heart was perfused by eserine solutions it is found that eserine, like acetylcholine, also slows down the frequency of the excitations generated by the rhythm guides of the ventricles and lengthens the preautomatic pause after cessation of frequent electrical stimulation. This action of eserine is attributed to an accumulation of acetylcholine forming in the myocardium. A.B.K.

A71-19282 # **Seasonal changes in the corticosterone level in the blood of animals kept in groups and in isolation (Sezonnye izmeneniia urovnia kortikosterona v krovi pri gruppovom i izolirovannom soderzhanii zhivotnykh).** E. V. Naumenko and A. G. Starygin (Akademiia Nauk SSSR, Institut Fiziologii, Novosibirsk, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 195, Nov. 21, 1970, p. 750-752. 13 refs. In Russian.

Study of the effect of seasonal factors on the functioning of the adrenal cortex in white rats kept in groups and in isolation. The functioning of the hypophysis-adrenal system was evaluated from the corticosterone content in the peripheral blood as determined fluorometrically. Over a period of a year pronounced seasonal changes in the corticosterone content in the blood were noted both in rats kept in groups and in rats kept in isolation. However, the hypophysis-adrenal system is found to react differently to one and the same complex of seasonal factors, depending on whether the rats were living in groups or in isolation. A.B.K.

A71-19456 # **Quantitative modelling of human performance in information systems.** J. D. Baker (Behavior and Systems Research Laboratory, Arlington, Va.). *(International Congress on Ergonomics, 4th, Strasbourg, France, July 6-10, 1970.) Ergonomics,* vol. 13, Nov. 1970, p. 645-664. 28 refs.

This paper summarizes an approach toward developing a general information system model which focuses on man and considers the computer only as a tool. The ultimate objective is to produce a simulator which will yield measures of system performance under different mixes of equipment, personnel and procedures. In structuring the framework for this model, the assumption was made that men have five basic and critical operations to perform in an information system: screen, transform, input, assimilate and decide. These operations, or functional areas, are interrelated along three dimensions: (1) a data flow and processing dimension; (2) a task analysis dimension for each event in the data flow sequence; and (3)

a source of variation dimension, such as level of training. The model approach described has several major points of payoff. Among the immediate benefits is the potential for using the model to quantify human performance by employing system measures and the value of the model as a tested, usable tool for developing test and evaluation plans which will provide human factors data as part of the information system design verification checkout. (Author)

A71-19457 A comparison of work capacity measured by graded step-test and on a bicycle ergometer. O. Škranc, V. Havel, and K. Barták (Karlova Universita, Hradec Králové, Czechoslovakia). *Ergonomics,* vol. 13, Nov. 1970, p. 675-683. 22 refs.

Examination of 18 males by graded load in the step-test and on the bicycle ergometer showed the following. Both tasks carried on to exhaustion gave practically the same heart rate values, the performance and oxygen intake being different. The maximum oxygen intake in the step-test was on an average 0.33 l/min (11 percent) lower than that on the ergometer. The differences were more pronounced and statistically significant in the younger subjects tested. The same applied, to a greater extent, to the values of the maximum output of carbon dioxide. The logarithms of values of oxygen intake or heart rate at different grades of load using both tests are linearly related to the logarithms of the corresponding values of lactic acid. The correlation coefficients for these relations are statistically highly significant. (Author)

A71-19458 Subjective and electromyographic assessment of isometric muscle contractions. A. J. Lloyd (U.S. Army, Medical Research Laboratory, Fort Knox, Ky.), J. H. Voor, and T. J. Thieman (Bellarmine College, Louisville, Ky.). *Ergonomics,* vol. 13, Nov. 1970, p. 685-691. 9 refs. Grant No. DA-DA-17-68-C-8042.

Forty male subjects were asked to pull either 25 per cent or 50 per cent of their maximal voluntary contraction on an isometric dynamometer handle. During the pull they were asked to rate the pain experienced in the muscles on a five-point scale. During the task the active muscle was continuously monitored by recording the EMG. The results indicated that individuals are able to predict their maximal endurance when concentrating on a dominant stimulus of pressure and/or pain in a physical task. The EMG analyses indicated that a differentiation can be made between physiological and psychological aspects of fatigue. The point in time when the EMG significantly increased in amplitude is interpreted to be the time when, due to motor unit impairment, the active muscle is fatigued. Additional contraction time was proposed to result from increased cortical recruitment, the length of which was determined by motivational elements. (Author)

A71-19459 Performance changes during the sustained operation of a complex psychomotor task. V. S. Ellingstad and N. W. Heimstra (South Dakota, University, Vermillion, S. Dak.). *Ergonomics,* vol. 13, Nov. 1970, p. 693-705. 14 refs. Research supported by the South Dakota Highway Department and the U.S. Bureau of Public Roads.

Fifteen male subjects were exposed to a primary tracking task and a variety of subsidiary tasks for a total of 15 hr. Tracking performance was assessed through the use of two error measures, amount of time off the target track, and number of times off target. In addition, three physiological measures were obtained. A significant decrement in tracking performance was obtained for both measures used. This decrement was not particularly abrupt in its occurrence but rather took place cumulatively over the entire course of the experiment. There was no clearly established performance decrement on the subsidiary tasks used in the investigation. A marked variability in performance over the course of the experimental session was characteristic of performance on these tasks. Performance on the vigilance task and one of the reaction time tasks improved during the 15-hr test session. M.M.

A71-19460 Structured and blank backgrounds in a pursuit tracking task. M. Hammerton and A. H. Tickner (Medical Research Council, Applied Psychology Unit, Cambridge, England). *Ergonomics,* vol. 13, Nov. 1970, p. 719-722.

An account is presented of an experiment in which subjects moved a sighting device so as to keep a graticule on a moving target. Both realistic and blank backgrounds for the target were used; and subject performances in the two conditions were compared. It was found that the blank and structured backgrounds were subjectively apprehended by subjects as providing entirely different types of control problem. Performance was inferior with a blank background; and it is suggested that training simulators for this type of control should always feature as realistic a background as possible. (Author)

A71-19461 The effect of temporary obscuration of the target on a pursuit tracking task. M. Hammerton and A. H. Tickner (Medical Research Council, Applied Psychology Unit, Cambridge, England). *Ergonomics,* vol. 13, Nov. 1970, p. 723-725.

An account is presented of an experiment in which subjects performed a continuous tracking task with the moving target temporarily obscured during part of its course. It was concluded that (1) subject's pursuit is very poor during the obscured interval; but (2) recovery of the target is very rapid thereafter. These conclusions held with both positional and velocity control systems. (Author)

A71-19462 Repeated errors in motor learning. D. H. Holding (Louisville, University, Louisville, Ky.). *Ergonomics,* vol. 13, Nov. 1970, p. 727-734. 8 refs.

Analysis was made of the error records of three groups of Ss carrying out two blocks of practice with the discrimination reaction timer. During the first block, an attempt was made to vary Ss 'commitment' to wrong responses by modelling the practice of the second group, and the observation of the third group, upon the responses of the control group. It was shown that, during the course of learning, Ss tend increasingly to repeat specific errors. Some support was found for the hypothesis that Ss learn the errors which they commit, although the contribution of early errors to the distribution of later errors was small and must be considered largely nonspecific. The method used to vary the degree of commitment had little effect. (Author)

A71-19463 The effect of mixed visual contrast schedules on detection times for both free and horizontally structured visual search. A. D. Lovie and P. Lovie (Liverpool, University, Liverpool, England). *Ergonomics,* vol. 13, Nov. 1970, p. 735-741.

Description of an experiment in which the detection times of human subjects were compared for free and systematic visual search for a small target. The systematic search pattern consisted of a horizontal zig-zag between pairs of lines drawn on the visual field. Two different levels of target contrast were employed. Groups of four subjects were presented with one of three mixed stimulus schedules containing different percentages of high and low contrast targets, each subject being tested on both free and systematic visual search for that schedule. It was found that high contrast targets showed an increased detection time for all schedules with the systematic search. The results were interpreted in terms of the interaction of the relative amount of 'contrast-uncertainty' contained by each schedule, with the condition of the visual field. M.M.

A71-19464 On the question of the susceptibility of the target aiming function (TAF) to a vegetative imbalance produced by experimental kinetosis (Zur Frage der Beeinflussbarkeit der 'Target Aiming Function' /TAF/ durch eine mittels experimenteller Kinetose ausgelöste vegetative imbalance). K. Saito, A. Haidenthaler, and W. Auerswald (Wien, Universität, Vienna, Austria). *Ergonomics,* vol. 13, Nov. 1970, p. 743-748. 8 refs. In German.

The performance of ten healthy male subjects in the target aiming function test (Takakuwa's TAF-test) was investigated after kinetosis had been experimentally induced in the subjects. The kinetosis caused a significant alteration of the vegetative equilibrium as indicated by the cold pressure test. However, the results obtained in the TAF-test were found to remain unchanged by these effects of the kinetosis. These findings show that the TAF-test, which is otherwise responsive to various forms of stress, is not affected by the exposure of the organism to stresses which cause a chiefly vagotonic vegetative imbalance. G.R.

A71-19465 Pilot response in flight and simulated flight. J. M. Rolfe, A. M. Hammerton-Fraser, R. F. Poulter, and E. M. B. Smith (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Ergonomics,* vol. 13, Nov. 1970, p. 761-768. 12 refs.

This paper describes an experiment in which an attempt was made to assess the value of two types of response, control activity and physiological activity, as indications of the effect on simulator fidelity of adding pitch motion cues. The investigation used a general-purpose research simulator and a two-seater Hunter T7 aircraft. The responses of nine experienced pilots were compared when, flying on instruments, they undertook the same flight plan under three different conditions, namely: flight in the Hunter T7 aircraft; simulated flight in the simulator with pitch motion present; simulated flight in the same simulator without motion. (Author)

A71-19466 A comparison of work-load using physiological and time study assessments. B. Moores (Manchester, University, Manchester, England). *Ergonomics,* vol. 13, Nov. 1970, p. 769-776. 27 refs.

There are currently two groups of individuals studying assessment of work-load. Thousands of work study officers are performing this task, generally as a basis for payment purposes, using techniques relatively unchanged for 40 years. Work physiologists are also concerned with examining the same problem with a different set of motives and methods. An attempt is made here to compare the two assessments on four arduous operations. The physiological evaluations were those of energy expenditure, while the work study officers' assessment was achieved by showing films of the operations to 105 practising observers throughout the country. The two final sets of values disagree alarmingly. Naturally, the work physiologist feels the work study officer is expecting too much, while he, in turn, before contemplating changing his methods, requires more justification for the physiological norms. (Author)

A71-19514 Relevant cue placement effects in concept identification tasks. Harry Rollings, Barbara Bethel, and Kenneth Deffenbacher (Nebraska, University, Omaha, Neb.). *Journal of Experimental Psychology,* vol. 87, Jan. 1971, p. 9-12. 5 refs.

Description of two experiments employing an enforced verbal encoding procedure, carried out to determine whether there were relevant cue placement effects on performance in two simple concept identification (CI) tasks. In the first experiment, a single-cue CI task, the serial position of the relevant cue in the encoding order and the encoding method were varied. The second experiment, a redundant relevant cue (RRC) CI task, varied the degree of RCC separation in the encoding order and method of encoding. The experimental results are evaluated. O.H.

A71-19515 Orienting response and apparent movement toward or away from the observer. Alvin S. Bernstein, Kenneth Taylor, Burton G. Austen, Martin Nathanson, and Anthony Scarpelli (New York, State University, New York, N.Y.). *Journal of Experimental Psychology,* vol. 87, Jan. 1971, p. 37-45. 16 refs. NIH Grant No. R 01-MH-15633.

Reexamination of Bernstein's (1968) hypothesis suggesting that the orienting response (OR) displays heightened reactivity in the galvanic skin response component to the onset of apparent movement in the visual field. The OR to stimuli that appeared to move toward and away from the observer was examined, while the effect of movement itself was explored in this plane, and the effect of the changes in pattern density that occur as part of such apparent movement was also investigated. Both the galvanic skin response and the finger pulse volume changes were studied to provide a broader basis for generalizing about the OR. O.H.

A71-19516 Figural change in apparent motion. Paul A. Kolers and James R. Pomerantz (Bell Telephone Laboratories, Inc., Holmdel, N.J.). *Journal of Experimental Psychology,* vol. 87, Jan. 1971, p. 99-108. 15 refs.

Experimental investigation of the effects of similar and disparate shape upon apparent motion, carried out to study the way subjects resolve a figural change. Three experiments were conducted which reveal, in addition to the motion percept itself, two distinctive resolving capabilities that the visual system uses. One is a plastic deformation of shape, the other is a rotation of a rigid shape in depth. The stimulus conditions for the two results differ. O.H.

A71-19521 Dormancy and survival; Society for Experimental Biology, Symposium, 23rd, University of East Anglia, Norwich, England, September 2-6, 1968, Proceedings. Edited by H. W. Woolhouse. New York, Academic Press, Inc. (Society for Experimental Biology, Symposia No. 23), 1969. 613 p. $15.

Mechanisms of survival in microorganisms and in many different groups of higher organisms under extreme conditions of temperature are described. Dormancy as an adaptive strategy, the dormancy and germination of fungus spores, and survival of algae under adverse conditions are treated, together with seed dormancy and oxidation processes, light-controlled germination of seeds, and some mechanisms of mammalian tolerance to low body temperature. Other topics considered include the growth and survival of plants at extremes of temperature, the dormancy and survival of plants in the humid tropics, hyperresponsiveness in hibernation, and interrelations of reproduction and hibernation in mammals. Author and subject indexes are included.

Individual items are abstracted in this issue. M.M.

A71-19522 Survival of algae under adverse conditions. G. E. Fogg (Westfield College, London, England). In: Dormancy and survival; Society for Experimental Biology, Symposium, 23rd, University of East Anglia, Norwich, England, September 2-6, 1968, Proceedings. (A71-19521 07-04) Edited by H. W. Woolhouse. New York, Academic Press, Inc. (Society for Experimental Biology, Symposia No. 23), 1969, p. 123-142. 70 refs.

Discussion of the physiological aspects of the resistance of algae to adverse conditions. The topics treated include survival and growth of algae at low and high temperatures, survival of desiccation, and halophilism. Comments are made on the role of akinetes, zygospores and other resting spores in the survival of adverse conditions by algae. M.M.

A71-19523 Some mechanisms of mammalian tolerance to low body temperatures. R. K. Andjus (Beograd, Univerzitet, Belgrade, Yugoslavia). In: Dormancy and survival; Society for Experimental Biology, Symposium, 23rd, University of East Anglia, Norwich, England, September 2-6, 1968, Proceedings. (A71-19521 07-04) Edited by H. W. Woolhouse. New York, Academic Press, Inc. (Society for Experimental Biology, Symposia No. 23), 1969, p. 351-394. 59 refs.

Definition of the physiological basis of tolerance to low body temperature in mammals. The approach used is that of considering separately: (1) limits compatible with spontaneous or unassisted recovery, and (2) limits concerning assisted recovery, including revival by specific reanimation or resuscitation procedures. Induced tolerance to extreme hypothermia and revival from subzero temperatures are also discussed. M.M.

A71-19524 Hyperresponsiveness in hibernation. C. P. Lyman and R. C. O'Brien (Harvard University, Cambridge, Mass.). In: Dormancy and survival; Society for Experimental Biology, Symposium, 23rd, University of East Anglia, Norwich, England, September 2-6, 1968, Proceedings. (A71-19521 07-04) Edited by H. W. Woolhouse. New York, Academic Press, Inc. (Society for Experimental Biology, Symposia No. 23), 1969, p. 489-509. 40 refs. PHS Grants No. GM-05611; No. GM-05197; Contract No. AF 41(609)-67-C-0052.

Discussion of experimental evidence to show that the responsiveness of animals in hibernation can be actually augmented by cold. It is pointed out that, if the hyperresponsiveness which Koizumi et al. (1959) observed as temperatures were lowered to about 20 C continues to augment in the hibernator down to 0 C, then the animal in hibernation has a built-in alarm system which becomes more responsive as the temperature decreases. This increase in responsiveness may well compensate for the loss of sensitivity so that the animal is able to maintain a steady state in hibernation, even if its body temperature approaches the freezing point. M.M.

A71-19525 Principles and further problems in the study of dormancy and survival. Laurence Irving (Alaska, University, College, Alaska). In: Dormancy and survival; Society for Experimental Biology, Symposium, 23rd, University of East Anglia, Norwich, England, September 2-6, 1968, Proceedings. (A71-19521 07-04) Edited by H. W. Woolhouse. New York, Academic Press, Inc. (Society for Experimental Biology, Symposia No. 23), 1969, p. 551-564. 11 refs. NIH Grant No. GM-10402.

Discussion of evidence for activity within the cold winter tissues of some animals in their natural environment in Alaska. Examples are presented to show that the dormant animal can count the passage of time, is sensitive to change within and without, remembers its specific character or heredity and its progress in life, and, as an individual, anticipates the seasonal changes in its locality. M.M.

A71-19584 * Simulation in the analysis and control of a cardio-circulatory assist device. D. A. Spyker (Honeywell, Inc., Systems and Research Div., St. Paul, Minn.). *Simulation*, vol. 15, Nov. 1970, p. 196-205. 18 refs. Research supported by the University of Minnesota; U.S. Department of Health, Education and Welfare Grant No. 5 T01-HE-5700-03; Grants No. AF AFOSR 63-1502; No. NGR-24-005-063.

Description of a hybrid computer simulation approach to the analysis and synthesis of controllers for a left ventricular bypass, pneumatic drive system, and experimental animal. A cardiovascular model was evaluated and accepted, and a model of the Baylor left ventricular bypass device and Statham controller was developed and accepted on the basis of in vitro operation. The sensitivity of the cardiac output, combined output, time tension index, and flow work to the control parameters (delay and duration) for both left atrium-to-aorta and left ventrical-to-aorta configurations were evaluated. Optimum delay and duration were then found for ranges of heart rate and peripheral resistance for various cost-functional weightings. The formulation of a more general optimal problem for control of the left atrium and outlet connection to the aorta appears promising. O.H.

A71-19585 * Computer simulation of human temperature control. Henry J. Winton (Santa Clara, University, Santa Clara, Calif.) and Robert N. Linebarger (NASA, Ames Research Center, Biomedical Research Branch, Moffett Field, Calif.). *Simulation*, vol. 15, Nov. 1970, p. 213-221. 21 refs. Grant No. NGR-05-017-020.

A feedback control system model of human temperature regulation is developed. Body thermal properties are represented by an electrical circuit analog. The sudomotor, vasomotor, and metabolic parameters in this circuit are made to be nonlinear functions of an error signal derived from hypothalamic and cutaneous thermoreceptors. The system state equations are derived and a digital simulation of the model using System 360/CSMP is discussed. An analog simulation of the same problem is also given, along with an evaluation of the advantages and disadvantages of each approach. Comparison of static and dynamic responses of the model with published data from physiological experiments shows reasonable agreement over a broad spectrum of conditions, including exposure to heat and cold, humidity, ice ingestion, and exercise. (Author)

A71-19594 * Effect of thyroxine on the cell generation cycle parameters of cultured human cells. H. John Burki and C. A. Tobias (California, University, Berkeley, Calif.). *Experimental Cell Research*, vol. 60, June 1970, p. 445-448. 17 refs. NASA Contract No. W 12-792.

A heteroploid cell line of human kidney cells was grown with or without the hormone 1-thyroxine. When the cells were in exponential growth, the cell generation cycle characteristics were determined in control and hormone-treated populations. The life cycle of the cells was reduced from 27 to 20 hr when hormone was present, while the dead cell fraction remained the same. The shortening of the life cycle is due to a reduced time in the pre-DNA replication period (G1). The time to complete other stages of the life cycle appears to be virtually unchanged. (Author)

A71-19595 * A three-element model for binary prediction. Raymond E. Hartley (Memphis State University, Memphis, Tenn.) and Carl D. Williams (Miami, University, Coral Gables, Fla.). *Psychological Reports*, vol. 26, 1970, p. 327-335. 8 refs. NSF Grant No. GU-728; Grant No. NGR-10-007-010.

Six hundred subjects received one of four 100-trial, 2-alternative, 50%-event sequences. A model incorporating logical, experiential, and error components provided a better description of choice behavior on these four event schedules than an alternative model. The data suggest that each element of the model presented in this paper plays an important role in choice behavior. (Author)

A71-19600 * Evaluation of a quantal response model with estimated concentrations. Richard G. Cornell (Florida State University, Tallahassee, Fla.) and Norman J. Petersen (National Communicable Disease Center). *Biometrics*, vol. 26, Dec. 1970, p. 713-722. Grant No. NGR-10-004-029.

A quantal response model used in the analysis of an experiment performed by Petersen et al. (1969) is evaluated. The purpose of the experiment was to relate the probability of exposing one or more viable microorganisms, as a result of fracturing a contaminated solid, to the concentration of microorganisms within the solid and to the fractured surface area exposed. In the initial analysis, a maximum likelihood estimate of the only parameter involved was computed using observed proportions of fractured plastic disks showing growth of bacterial spores and corresponding experimentally determined concentrations assumed to be measured without error. When the model was evaluated using calculated parameter estimates, it was found that it did not describe the data properly. An estimation procedure is developed for the true concentrations which utilizes

both observed proportions and concentrations. The fit of the model is considerably improved, and the conclusion is that the model is appropriate. V.P.

A71-19607 * The use of permanent magnets in zero-gravity mobility and restraint footwear concept. Arthur A. Rosener and Arnold W. Hanger (Martin Marietta Corp., Denver, Colo.). *(Institute of Electrical and Electronics Engineers, INTERMAG Conference, Washington, D.C., Apr. 21-24, 1970, Paper 2.2.) IEEE Transactions on Magnetics,* vol. MAG-6, Sept. 1970, p. 464-467. 6 refs. Contract No. NAS 9-9336.

Four prototype shufflers - i.e., foot wear using permanent magnets for providing restraint and mobility in spacecraft under zero gravity - were fabricated out of noncompatible materials and tested in a simulated zero-gravity environment by neutral buoyancy and a six-degree-of-freedom simulator. The evaluation of these prototypes led to the final design which includes a closed-toe configuration and a floating front magnet. The test results indicated that the analytical assumptions were correct and the shuffler concept was not only workable but practical as well. The front magnet of each shuffler will float or remain flexible with respect to orientation, and will be removable to allow replacement of the 10-mil low coefficient of friction Teflon covering when necessary. The rear magnet is large enough to align itself so that it will be rigidly attached and covered with a high coefficient of friction material called Viton, which is 1/64-in. thick. The magnets are attached to the insole. The bonding of the sole and insole gives a flexible sole assembly. M.V.E.

A71-19626 Heart rate studies - An automatic data acquisition and management system. Lowell Adams, Roger E. Wetmore (California, University, San Francisco, Calif.), and Robert L. Limes (U.S. Naval Postgraduate School, Monterey, Calif.). *Telemetry Journal,* vol. 6, Dec.-Jan. 1971, p. 15-17. PHS Grant No. GM-11993.

Description of a first-generation prototype of a data system requiring no manual effort from collection of heartbeat information from California ground squirrels to computer printout of results. The system, now operative in the laboratory at short ranges, is being extended to incorporate multiple sensors covering any number of ecological-physiological factors. Instrumentation is moderately priced and is especially oriented toward use in the field. F.R.L.

A71-19636 Fourier analysis of left ventricular performance - Evaluation of impedance matching. Francis L. Abel (Indiana University, Indianapolis, Ind.; Southern California, University, Los Angeles, Calif.). *Circulation Research,* vol. 28, Feb. 1971, p. 119-135. 23 refs. PHS Grants No. H-6308; No. HE-10659; No. GM-16437; NIH Grant No. FR-00162.

Fourier analysis has been applied to simultaneously obtained ventricular pressure, ascending aortic pressure, and aortic flow in the closed- and open-chest dog and during infusion with isoproterenol, norepinephrine, and phenylephrine. Partial measurements were also obtained from a sheep and a primate. Impedance moduli and phases were calculated from the ventricular (forcing) and aortic (input) side of the aortic valve and compared. Forcing impedance was similar in form but larger than input impedance, and the phase became positive earlier. Ventricular and aortic powers were calculated and expressed as pressure power, kinetic energy power, and reactive power, along with their harmonic distributions. Mean pressure represented from 80 to 91% of total load power but only from 20 to 51% of total ventricular power. The concept of impedance matching was investigated; maximal efficiency occurred with optimal matching. G.R.

A71-19637 Conduction of the cardiac impulse. I - Delay, block, and one-way block in depressed Purkinje fibers. Paul F. Cranefield (Rockefeller University, New York, N.Y.), Herman O. Klein (Albert Einstein College of Medicine, Bronx, N.Y.), and Brian F. Hoffman (Columbia University, New York, N.Y.). *Circulation Research,* vol. 28, Feb. 1971, p. 199-219. 33 refs. NIH Grant No. HE-11994-02.

Depressed excitability and responsiveness were created in excised bundles of canine Purkinje fibers. A segment 8 mm long was depressed by being encased in agar containing potassium ions, the ends of the bundle outside the agar remaining normal. Either normal end could be excited through extracellular electrodes. Action potentials were recorded by intracellular microelectrodes at each end and within the depressed segment. Conduction velocity within the depressed segment fell as low as 0.05 m/sec. Abnormalities of impulse transmission through the depressed segment included delay, 2:1 block, higher degrees of block, rate-dependent block, and block showing the Wenckebach phenomenon. Asymmetries of conduction seen included one-way block. Action potentials in the depressed segment were of low amplitude and showed slow upstrokes. The results obtained prove that conduction delays great enough to permit reentry can occur in short segments of Purkinje fibers subjected to high potassium ion concentrations. G.R.

A71-19638 Conduction of the cardiac impulse. II - Summation and inhibition. Paul F. Cranefield (Rockefeller University, New York, N.Y.) and Brian F. Hoffman (Columbia University, New York, N.Y.). *Circulation Research,* vol. 28, Feb. 1971, p. 220-233. PHS Grant No. HE-11004.

A segment of a bundle of canine Purkinje fibers was encased in agar made up in Tyrode solution containing elevated K(+) to depress the excitability of the segment. At a degree of depression producing total block of conduction in each direction through the depressed segment, exciting both ends of the bundle yielded full excitatory responses in the center of the depressed area. These responses arose with a long latency after excitation of the normal ends outside the depressed segment. Summation occurred over a long interval of relative timing of excitation of the ends. When excitation of one end alone produced a response in the center of the depressed segment, that response sometimes could be inhibited by stimulating the other end. In another preparation a branch emerged from the center of the depressed segment. It is pointed out that the results obtained are important as part of the explanation of phenomena associated with reentrant arrhythmias. G.R.

A71-19641 Introduction to Pressure Suit Assemblies. *SAE Aerospace Information Report,* AIR 1103, Nov. 16, 1970. 11 p.

Introductory description of the characteristics of Pressure Suit Assemblies (PSAs), supporting subsystems and the interface areas to be resolved in applying them to aeronautical and space systems. The information presented was compiled to provide aerospace system and environmental control system engineers with a ready reference to general information and application guidelines to be considered when designing a vehicle which is expected to expose operators to reduced pressure levels. M.M.

A71-19648 Continuous flow oxygen regulator. *SAE Aerospace Standard,* AS 1197, Nov. 2, 1970. 5 p.

This Aerospace Standard has the purpose of establishing requirements for construction, performance, and testing of continuous-flow oxygen regulators. It covers automatic continuous-flow regulators, adjustable continuous-flow regulators, and pre-set continuous-flow regulators, as well as Class B (cylinder mounted) and Class A (line mounted) regulators. The regulators described are intended to perform as oxygen supply regulators in aircraft supplemental oxygen breathing systems. V.P.

A71-19694 Various approaches to the study of perception; New York Academy of Sciences, Conference on the

Fundamentals of Psychology, 3rd, New York, N.Y., October 13, 14, 1969, Proceedings. *New York Academy of Sciences, Annals,* vol. 169, June 23, 1970. 144 p.

A general model is developed for sequential blanking, displacement, and overprinting phenomena to facilitate visual information processing with sequential inputs. The evolution of the Gestalt theory from its inception to the year 1969 is described. The role of perception in identifying psychopathological syndromes is assessed. The relation between perception and thought is investigated, and mechanisms of perceptual functioning in schizophrenia are demonstrated.

Individual items are abstracted in this issue. A.B.K.

A71-19695 Visual information processing with sequential inputs - A general model for sequential blanking, displacement, and overprinting phenomena. M. S. Mayzner (New York University, New York, N.Y.) and M. E. Tresselt. *(New York Academy of Sciences, Conference on the Fundamentals of Psychology, 3rd, New York, N.Y., Oct. 13, 14, 1969.) New York Academy of Sciences, Annals,* vol. 169, June 23, 1970, p. 599-618. 37 refs. NSF Grant No. GB-8037.

The paper is directed primarily toward three perceptual phenomena in the area of visual perception that exhibit marked space-time interactions and the associated input-output mismatches that occur with such interaction. These phenomena are 'sequential blanking,' 'sequential displacement,' and 'overprinting' phenomena. The hardware system used for the study of space-time interactions in the visual system is described. An account of the research terminology and strategy used is given. A general model of visual information processing designed to conceptualize the phenomena considered within a single theoretical framework is developed. G.R.

A71-19696 The perception of Gestalt - 1969. Harry Helson (Massachusetts, University, Amherst, Mass.). *(New York Academy of Sciences, Conference on the Fundamentals of Psychology, 3rd, New York, N.Y., Oct. 13, 14, 1969.) New York Academy of Sciences, Annals,* vol. 169, June 23, 1970, p. 654-662; Discussion, p. 662, 663. 19 refs.

Some facets of Gestalt theory are discussed taking into consideration advances that have been made in the treatment and theory of organized wholes in several realms of behavior. Particular attention is given to advances in analyzing and quantifying some Gestalt phenomena in perception, cognition, learning, and judgment. It is pointed out that configurational principles, when applied to perceptual learning, must be modified to include qualitative and organismic factors. The problem of perception as part of the broader problem of cognitive systems is investigated, and the significance of the results obtained in two experiments in which differently colored squares and weights were differently organized is explored. G.R.

A71-19697 Role of perception in identifying psychopathology. Maurice Lorr (Catholic University of America, Washington, D.C.). *(New York Academy of Sciences, Conference on the Fundamentals of Psychology, 3rd, New York, N.Y., Oct. 13, 14, 1969.) New York Academy of Sciences, Annals,* vol. 169, June 23, 1970, p. 697-704; Discussion, p. 704, 705. 23 refs.

Syndromes thus far isolated from behavioral observations are considered. Questions of syndrome identification are investigated giving attention to the fact that a syndrome is basically a statistical concept. Studies utilizing the Inpatient Multidimensional Psychiatric Scale are reported. Minor psychotic syndromes, major psychotic disorders, and neurotic syndromes are considered. G.R.

A71-19698 Studies on hypoxia. VII. S. S. Han, J. H. Kim, and A. R. Burdi (Michigan, University, Ann Arbor, Mich.). *Society for Experimental Biology and Medicine, Proceedings,* vol. 136, Jan. 1971, p. 191-195. 10 refs. NIH Grants No. HD-03147; No. DE-02731.

A radioautographic study was made to determine whether or not a single prenatal exposure of rats to anoxia would cause a prolonged suppression of labeled amino acid incorporation into the developing submandibular gland and pancreas during the neonatal period. The results show a protracted suppression of leucine(H-3) in both organs which supports previous histologic data. It was not determined whether this protracted suppression is due to a prolonged effect on the rate of transcription and translation of secretory products, or due simply to a retardation in the degree of differentiation. T.M.

A71-19700 Absorption metabolism and excretion of toxic substances. John E. Kasik (Iowa, University, Iowa City, Iowa). *(Industrial Medical Association, Annual Meeting, 55th, Chicago, Ill., Apr. 13, 1970.) Journal of Occupational Medicine,* vol. 13, Jan. 1971, p. 8-13. 37 refs.

Review of the most basic mechanisms that are involved in the absorption, metabolism, and excretion of drugs and chemicals in man. It is shown that the absorption surfaces of the body are diverse, but it appears that the same basic principles govern the absorption of toxic materials through all of them. Metabolism and excretion of toxic substances usually involve multiple steps. The liver is the predominant metabolizing agent and after chemical alteration of chemical substances the kidney is the predominant organ of excretion. O.H.

A71-19720 # Man-machine considerations in NAS design and implementation. L. G. Culhane (Mitre Corp., Atlantic City, N.J.). *American Institute of Aeronautics and Astronautics, Integrated Information Systems Conference, Palo Alto, Calif., Feb. 17-19, 1971, Paper 71-246.* 7 p. Members, $1.50; nonmembers, $2.00.

Discussion of the prerequisites to full realization of the benefits to be derived from air traffic control automation for the National Airspace System (NAS). The benefits to be derived include increased controller productivity through reduction of the controller's workload. Unless a satisfactory man-machine interface exists, expected benefits can be negated. At the radar controller's position, two problems had to be solved: (1) complex, awkward and cumbersome input actions, and (2) clutter and overlapping symbology resulting in an illegible display presentation. The combination of techniques applied to the solution of these problems is described. M.V.E.

A71-19775 * Estimation of effective stimuli in probability learning. Carl D. Williams, Richard T. Harrington (Miami, University, Miami, Fla.), Raymond E. Hartley (Memphis State University, Memphis, Tenn.), and James L. Taylor. *American Psychological Association, Annual Convention, 78th, Miami Beach and Bal Harbour, Fla., Sept. 4-8, 1970, Paper.* 2 p. 10 refs. Grant No. NGL-10-007-010.

A procedure for identifying the discriminative stimuli perceived and responded to in a given experiment. Basically, the procedure assesses the strength of association between predicted and observed responses for possible event patterns via a simple parameter-free model. The set of event patterns most highly correlated with the actual performance of the test subjects is taken as the best estimate of the effective stimuli for that event sequence. V.P.

A71-19782 Designs and functions of laser systems for biomedical applications. James Rockwell, Jr. (Cincinnati, University, Cincinnati, Ohio). *(New York Academy of Sciences, Conference on the Laser, 2nd, New York, N.Y., May 2, 3, 1969.) New York*

Academy of Sciences, Annals, vol. 168, Feb. 10, 1970, p. 459-471. 20 refs.

Discussion of some system design criteria and application-stressed parameters of lasers in biomedical use. Covered design criteria include personnel safety, laser flexibility, performance reliability, and adaptability to the medical environment. The application areas reviewed with respect to their laser parameter desiderata are those of ophthalmology, dermatology, surgery, biological and cellular research, and analytical and diagnostic medicine. M.V.E.

A71-19791 A commentary on laser-induced biological effects and protective measures. George M. Wilkening (Bell Telephone Laboratories, Inc., Murray Hill, N.J.). *(New York Academy of Sciences, Conference on the Laser, 2nd, New York, N.Y., May 2, 3, 1969.) New York Academy of Sciences, Annals,* vol. 168, Feb. 10, 1970, p. 621-626. 34 refs.

Discussion of some major requirements for appropriate control of biological laser radiation hazards. Available data on ocular and skin effects of various kinds and levels of laser radiation are briefly mentioned or reviewed, and important areas of still imperfect knowledge are pointed out as urgent objects for early research. The education of people using laser devices is singled out as the most important factor in the control of laser radiation hazards. M.V.E.

A71-19792 The effects of lasers on the eye. Charles J. Campbell and M. Catherine Rittler (Presbyterian Hospital, New York, N.Y.). *(New York Academy of Sciences, Conference on the Laser, 2nd, New York, N.Y., May 2, 3, 1969.) New York Academy of Sciences, Annals,* vol. 168, Feb. 10, 1970, p. 627-633. 13 refs. PHS Grant No. NB-07130.

Several laser devices have been experimentally employed in an extensive study of the biological basis of laser effects on the eye of the chinchilla rabbit. The lesions produced by six different lasers on various ocular structures are described. The threshold values for damage in some of these situations are indicated. Also, the applications of lasers to some clinical ophthalmological problems are discussed. M.V.E.

A71-19837 T-wave abnormalities during hyperventilation and isoproterenol infusion. Leonard Biberman, R. N. Sarma, and Borys Surawicz (Kentucky, University, Lexington, Ky.). *American Heart Journal,* vol. 81, Feb. 1971, p. 166-174. 29 refs. NIH Grant No. HE-07359.

Study of the effects of three types of hyperventilation (HV) on the ECG, arterial blood gases, and plasma electrolyte concentration in twelve patients without heart disease in whom HV produced T-wave abnormalities, and in eleven healthy volunteers. The T-wave abnormalities produced by HV could not be attributed to alkalosis, changes in plasma Na, K, Ca, or Mg concentrations, or changes in heart position. In ten of eleven subjects in whom the T wave became inverted during HV, isoproterenol infusion at a rate of 3 to 6 micrograms per min also produced T-wave inversion. In all subjects the T-wave inversion during HV and isoproterenol infusion was transient, occurred at the onset of tachycardia, and was associated with prolongation of the Q-T sub c interval, attributed to the hysteresis of the Q-T interval. It is postulated that the transient T-wave abnormalities during HV and isoproterenol infusion may be due to asynchronous shortening of repolarization. M.M.

A71-19838 Pulmonary angiography in acute pulmonary embolism - Indications, techniques, and results in 367 patients. James E. Dalen, Harold L. Brooks, Lewis W. Johnson, Steven G. Meister, Murrill M. Szucs, Jr., and Lewis Dexter (Peter Bent Brigham Hospital; Harvard University, Boston, Mass.). *American Heart Journal,* vol. 81, Feb. 1971, p. 175-185. 19 refs. NIH Grants No. 1 R01-HE-12439-01; No. 5 T01-HE-05234-12.

Assessment of 367 angiographic studies of the pulmonary vasculature in man from 1964 to 1970. Using the two diagnostic angiographic criteria of pulmonary embolism consisting of intraluminal filling defects and cutoff arteries, in 247 patients studied because of a clinical diagnosis of acute pulmonary embolism, a definitive diagnosis was established by angiography in 74%. In 9% the diagnosis was probable pulmonary embolism, and in 17% the findings were equivocal for pulmonary embolism. Application of these diagnostic criteria results in minimal false positive angiographic diagnoses. False negative diagnoses may occur if embolism is limited to peripheral branches of the pulmonary vasculature that are not visualized by current angiographic techniques. The primary limitation of this technique is that the results of angiography may be equivocal in patients with underlying heart disease or chronic lung disease. M.M.

A71-19839 Reduction of electrocardiographic beat-to-beat variation through computer wave recognition. K. Ishikawa, C. Batchlor, and H. V. Pipberger (U.S. Veterans Administration Research Center for Cardiovascular Data Processing; Georgetown University, Washington, D.C.). *American Heart Journal,* vol. 81, Feb. 1971, p. 236-241. 8 refs. NIH Grant No. HE-09696.

Investigation of the possibility of reducing the variability in BBV (beat-to-beat variation) and observer variation when precise mathematically defined criteria programmed for a digital computer are applied for determination of onset and end of ECG waves. As compared to visual determination of ECG time intervals, variation of QRS duration, P duration, and Q-T interval were markedly reduced by computer technique, whereas that of P-R interval remained unchanged. Computer wave recognition also significantly reduced BBV in magnitude and direction of spatial instantaneous QRS vectors. M.M.

A71-19840 The primary T wave - A new electrocardiographic waveform. J. A. Abildskov, Mary Jo Burgess, Kay Millar, Roland Wyatt, and Gerhard Baule (Utah, University, Salt Lake City, Utah; Syracuse University, Syracuse, N.Y.). *American Heart Journal,* vol. 81, Feb. 1971, p. 242-249. 11 refs. Research supported by the Utah Heart Association; PHS Grants No. HE-12551; No. HE-12611.

Derivation of an electrocardiographic waveform which is largely dependent on intrinsic properties of ventricular recovery and less dependent on activation order than the recorded T wave. This wave has been designated the primary T wave and was obtained by subtracting the secondary from the recorded T wave. The secondary T wave was defined as the waveform that would follow a given QRS complex if ventricular recovery properties were uniform. Experimental evidence that the primary T wave is largely independent of ventricular activation order has been obtained. M.M.

A71-20017 * Effect of glutaraldehyde fixation on the localization of various oxidative and hydrolytic enzymes in the brain of rhesus monkey, Macaca mulatta. Sohan L. Manocha (Emory University, Atlanta, Ga.). *Histochemical Journal,* vol. 2, 1970, p. 249-260. 32 refs. NIH-supported research; Grant No. NGR-11-001-016.

Histochemical investigations have been made on the localization of certain oxidative and hydrolytic enzymes in the different areas of rhesus monkey brain using unfixed, fresh-frozen tissue and 3% glutaraldehyde-fixed material. After glutaraldehyde fixation, the oxidative enzymes lose most of their activity normally demonstrable in the fresh-frozen section. The hydrolytic enzymes are somewhat resistant to fixation but also lose about half of the enzyme activity

observed after no fixing procedure. The glycogen is better preserved in the glutaraldehyde-fixed material compared to fresh-frozen or even formaldehyde-fixed tissue. The significance of these observations is discussed in relation to glutaraldehyde as a fixative of choice in electron histochemistry. (Author)

A71-20050 * Tissue-typing instrumentation using the fluorochromatic cytotoxicity assay. H. R. Hulett, Anne Coukell, and Walter Bodmer (Stanford University, Stanford, Calif.). *Transplantation*, vol. 10, July 1970, p. 135-137. 7 refs. NIH Grants No. GM-14650; No. CA-046-18111; Grant No. NGR-05-020-004.

Description of a technique for instrumenting the tissue-typing test in the fluorochromatic cytotoxicity assay. The purpose for the instrumenting is that of removing the need for visual counting and permitting more quantitative analysis of the data. In order to compensate for the spontaneous slow leakage of fluorescein from the cells, all cell counts in the treated samples are converted to a percentage of the counts in the control at the same time. The instrumenting technique calls for the development of an automatic sampling device for the rapid sequential analysis of samples from a Falcon microtest plate. M.M.

A71-20101 # Linearized model of edge contrast in vision (Linearizovannaia model' kraevogo kontrasta zreniia). A. G. Murashko and V. Ia. Serdiuchenko (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukrainian SSR). *Problemy Bioniki*, no. 3, 1970, p. 3-15. In Russian.

Description of a linear mathematical model for the human visual information processing function whereby image contours are delineated and emphasized (enhanced in contrast). The validity of the formulated algorithms is evaluated by comparing theoretical reactions of the model and measured human responses to several different input signals commonly used in vision research. The results show that the model is accurate when the changes in the brightness on the visual pattern do not exceed 10%. T.M.

A71-20104 # Influence of irrelevant information on the human memory (Vliianie irrelevantnoi informatsii na zapominanie u cheloveka). P. B. Nevel'skii and I. M. Mel'nik. *Problemy Bioniki*, no. 3, 1970, p. 108-111. In Russian.

Subjects were presented sets of symbols where the useful information was represented by certain specific attributes (e.g., oddness or evenness) and by the sequence of appearance of these attributes. Other attributes of the symbols appeared as irrelevant information. Results show that irrelevant information which has no connection with the purpose of activity has a detrimental effect on the remembrance of useful information. Coded information, where the human operator is presented with only useful information, increases the transfer capacity of the short-term human memory. T.M.

A71-20105 # Cybernetic models of memory (O kiberneticheskikh modeliakh pamiati). B. A. Smirnov. *Problemy Bioniki*, no. 3, 1970, p. 112-115. In Russian.

Description of a method for large-scale simulation of complex human memory processes (cybernetic modeling), as opposed to microsimulation of the elementary functions of artificial neurons and nerve networks (bionic modeling). A formula is derived for calculating the probability of information handling by long-term and short-term memories. The probability of a loss of information is also formulated, and parameters characterizing the action of memory are defined. The proposed model can be used to construct an overall model of human activity associated with the reception, storage, and retrieval of information. T.M.

A71-20106 # Mathematical model of coordinate transformation in the field of vision (Matematicheskaia model' preobrazovaniia koordinat v pole zreniia). Iu. P. Shabanov-Kushnarenko and I. V. Shul'gin. *Problemy Bioniki*, no. 3, 1970, p. 127, 128. In Russian.

Mathematical analysis of certain coordinate transformation problems concerning the conversion of a visual pattern into a visual sensation. It is shown that a coordinate system in a plane perpendicular to the visual axis can be considered undistorted only in the central portion of the visual field. Distortion of the coordinate system occurs at the peripheral areas of the visual field. T.M.

A71-20107 # Analysis of the psychophysiological characteristics of a human operator by simulation of the interdependence of memory and activity. I, II (Analiz psikhofiziologicheskikh osobennostei cheloveka-operatora na osnove modelirovaniia vzaimozavisimosti pamiati i deiatel'nosti. I, II). E. V. Utcusz. *Problemy Bioniki*, no. 3, 1970, p. 129-141. 15 refs. In Russian.

Information retention processes in the human memory are described initially as processes in a dynamic system, permitting the use of such techniques as the transient curve method. It is shown that traditional methods of studying memory and habit in psychology are special cases of considering memory as a dynamic system. The development of the structure and volume of the buffer memory as a function of age is simulated by a multiple-capacity model with a transient time of 4.2 years. In a further section of the study, reflex systems with memory are described as closed cycle plants, and criteria are derived for the trainability of a human operator. The applicability of these statistical criteria for estimating the ability of acquiring habits in a tracking function was studied in experiments where a subject was required to pursue a moving point on an oscilloscope. T.M.

A71-20108 # Simulation of the preliminary information handling processes in the visual analyzer with the aid of a television system (Modelirovanie protsessov pervichnoi obrabotki informatsii v zritel'nom analizatore s pomoshch'iu televizionnoi sistemy). Iu. I. Nefedov, V. G. Chervov, and Iu. P. Bugai. *Problemy Bioniki*, no. 3, 1970, p. 142-148. 6 refs. In Russian.

Simple nerve systems organized according to the principle of receptor fields are simulated by a physical model consisting of a television circuit with controlled focusing of the scanning beams in both the camera and the picture tube. A block diagram of the system is explained, and it is demonstrated that various modes of system operation correspond to receptor fields of different configurations. The possibility of using such systems for automatic image analysis is demonstrated. T.M.

A71-20109 # Mathematical simulation of recognition (O matematicheskom modelirovanii uznavaniia). Iu. P. Shabanov-Kushnarenko, I. V. Shul'gin, and B. K. Lopatchenko. *Problemy Bioniki*, no. 3, 1970, p. 149-152. In Russian.

The human function of recognition is examined in a black-box approach as an information-conversion process based on certain specific algorithms. A theorem is formulated which makes it possible to reduce the problem of deriving a general recognition operator satisfying an empirical law to the simpler problem of deriving at least one special form of the operator satisfying the same law. T.M.

A71-20110 # Principles of optimum information reception in the visual system of man (Printsipy optimal'nogo priema informatsii v zritel'noi sisteme cheloveka). V. K. Kagan and T. Ia. Shteinshnaider. *Problemy Bioniki*, no. 2, 1970, p. 3-12. 8 refs. In Russian.

The quality of the human eye as an information reception system is assessed in the light of the Weber-Fechner and Blodel-Rey laws, in terms of the constancy of the threshold information amount and a minimum continuous signal energy. It is concluded that the human visual analysor uses the most effective information reception principles and information processing algorithms. The characteristics of the human visual analysor as an optimal system are discussed. A classification and a division of complex visual problems into elements are considered to determine why the human visual analysor selects a certain specific algorithm among other alternatives for realization. V.Z.

A71-20111 # **Use of the characteristics of relative spectral sensitivity types in the description of nonlinear systems (O primenenii kharakteristik tipa otnositel'noi spektral'noi chuvstvitel'nosti k opisaniiu nelineinykh sistem).** V. K. Kagan. *Problemy Bioniki,* no. 2, 1970, p. 13-17. In Russian.

Discussion of the applicability of the concept of relative spectral sensitivity (called the amplitude-frequency characteristic in automatics) to the description of the properties of linear systems. Expressions are derived to define various types of relative spectral sensitivity. The possibility of applying this concept to the description of a nonlinear system represented by the visual function is analyzed. Criteria are given to identify nonlinear systems to which this concept can be applied. V.Z.

A71-20112 # **Some generalizations of the mathematical problem of vision (Nekotorye obobshcheniia matematicheskoi modeli zreniia).** G. S. Grushko. *Problemy Bioniki,* no. 2, 1970, p. 31, 32. In Russian.

Analysis of the equation of thermal conductivity of a homogeneous medium which was proposed by Shabanov-Kushnarenko et al. (1966) as a basis for a mathematical model of vision. The properties of this equation are examined when the coefficients contained in the equation are varied. A more general model of vision is proposed by using a generalized modification of this equation as the basis for generalization. V.Z.

A71-20113 # **Redundancy and the working capacity of memory (Izbytochnost' i propusknaia sposobnost' pamiati).** P. B. Nevel'skii and V. L. Flanchik. *Problemy Bioniki,* no. 2, 1970, p. 33-35. In Russian.

Description of experiments in which the memory of 10 students was tested when they were shown matrices of letters arranged with zero redundance and 33% redundance for memorization. The memorizing performance of the students was generally higher in experiments with redundance. It is pointed out that this property of human memory may be beneficial in memory systems designs. V.Z.

A71-20114 # **Generalized model of excitation of nervous and muscular elements (Obobshchennaia model' vozbuzhdeniia v nervnykh i myshechnykh elementakh).** Iu. P. Bugai, V. G. Chervov, and Iu. I. Nefedov. *Problemy Bioniki,* no. 2, 1970, p. 36-48. 7 refs. In Russian.

Development of an electronic analog model describing the above-threshold stimulation of nervous and muscular elements on a background of potential subthreshold stimulation. The relation between above-threshold and subthreshold bioreactions is discussed and is interpreted by the operation and structure of this model. Essential in this model are positive and negative nonlinear feedbacks representing the threshold properties of bioresponses. The model covers transient and steady stimulation processes produced by jumpwise and rhythmic stimuli with adaptation and accommodation of nervous and muscular elements. Possible uses of this model in designing artificial neuronlike structures are considered. V.Z.

A71-20115 # **Simulation of electrotonic variations of excitability by applying subthreshold stimuli (Modelirovanie elektrotonicheskikh izmenenii vozbudimosti pri podporogovykh razdrazhiteliakh).** Iu. P. Bugai and V. G. Chervov. *Problemy Bioniki,* no. 2, 1970, p. 49-58. In Russian.

Mathematical analysis of the excitability of nervous and muscular tissues during rhythmic stimulation of nervous and muscular elements. Electrotonic fluctuations of the excitation threshold for polarizing and depolarizing rectangular pulses are discussed in detail. The authors' mathematical model (1968) for compounding polarization-induced electrotonic fluctuations is used in a study of subthreshold responses of nervous and muscular elements to various stimuli. The Weber law is used in the interpretation of the results. V.Z.

A71-20116 # **Problem of vibratory sensibility of human skin (K voprosu o vibratsionnoi chuvstvitel'nosti kozhi cheloveka).** A. G. Murashko and V. V. Tishchenko. *Problemy Bioniki,* no. 2, 1970, p. 59-61. In Russian.

Consideration of the nature of the vibratory sensibility of the skin as a component of an analysor - i.e., a receptor converting stimuli into nervous processes. Vibratory sensibility is defined as a transient between tactile sensibility and hearing. A mathematical interpretation is given for the functions of the skin. A cybernetic black box is used to develop a basis for a biological model of vibratory sensibility. V.Z.

A71-20117 # **Investigation of the psychophysiological characteristics of an operator (Issledovanie psikhofiziologicheskikh osobennostei operatora).** E. V. Uteush. *Problemy Bioniki,* no. 2, 1970, p. 62-67. 9 refs. In Russian.

Consideration of a human operator as a component of a man-machine system of cybernetics, with the emphasis on human memory. An integral criterion is developed to describe the activity of memory as part of a man-machine system. Mathematical expression is given to operational qualities of individual human operators by using special correlation functions. V.Z.

A71-20118 # **A keyboard structure as a memory model and its role in perception processes (Registrovaia struktura kak model' pamiati i ee rol' v protsessakh vospriiatiia).** E. V. Uteush. *Problemy Bioniki,* no. 2, 1970, p. 68-81. 17 refs. In Russian.

Discussion of possible approaches to electronic simulation of biological memory. Circuits controlled by keyboard sections are used as the electronic framework of a biological memory model which reenacts the reception, storage, and delivery of words by a human memory. The memory model simulates certain physiological control processes and uses sliding sets of keys to represent delay line control processes in biological receptors. V.Z.

A71-20119 # **Technological realization of information processing algorithms in the visual system of man (O tekhnicheskoi realizatsii algoritmov pererabotki informatsii v zritel'noi sisteme cheloveka).** A. G. Murashko. *Problemy Bioniki,* no. 2, 1970, p. 92-101. In Russian.

Discussion of the possibility of technological materialization of a mathematical model realizing information processing by human eye. A model of this type proposed by Shabanov-Kushnarenko is analyzed in terms of its suitability for materialization. Possible circuits for the information processing algorithms of this model are considered. A model design using a circuit with three inputs and twenty digital integrators which contain roughly 150 semiconductor triodes and 200 to 300 diodes is described as realizable. V.Z.

A71-20120 # **Mathematical modeling of the constancy of perception of the size of an object (Matematicheskoe modelirovanie konstantnosti vospriiatiia velichiny ob'ekta).** Ia. Ia. Belik. *Problemy Bioniki,* no. 2, 1970, p. 102-106. In Russian.

Development of optical models of the three mechanisms determining the constancy of perception of the size of an object - namely, models of accommodation, convergence, and retinal image size. A study is made of the dependence of the curvature of the refracting surfaces of the eye, the angle of convergence, and the retinal image on distance, assuming the eye to be an equivalent thick lens. A.B.K.

A71-20121 # **Mathematical simulation of functional systems estimating distances by visual observations of the size, gradient and velocity of landmarks (Matematicheskoe modelirovanie funktsional'nykh sistem otsenki udalennosti po vidimoi velichine orientira, ee gradientu i vidimoi skorosti).** Ia. Ia. Belik. *Problemy Bioniki,* no. 2, 1970, p. 107-110. In Russian.

Development of mathematical models for simulation of the activity of functional systems responsible for the visual distance perception capacity of man from observations of ground reference features during a vertical flight. Expressions are given for estimating a distance from apparent changes in the size and positions of ground reference points. The distance-dependent gradients of linear and two-dimensional reference objects are also considered as a basis for distance estimations by visual observations. V.Z.

A71-20122 # **Electronic model of color recognition by the visual organ of man (Elektronnaia model' raspoznavaniia tsvetov organom zreniia cheloveka).** V. P. Pchelinov and E. P. Putiatin. *Problemy Bioniki,* no. 2, 1970, p. 111-116. In Russian.

Description of an electric circuit designed to simulate the activity of the color recognition mechanism of the human eye. Essential in this circuit are a daylight source blinking at a frequency of 50 Hz, a set of 10 photosensors with different spectral frequencies, a block of cathode repeaters, amplifiers with capacitors, and an analog-code converter with a feedback. The circuit performs a series of mathematical transformations resulting in signals which are proportional to the color coordinates of the eye. V.Z.

A71-20123 # **Problem of simulation of edge contrast effects (K voprosu modelirovaniia iavlenii kraevogo kontrasta).** Iu. P. Shabanov-Kushnarenko and V. Ia. Serdiuchenko. *Problemy Bioniki,* no. 2, 1970, p. 117-125. In Russian.

Development of a mathematical model of the visual information processing which produces the edge contrast effects in human eye as functions of the image brightness and the viewing angle coordinates. Expressions are derived to translate into a mathematic language the successive multistep transformation of achromatic visual images into edge contrast effects. A block diagram of the transformation process is also given. A rotating Maxwell disk was used to substantiate the theoretical considerations on which this model is based. V.Z.

A71-20124 # **Some results of an experimental investigation of a model for constructing motor behavior plans (Nekotorye rezul'taty eksperimental'nogo issledovaniia modeli postroeniia planov dvigatel'nogo povedeniia).** L. M. Kasatkina. *Problemy Bioniki,* no. 2, 1970, p. 126-130. In Russian.

Description of a procedure for developing a model for planning the purposeful motor behavior of a system contained in a medium consisting of cells or elements. It is assumed that the system moves from cell to cell, can view the cells adjacent to the cell of its present residence, and reacts differently to the nearby cells depending on the content of these cells and on its own state at the moment. Diagrams are plotted to describe both a rigid and an elastic planning of the path of such a system. V.Z.

A71-20125 * # **Explanation of some aspects of the origin of life based on experimental data (Ob'iasnenie nekotorykh aspektov proiskhozhdeniia zhizni, osnovannoe na eksperimental'nykh dannykh).** S. W. Fox (Miami, University, Coral Gables, Fla.). *Zhurnal Evoliutsionnoi Biokhimii i Fiziologii,* vol. 6, no. 2, 1970, p. 131-147. 58 refs. In Russian. Contract No. NAS 8-101; Grant No. NGR-10-007-008.

Outline of a biophysical model designed to represent the origin of life on earth on the basis of experimental data. The foundation of the model is a succession of transformations beginning with the synthesis of small organic molecules from primordial gases, followed by the polymerization of the molecules into macromolecules of prebiological proteins and nucleic acid with subsequent self-arrangement of the latter into protocells, and the reproduction and Darwinian selection of species. The author's laboratory experiments in which the chemical processes of this scheme were realized are reviewed. Translation of the positive laboratory results into a geological matrix is discussed. V.Z.

A71-20210 **A digital system for the study of eye-movements.** Robert C. Arzbaecher (Illinois, University; Rush-Presbyterian St. Luke Medical Center, Chicago, Ill.), David I. Cheifetz, and David C. Garron (Rush-Presbyterian St. Luke Medical Center, Chicago, Ill.). *Medical Research Engineering,* vol. 9, Oct.-Nov. 1970, p. 23-25. 7 refs.

Description of a new system for TV monitoring and digital recordings of the corneal reflection from a human subject during voluntary eye movements. The corneal reflection is electronically superimposed on a TV image of the scene and digital circuitry simultaneously computes and records its horizontal and vertical coordinates. The system is intended for use in studies of perception which deal with visual scanning of a displayed field. M.M.

A71-20212 **Auditory illusions and confusions.** Richard M. Warren and Roslyn P. Warren (Wisconsin, University, Milwaukee, Wis.). *Scientific American,* vol. 223, Dec. 1970, p. 30-36.

A sentence was recorded, and subsequently certain phonemes or speech sounds were cut out. The recorded sound of a cough of the same duration was spliced into the tape to replace deleted segments. When this doctored sentence was played to listeners it was found that the missing speech sound was heard as clearly as were any of the phonemes that were physically present. The significance of this and similar tests is discussed. In another investigation a variety of repeated four-item sequences was employed in order to examine the perception of temporal order in the absence of onset and termination cues. Some remarkable effects of age on the frequency of verbal transformations and the types of illusory changes are discussed. It is pointed out that phonemic restorations and verbal transformations appear to provide new techniques for studying the perceptual organization of heard speech. G.R.

A71-20213 **Stress and behavior.** Seymour Levine (Stanford University, Stanford, Calif.). *Scientific American,* vol. 224, Jan. 1971, p. 26-31.

The pituitary-adrenal system's operation in response to stress is investigated, and it is shown that the entire mechanism is exquisitely controlled by a feedback system. Effects of the secreted hormones ACTH or glucocorticoid on the brain are pointed out, and investigations regarding the learning and extinction of an avoidance response in rats are reported. Other investigations reveal that the pituitary-adrenal system also comes into play in the regulation of behavior based on appetitive responses. Studies which show that hormones of the adrenal cortex play a crucial role in the sensory functions in man are discussed. It is pointed out that the mechanism by which the pituitary-adrenal hormones act to regulate or influence behavior is still almost completely unknown. G.R.

A71-20215 **The circulation time in the aged.** Jos L. Willems, Jos R. Roelandt, Hugo R. Van de Vel, and Jozef V. Joossens (Louvain, Catholic University; University Hospital, Louvain, Belgium). *American Journal of Cardiology,* vol. 27, Feb. 1971, p. 155-161. 21 refs. Research supported by the Ministry of Health.

Determination of the arm to tongue circulation time in 507 elderly people of both sexes (mean age 70.6 years) who were living in quite normal circumstances outside the hospital. In the light of these results, the normal values for circulation time in the aged are discussed, and the possible factors influencing these values are examined. O.H.

A71-20216 **Time judgment as a function of angular velocity.** William T. Rivero (Louisiana State University, Baton Rouge, La.). *Psychonomic Science,* vol. 22, Jan. 25, 1971, p. 65, 66. 11 refs.

The present experiment was undertaken in an attempt to determine possible effects of angular velocity upon time judgment. Thirty-six college sophomores were used as Ss. Angular velocity was induced by means of a motor-driven rotating chair. An analysis of variance and t test indicated bodily rotation during time reproductions had a significant (p less than .05) effect upon 27- and 37-sec time reproductions. The results implied that speed of rotation is directly proportional to the magnitude and occurrence of positive time-judgment error. (Author)

A71-20217 * **Magnitude estimation - Range of response and the exponent.** Robert P. Markley (Fort Hays Kansas State College, Hays, Kan.). *Psychonomic Science,* vol. 22, Jan. 25, 1971, p. 71-73. 9 refs. Research supported by the Texas Christian University; Grant No. NGR-44-009-018.

Ss made magnitude-estimation judgments of the apparent distance of a space vehicle in a reduced cue setting. The effects of stimulus range on response range and the exponent of a Stevens-type power function were investigated. Limitations upon the generality of previous findings about the effects of this variable were discussed. (Author)

A71-20218 **Effects of target-field luminance, interstimulus interval, and target-mask separation on extent of visual backward masking.** Sue I. Cox and William N. Dember (Cincinnati, University, Cincinnati, Ohio). *Psychonomic Science,* vol. 22, Jan. 25, 1971, p. 79, 80. 18 refs. PHS Grant No. EY-00481-04.

The three variables of target field luminance, interstimulus interval, and spatial separation of target and mask were found to have significant effects on backward masking, in accord with predictions from a model developed by Purcell, Steward, and Dember (1968). Quantitative differences between the results of the present and earlier (1968) study were attributed to a masking-by-flashes effect in the earlier study or, when considered in terms of receptive fields, to the involvement of different-sized receptive fields resulting from the difference in the size of the targets employed in the two studies. The results of the present study provide an estimate of the radius of the inhibitory region for the detection system that is in close accord with such estimates from experiments using quite different procedures. M.M.

A71-20230 * # **Shuttle: Life support, protective systems, and crew system interface technology.** Joseph N. Pecoraro (NASA, Office of Advanced Research and Technology, Biotechnology and Human Research Div., Washington, D.C.), Edward L. Hays (NASA, Manned Spacecraft Center, Houston, Tex.), George Hopson (NASA, Marshall Space Flight Center, Huntsville, Ala.), Robert Osborne, Layton Ingelfinger (NASA, Washington, D.C.), Lewis R. Carpenter (NASA, Flight Research Center, Edwards, Calif.), and Melvin Sadoff (NASA, Ames Research Center, Moffett Field, Calif.). *Astronautics and Aeronautics,* vol. 9, Feb. 1971, p. 58-63.

Approaches for the removal of metabolic carbon dioxide, water vapor, particulate matter, and trace gas contaminants from a 15-psia, two-gas (70% oxygen, 30% nitrogen) atmosphere are discussed. A hybrid sensor system for detecting and measuring gaseous trace contaminants is considered, and various systems and designs for providing protection to the crew in case of accidents are described. Studies conducted to solve cargo transfer problems are reported. An advanced solid-waste management system is considered, and a new method, involving a quartz-plate oven, of heating foods more conventionally and making them more palatable is discussed. G.R.

A71-20326 **Respiratory and cardiac responses to exercise in man.** Poul-Erik Paulev (Copenhagen, University, Copenhagen, Denmark). *Journal of Applied Physiology,* vol. 30, Feb. 1971, p. 165-172. 26 refs.

The purpose of the present study was to analyze the heart rate and ventilatory response to exercise during the initial 4 s (average duration of the first respiratory cycle) as well as the final responses at the offset. Instantaneous heart rate and ventilation were recorded from cycling periods and treadmill runs in 32 normal adults. In relaxed subjects an initial rise in heart rate was invariably found when exercise was begun, and the increment was roughly proportional to the size of the integrated EMG signal. A considerable increase in instantaneous respiratory frequency and ventilation occurred in more than two-thirds of all observations. In the remaining one-third of observations the initial ventilation fell or remained unchanged. The cardioventilatory responses could not be correlated with sex, bicycle training, or external, conditioned stimuli. The respiratory changes always preceded the cardiac response, also in the recovery period. It is concluded that different nervous processes seem responsible for the cardiac and the ventilatory response. (Author)

A71-20327 **Carbon dioxide absorption curves of dog blood and plasma.** F. Lee Rodkey, Harold A. Collison, John D. O'Neal, and Julius Sendroy, Jr. (National Naval Medical Center, Naval Medical Research Institute, Bethesda, Md.). *Journal of Applied Physiology,* vol. 30, Feb. 1971, p. 178-185. 42 refs. Navy-supported research.

Carbon dioxide absorption curves of dog blood were obtained in vitro at 37.0 deg C. Total carbon dioxide, carbon dioxide tension, and pH were all experimentally measured to allow for the calculation of pK' in the Henderson-Hasselbalch equation. Data were obtained for the nonbicarbonate buffer value of separated dog plasma of widely different protein concentration and for whole blood and true plasma, both oxygenated and reduced. The whole-blood samples varied in fractional cell volume from 0.1 to 0.6. Empirical equations were derived to allow calculation of the buffer value, change in bicarbonate on oxygenation, and the difference in bicarbonate concentration between plasma and whole blood at any given hemoglobin concentration of the blood. (Author)

A71-20328 **Serum protein determination during short exhaustive physical activity.** Jacques R. Poortmans (Bruxelles, Université Libre, Brussels, Belgium). *Journal of Applied Physiology,* vol. 30, Feb. 1971, p. 190-192. 18 refs. Research supported by the Ministère de l'Education Nationale.

Twenty-eight highly trained men were submitted to an exhaustive work on bicycle ergometer. Blood samples were taken before and after the exercise. Hematocrit ratio and concentration of total protein, thermosoluble proteins, and perchlorosoluble proteins were determined, as well as the concentration of 11 individual proteins. During exercise, hematocrit ratio increased to a value 6% higher than

at rest, while total protein attained a level 9% higher. The fluctuations were not ascribable to perchlorosoluble or thermosoluble proteins. No correlation was found between the rise of hematocrit ratio and that of total protein concentration. The changes in the concentration of serum proteins are only due to albumin, haptoglobin, alpha-two-macroglobulin, transferrin, beta-one-A globulin, gamma-A globulin, and gamma-G globulin. Three hypotheses have been evaluated, i.e., tissue breakdown, proteins synthesis, change in membrane permeability. It seems that short exhaustive exercise in trained men leads to a redistribution of proteins in the intravascular bed. (Author)

A71-20329 Chemosensitivity in normal subjects, athletes, and patients with chronic airways obstruction. Simon Godfrey, Richard H. T. Edwards, Grahame M. Copland, and Peter L. Gross (Royal Postgraduate Medical School, London, England). *Journal of Applied Physiology*, vol. 30, Feb. 1971, p. 193-199. 28 refs.

Studies of CO2 and O2 sensitivity have been made using rebreathing methods in normal subjects, athletes, and patients with and without chronic airways obstruction. The rebreathing techniques enabled isoxic CO2 response curves and isocapnic O2 response curves to be constructed from many points obtained over a short time. There was little difference in response among the groups of normal subjects but the patients with lung disease had a flatter CO2 response curve and required lower levels of oxygen tension to stimulate ventilation. When ventilation was expressed as a fraction of the maximal voluntary ventilation, much of the difference between normal subjects and chest patients disappeared, suggesting that the reduced ventilatory response may be of mechanical origin. There remained some patients who were truly insensitive to one or both stimuli and they appeared to be those whose clinical condition was poorest. (Author)

A71-20330 Changes in plasma catecholamine and corticosterone levels after muscular exercise. Alan K. Chin and Eugene Evonuk (Oregon, University, Eugene, Ore.). *Journal of Applied Physiology*, vol. 30, Feb. 1971, p. 205-207. 25 refs.

Male Sprague-Dawley rats were administered moderate and exhaustive exercise programs for 6 weeks. Blood was collected by cardiac puncture and the plasma catecholamine and corticosterone levels were analyzed fluorometrically. The results indicate that there were no significant differences in the plasma norepinephrine, epinephrine, total catecholamine, and corticosterone levels between the nonexercised control animals and the moderately exercised group. However, between the exhaustively exercised animals and the control and moderately exercised groups, there were significant increases in the plasma norepinephrine and total catecholamine levels, and a significant decrease in the plasma epinephrine and corticosterone concentrations. (Author)

A71-20331 Functional changes of cardiac muscle in adaptation to two types of chronic hypoxia. Josef Souhrada, Bohuslav Mrzena, Otakar Poupa, and R. W. Bullard (Karlova Universita; Československá Akademie Věd, Fysiologický Ústav, Prague, Czechoslovakia; Indiana University, Bloomington, Ind.). *Journal of Applied Physiology*, vol. 30, Feb. 1971, p. 214-218. 33 refs.

Tolerance to acute anoxia of the myocardium of laboratory rats adapted to the chronic hypoxia of simulated high altitude and of animals adapted to long-term sideropenic anemia was tested. Two parameters, the resistance of heart function in anoxia (Rt) and the recovery of static cardiac work after anoxia exposure, were measured to determine the tolerance of the working myocardium to acute oxygen lack. Increased tolerance of cardiac muscle of rats acclimated to altitude hypoxia and chronic sideropenic anemia was demonstrated. The presence of CO2 during anoxia had a different effect on anoxic survival of hearts from rats adapted to chronic hypoxia and those of both control and animals with sideropenic anemia. M.M.

A71-20332 Terminal bronchiole diameter changes with volume in isolated, air-filled lobes of cat lung. Terence G. Klingele and Norman C. Staub (California, University, San Francisco, Calif.). *Journal of Applied Physiology*, vol. 30, Feb. 1971, p. 224-227. 10 refs. NIH Grant No. HE-06285; PHS Grant No. 5-501-FR-05355-06; Contract No. Nonr-222(55).

Description of the results of measurements of the inside diameter of terminal bronchioles in cat lung lobes. The average terminal bronchial diameter changed proportionally to the cube root of lung volume. Terminal bronchiole diameter is thus a function of lung volume rather than transpulmonary pressure. The results confirm the anatomic and histologic finding (Hayek, 1953; Staub, 1963) that the bronchioles are directly enmeshed in the structural framework of the terminal respiratory unit they serve. It is concluded that in the absence of active smooth muscle tone the fraction of airflow resistance attributable to the bronchioles is the same during inflation as during deflation at comparable alveolar volumes. M.M.

A71-20333 Effects of carbohydrate metabolism upon respiratory gas exchange in normal men. Herbert A. Saltzman and John V. Salzano (Duke University, Durham, N.C.). *Journal of Applied Physiology*, vol. 30, Feb. 1971, p. 228-231. 9 refs. Navy-supported research; NIH Grant No. HE-07896.

In five resting young men breathing air at 1 Ata, the ingestion of carbohydrate (920 kcal) caused respiratory changes. Carbon dioxide production increased on the average by 43%, alveolar ventilation by 47%, oxygen consumption by 13%, tidal volume by 25%, respiratory gas exchange ratio by 0.21, and arterial oxygen tension by 9.3 mm Hg. At the same time, mean pH fell 0.022 units. It is concluded both that metabolism of carbohydrate in normal men will increase alveolar ventilation sufficiently to raise the arterial oxygen tension significantly. (Author)

A71-20334 Physiological effects of acute changes in altitude in a deep mine. C. H. Wyndham, R. Kok, N. B. Strydom, G. G. Rogers, and S. Zwi (Chamber of Mines of South Africa, Human Sciences Laboratory; Witwatersrand, University, Johannesburg, Republic of South Africa). *Journal of Applied Physiology*, vol. 30, Feb. 1971, p. 232-237. 29 refs.

Rapid descent from an altitude of 1736 m into a deep mine to sea level resulted in an increase in V sub O2 max by 11-12% and a significant reduction in minute ventilation at maximal effort. Arterial PO2 and PCO2 were higher at sea level than at 1763 m and higher at rest than at maximal effort. Lactic acid concentrations rose above control levels at 60% of V sub O2 max at both altitudes. pH at rest and submaximal effort was slightly higher at 1763 m than at sea level, but at maximal effort pH fell to acidemic levels in association with the marked rise in lactic acid concentrations. Breathing 25% oxygen in inspired air at 1763 m increased V sub O2 max and reduced minute ventilation at maximal effort to sea-level values. Arterial PO2, PCO2, pH, and lactic acid concentrations were all restored to close to sea-level values. (Author)

A71-20335 Electronic compensation of the effects of water vapor in respiratory mass spectrometry. Peter Scheid, Heinrich Slama, and Johannes Piiper (Max-Planck Institute of Experimental Medicine, Göttingen, West Germany). *Journal of Applied Physiology*, vol. 30, Feb. 1971, p. 258-260. 5 refs.

The fractional concentrations of the component gases in a gas mixture sampled by a mass spectrometer can be directly measured if a correction is made for the partial pressure of water vapor in the sample. An automatic control system is described which performs this correction by stabilizing the sum of the mass spectrometer signals for all component gases other than water vapor. Also effects of pressure changes are compensated by the device. (Author)

A71-20336 Rate constant for the kinetics of oxygen uptake during light exercise. Brian J. Whipp (University College, Cardiff, Wales). *Journal of Applied Physiology,* vol. 30, Feb. 1971, p. 261-263. 15 refs.

Description of a simple algebraic solution for the rate constant parameter k appearing in the exponential equation representing the time course of the changes of oxygen uptake for mild and moderate intensities of exercise or for the early, predominantly alactic phase of more intense exercise. The rate constant for the exponential increase of oxygen uptake during low-intensity excercise may be simply derived by dividing the steady-state oxygen uptake by the oxygen deficit. M.M.

A71-20349 Temperature regulation during exercise dehydration in man. Björn Ekblom, Carol J. Greenleaf, John E. Greenleaf, and Lars Hermansen (Gymnastik- och Idrottshögskolan, Stockholm, Sweden). *Acta Physiologica Scandinavica,* vol. 79, 1970, p. 475-483. 25 refs. Research supported by the Bank of Sweden, the Swedish Sport Federation, and the Swedish Delegation for Medical Defense Research.

Investigation of the effects of mild exercise dehydration (1% of the body weight) on temperature regulation in three men during continuous and intermittent exercise of 1 hr duration on a Krogh bicycle ergometer with the same average heat production at a relative O2 uptake of 62% in the environment-independent zone (22 C T sub a and 38% rh). In both hydration and dehydration, during intermittent work, equilibrium levels of rectal temperature were 0.3 C higher than during continuous work. Progressive dehydration elevated equilibrium levels of rectal temperature and mean body temperatures 0.3 to 0.4 C above hydration control values while mean skin temperatures were essentially constant at 30 plus or minus 0.2 C. The elevation of rectal temperature with dehydration was due, predominantly, to reduced sweating. It is suggested that the sweat depression was due to reduced stimuli from the central nervous system to the glands. These results emphasize the sensitivity of the thermoregulatory system to dehydration and point up the need to control water intake during such experiments. (Author)

A71-20351 Bundle branch and ventricular activation in man. Kenneth M. Rosen, Shahbudin H. Rahimtoola, M. Ziad Sinno, and Rolf M. Gunnar (Hektoen Institute for Medical Research; Cook County Hospital; Illinois, University, Chicago, Ill.). *Circulation,* vol. 43, Feb. 1971, p. 193-203. 29 refs. PHS Grant No. HE-08834-0651.

Study of human cardiac conduction using the simultaneous recording of both right and left bundle branch potentials in ten patients during catheterization. Several intervals were measured. The measurements were analyzed and used to study normal intraventricular conduction, as well as the functional conduction defects produced by coupled atrial pacing. Conclusions have been reached regarding the normal sequences of bundle branch and right and left ventricular activation. It is found that the proximal left and right bundle branches are usually activated simultaneously, and that block of either bundle without contralateral bundle delay does not significantly delay the onset of ventricular activation. O.H.

A71-20352 Analysis of left ventricular function by atrial pacing. John O. Parker, Fareeduddin Khaja, and Robert B. Case (Queen's University, Kingston, Ontario). *Circulation,* vol. 43, Feb. 1971, p. 241-252. 22 refs. Research supported by the Ontario Heart Foundation; Medical Research Council of Canada Grant No. MA-3062.

With the technique of right atrial pacing, left ventricular function was assessed in 21 normal subjects and in 13 patients with elevated left ventricular filling pressures. Since cardiac output does not change significantly with atrial pacing, the stroke volume decreases as an inverse function of the pacing rate. Stroke volume can thus be varied over a wide range, and by simultaneous measurement of left ventricular end-diastolic pressure, pacing ventricular function curves can be obtained. The calculated average slope for the ventricular function curve relating stroke volume index to left ventricular end-diastolic pressure was steeper in the normal subjects than in the group with elevated left ventricular end-diastolic pressure, but considerable overlap occurred between the groups. However, in individual patients the pacing ventricular function curve appears useful in assessment of the effect of interventions that augment or depress ventricular performance. (Author)

A71-20353 Mode of action of chlorophenoxyisobutyric acid on cholesterol metabolism in man. L. Horlick, B. J. Kudchodkar (Saskatchewan, University; University Hospital, Saskatoon, Saskatchewan, Canada), and H. S. Sodhi. *Circulation,* vol. 43, Feb. 1971, p. 299-309. 21 refs. Research supported by the Medical Research Council, the Saskatchewan Heart Foundation, and the Ayerst Co.

In short-term trials chlorophenoxyisobutyric acid (CPIB) (Atromid-S) reduced the plasma cholesterol and triglyceride levels in eight subjects with type II and IV hyperlipidemias to an equal extent. In these subjects, who were maintained on constant solid food diets, CPIB administration resulted in increased excretion of fecal neutral and acidic sterols in the type II subjects only. There was an immediate increase in specific activity of plasma cholesterol in seven of the eight subjects, and a reduced rate of fall of specific activity in many of the subjects. It is suggested that CPIB inhibits the synthesis of cholesterol in vivo, and that the subsequent fall in plasma cholesterol is responsible for the release of cholesterol with higher specific activity from tissues into the plasma pool. (Author)

A71-20354 Optimal radiologic facilities for examination of the chest and the cardiovascular system. Herbert L. Abrams, S. James Adelstein, Larry P. Elliott, Kent Ellis, Richard H. Greenspan, Melvin P. Judkins, and Manuel Viamonte, Jr. *Circulation,* vol. 43, Feb. 1971, p A-135 to A-156. 11 refs. NIH-supported research.

Recommendations of optimal radiologic facilities in the prevention, treatment, and rehabilitation of patients with cardiovascular diseases. Three primary areas are dealt with: optimal facilities for the X-ray examination of the chest, the optimal catheterization-angiocardiographic laboratory, and the optimal nuclear radiology laboratory. In addition, the requisite staffing patterns in these laboratories are analyzed, and radiologic facilities for cardiovascular surgical operating rooms and medical and surgical intensive care units are considered. A set of standards is defined which could provide the very best radiologic resources for heart disease for the nation and which comprise, therefore, objectives to be attained rather than a description of existing facilities. Problems of radiation safety and economic equipment utilization are also considered. O.H.

A71-20374 * The coming search for life on Mars. Cyril Ponnamperuma and Harold P. Klein (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.). *Quarterly Review of Biology,*

vol. 45, Sept. 1970, p. 235-258. 144 refs.

General review of hypotheses which accept the possibility of extraterrestrial life. According to modern astronomy, planetary systems and conditions suitable to life are considered to be of common occurrence in the universe. The Oparin-Haldane hypothesis postulates the prebiotic synthesis of organic compounds as a necessary preamble to the origin of life on earth, and experimental work has produced considerable support of this idea. It is therefore reasonable to suppose that a similar sequence of events may have taken place elsewhere in the universe. Mars is of special interest because its physical parameters, although severe, do not exclude the possibility that microorganisms may exist on that planet. F.R.L.

A71-20382 Effects of brief sensory deprivation and somatic concentration on two measures of field dependence. George D. Kurie and Arnold M. Mordkoff (New York University, New York, N.Y.). *Perceptual and Motor Skills,* vol. 31, Dec. 1970, p. 683-687. 13 refs. PHS Grant No. MH-13899-02.

An experiment was performed to substantiate the indirect evidence that brief sensory deprivation (SD) has different effects on two measures of field dependence, the rod-and-frame test (RFT) and the embedded-figures test (EFT) and specifically to investigate whether it is the increased awareness of somatic activity which is involved in the more veridical RFT performance while having no effect on EFT. The RFT and EFT were administered to three groups of Ss before and after one group had been submitted to 1 hr of SD, a second group to 1 hr of somatic concentration, and a third to a control period. The results supported the above hypothesis in that the greatest changes in RFT performance occurred in the somatic concentration condition which were significantly greater than those obtained in the SD condition, these in turn were significantly greater than those occurring in the control condition. No significant effects were obtained with respect to the EFT. (Author)

A71-20383 Fluctuations of perceptual organization and orientation - Stochastic (random) or steady state (satiation). Timothy G. Sadler and Roy B. Mefferd, Jr. (U.S. Veterans Administration Hospital; Baylor University; Houston, University, Houston, Tex.). *Perceptual and Motor Skills,* vol. 31, Dec. 1970, p. 739-749. 39 refs.

Using flat drawings, intrareversal times were obtained for two kinds of fluctuations, perspective reversals in a figure eliciting apparent depth and reversals of lateral organization in a figure not eliciting apparent depth. The durations of the alternate percepts (P1 and P2) between reversals early in a viewing session were compared with recently published data of the same type. In the latter study, P1 was found to be of longer duration than P2, both with a flat drawing and a rotating skeletal cube. These prior data were explained in terms of satiation theory; however, we found no significant differences between P1 and P2 with two different groups of Os and with two figures. Explanations for these differences in results were advanced. The use of grouped percept-duration data to support steady state (e.g., satiation) theories of perceptual fluctuation phenomena was criticized. (Author)

A71-20384 * Effects of payoff on detection in a symmetric auditory detection task. Robert C. Calfee (Stanford University, Stanford, Calif.). *Perceptual and Motor Skills,* vol. 31, Dec. 1970, p. 895-901. 6 refs. NASA-supported research.

The assumption common to several models for signal detection, that increased payoff should have no effect on detection rate, was tested in a two-interval forced-choice auditory signal detection task. The signal occurred equally often in each interval, and amount of gain or loss was the same for both intervals. Payoff values (0,.1,.5, and 1 cent) were changed within sessions in 50-trial blocks. Detection rate increased noticeably in one experiment, was significant in a second experiment and had no effect in a third. With minimal payoffs of the sort typically used, significant effects may depend on convincing S of the importance of the incentive. Analysis of conditional error probabilities showed that errors were more likely to follow errors, which suggests periodic variation in level of attention. (Author)

A71-20385 Visual-tactual dominance relationship as a function of accuracy of tactual judgment. Ellen Derrick and Robert Dewar (Calgary, University, Calgary, Alberta, Canada). *Perceptual and Motor Skills,* vol. 31, Dec. 1970, p. 935-939. 9 refs.

The question of dominance of either the visual or tactual modalities when information to the two is simultaneous and disparate but not conflicting. Thirty six subjects viewed one object while exploring another of different size using active touch, and then matched the 'seen' and 'felt' objects from an array of 10 such objects. An average tactual error significantly larger than the average visual error indicates a residual dominance of vision over touch. A hypothesis that as the degree of tactual accuracy decreases the amount of visual dominance decreases was not confirmed. V.P.

A71-20386 Minimum visual feedback processing time for amendment of an incorrect movement. Robert W. Christina (New York, State University, Brockport, N.Y.). *Perceptual and Motor Skills,* vol. 31, Dec. 1970, p. 991-994. 20 refs.

The average minimum time required by a performer to amend an incorrect movement based upon his ability to process visual feedback is discussed. Further, a decremental effect of the psychological refractory period on minimal visual feedback processing time is suggested. (Author)

A71-20445 Influence of the latency fluctuations and the quantal process of transmitter release on the end-plate potentials' amplitude distribution. Branko Souček. *Biophysical Journal,* vol. 11, Feb. 1971, p. 127-139. 9 refs. AEC-sponsored research.

Spontaneous synaptic potentials and their relation to the end-plate potential (e.p.p.) are studied. It has been suggested earlier that the e.p.p. at a single nerve-muscle junction is built up statistically of small all-or-none units which are identical in size with the spontaneous miniature end-plate potentials (m.e.p.p.'s). In this paper, a more general theory is developed which takes into account latency fluctuations of the unit components. A general equation for e.p.p. amplitude probability distribution is derived. This probability distribution is a function of the latency distribution, m.e.p.p.'s pulse shape, m.e.p.p.'s amplitude distribution, and the mean quantal content. The time course of transmitter release, or latency distribution, is derived from a histogram of synaptic delays in a frog muscle, but obtained equations can be used for other distribution functions as well. (Author)

A71-20446 Model of red blood cell rotation in the flow toward a cell sizing orifice. Application to volume distribution. M. O. Breitmeyer, E. N. Lightfoot, and W. H. Dennis (Rose Polytechnic Institute, Terre Haute, Ind.; Wisconsin, University, Madison, Wis.). *Biophysical Journal,* vol. 11, Feb. 1971, p. 146-157. 12 refs. NSF Grant No. GK-3601.

The rotation of human red blood cells (RBC) as they flow in the shear field established by a Coulter type orifice is modeled. This model, based on hydrodynamics of ellipsoid rotation in laminar creeping flow, is used to calculate the probability of the cells entering the orifice with a specific orientation. The electrical resistance change produced by a cell passing through the orifice of an

electronic cell volume detector is the product of an orientation-dependent shape factor and the cell volume. This paper presents a method to calculate the shape factor probability distribution which can be used to predict its effect on the cell volume distribution. Experimental results confirm the theoretical prediction that the right skewness of resistance change distributions is in part a result of the nonspherical shape of red cells. (Author)

A71-20447 Dinitrophenol inhibits the rejoining of radiation-induced DNA breaks by L-cells. A. J. Moss, Jr., Glenn V. Dalrymple, J. L. Sanders, K. P. Wilkinson, and John C. Nash (Arkansas, University; U.S. Veterans Administration Hospital, Little Rock, Ark.). *Biophysical Journal,* vol. 11, Feb. 1971, p. 158-174. 48 refs. Research supported by the American Cancer Society; AEC Contract No. AT (40-1)-3884; NIH Grant No. 1 FO1 GM41415-01A1, BPOC.

Study of the production and rejoining of X-ray induced single-stranded DNA breaks using the alkaline sucrose density gradient technique and by measuring the disappearance of both 5' termini and 3'-OH termini using polynucleotide kinase and DNA, respectively. All studies were conducted using L-cell suspensions irradiated both in the presence and absence of 2,4-dinitrophenol (DNP), an uncoupler of oxidative phosphorylation. Results show that the induction of single-stranded DNA breaks probably includes a nucleolytic component in addition to indirect free radical effects. A greater number of breaks were produced in the absence of DNP, suggesting that depressed adenosine triphosphate (ATP) levels reduce endogenous nucleolytic activity. The rejoining mechanism is enzymatic and requires an available ATP supply for operation. In the presence of DNP no DNA rejoining was observed following 30 min incubation after 10,000 rad. These results suggest that DNA breaks produced may be characterized by 5'-PO4-3'-OH termini and are rejoined by DNA ligase. O.H.

A71-20539 # Influence of a microwave field on the hemopoietic system (O vozdeistvii SVCh polia na sistemu krovetvoreniia). I. I. Dochkin. *Voenno-Meditsinskii Zhurnal,* Nov. 1970, p. 42, 43. In Russian.

Changes in the peripheral blood and in the morphology of bone marrow were studied in chronic and acute tests on dogs and rabbits irradiated by electromagnetic radiation at a frequency of 2375 MHz. The field strength was 30 microwatts per square centimeter. The rabbits were subjected to between one and ten irradiations of 60 min duration each. The dogs were subjected to repeated irradiations over a period of more than one year. The changes in the blood and marrow of rabbits are not stable and pass after a period of five to ten days. Changes observed in the chronically irradiated dogs were more stable and became normalized over a period of 25 days. Specific data are given for changes in the hemoglobin content, leukocyte and erythrocyte counts, and bone marrow structure. T.M.

A71-20540 # Psychophysiological features of the perception of instrument information by the pilot after diverting his attention to features outside of the cockpit (Psikhofiziologicheskie osobennosti vospriiatiia letchikom pribornoi informatsii posle otvlecheniia vnimaniia na vnekabinnye orientiry). V. V. Davydov. *Voenno-Meditsinskii Zhurnal,* Nov. 1970, p. 50-53. 9 refs. In Russian.

The time required for visual perception of instrument readings after viewing external features and landmarks was studied in actual-flight and ground-trainer experiments on 15 pilots aged from 25 to 35 years. Cinematographic and electrooculographic observations of eye movements indicated durations for which sight remained fixed on an instrument before the pilot took the necessary control action. Perception durations obtained for initial viewing of the instruments were compared with those for viewing after attention (and vision) was distracted by external factors to establish possible differences caused by the combined effects of eye motion and optical accommodation. Results show that optical accommodation processes occasioned by switching from far- to near-field viewing do not significantly affect the time for perception of panel readings in actual and simulated flight conditions. T.M.

A71-20541 # Early and prognostic signs of arteriosclerosis in flight personnel (Rannie i prognosticheskie priznaki ateroskleroza u letnogo sostava). Iu. F. Udalov, N. N. Bakhtadze, and B. N. Garashov. *Voenno-Meditsinskii Zhurnal,* Nov. 1970, p. 54-56. 12 refs. In Russian.

Medical examination records for healthy pilots were compared with those of pilots who later developed arteriosclerosis in order to establish possible early symptoms of this cardiovascular disease. Pilots who developed arteriosclerosis within a period of one to two years were found to complain much more frequently about pains in the chest and near the heart, about dyspnea during physical strain, and about tachycardia. They also showed more variations in heart tones and electrocardiogram patterns. Biochemical examinations showed differences in cholesterin content and a higher frequency of hypercholesterinemia in pilots who became sick. T.M.

A71-20623 Receptive field mechanism in the vertebrate retina. Ken-Ichi Naka (California Institute of Technology, Pasadena, Calif.). *Science,* vol. 171, Feb. 19, 1971, p. 691-693. 14 refs. PHS Grant No. NB 03627.

Study of the organization of the receptive field in the catfish retina. This retina has two ganglion cells. In one type, a spot of light at the center of its receptive field gives rise to a sustained discharge whereas an annulus gives rise to a transient response, and in the other type the response pattern is reversed for a spot and an annulus. It was found that current injected into the horizontal cell induces spike discharges of the ganglion cell very similar to that elicited by a spot of light or by an annulus. In both types of receptive fields, depolarization of the horizontal cell gives rise to a response of the ganglion cell similar to that elicited by a spot of light, whereas hyperpolarization of the cell gives rise to a response of the ganglion cell similar to that elicited by an annulus. Current through a single injecting electrode could drive two types of cells simultaneously. Interaction between a spot of light and an annulus can also be simulated by replacing one light stimulus by current of the proper polarization injected into the horizontal cells. It is suggested that interactions among three neuronal structures (the receptor, the horizontal cell, and the bipolar cell) produce the basic receptive field organization in the channel catfish. Z.W.

A71-20676 Effect of exercise on production of erythropoietin in normal and hypoxic rats. J. Živný, T. Trávníček, and J. Neuwirt (Karlova Universita, Prague, Czechoslovakia). *American Journal of Physiology,* vol. 220, Feb. 1971, p. 329-332. 24 refs.

The effect of exercise on the production of erythropoietin was followed in normal and hypoxic rats. The erythropoietin titer in plasma was not changed in rats performing work under normal atmospheric pressure, but was increased in rats performing work in mild hypoxia. The exposure of rats to exercise of long duration at higher altitudes had a reverse effect and the erythropoietin titer was decreased. The concentrations of lactic acid, pH, and PCO2 in plasma were measured simultaneously. The only significant change observed was the elevation of lactic acid concentration. The erythropoietin titer in rat plasma was not altered after in vitro incubation with increasing concentrations of lactic acid. The profound hypoxia, together with strenuous exercise, may exert severe changes in the kidney circulation and kidney tissue. The changes may be of importance in the observed decreased production of erythropoietin. (Author)

A71-20677 **Restricted diffusion in skeletal muscle capillaries in man.** Jens Trap-Jensen and Niels A. Lassen (Bispebjerg Hospital, Copenhagen, Denmark). *American Journal of Physiology,* vol. 220, Feb. 1971, p. 371-376. 35 refs. Research supported by the King Christian X Foundation.

The skeletal muscle capillary permeabilities for EDTA-Cr51 and inulin were measured simultaneously by means of the indicator-diffusion technique in the exercising forearm of nine normal human adults. The capillary permeability data were expressed as the capillary diffusion capacity, CDC, defined as the unidirectional flux of permeable tracer across the capillary membrane per 100 g tissue per unit concentration difference across the capillary. The results obtained indicate the existence of restriction to diffusion for smaller hydrophilic molecules over the skeletal muscle capillary membrane. The finding is in accordance with the morphological observations of apertures with a narrowest diameter of about 40 A situated between the skeletal muscle capillary endothelial cells. G.R.

A71-20678 **High altitude-induced pulmonary arterial hypertension in the llama (Lama glama).** Natalio Banchero, Robert F. Grover, and James A. Will (Colorado, University, Denver, Colo.; Wisconsin, University, Madison, Wis.). *American Journal of Physiology,* vol. 220, Feb. 1971, p. 422-427. 14 refs. Research supported by the Colorado Heart Association; PHS Grant No. GRS-108.

Three male sea-level llamas were studied at 260 m and after 5 and 10 weeks at 3,420 m. Using heart catheterization, measurements were made at rest, during acute hypoxia, and during treadmill exercise. At high altitude 100% oxygen was also given. The average sea-level resting mean pulmonary artery pressure (Ppa) was 14 mm Hg and increased significantly in every animal. Average Ppa was 23 mm Hg after 100 weeks at 3,420 m due to increased resistance to blood flow. The llama develops a moderate degree of pulmonary arterial hypertension as seen in humans but less than that seen in cattle. There is indirect evidence of vasoconstriction. G.R.

A71-20679 **Capillary development during exposure to chronic hypoxia.** S. Cassin, R. D. Gilbert, C. E. Bunnell, and E. M. Johnson (Florida, University, Gainesville, Fla.). *American Journal of Physiology,* vol. 220, Feb. 1971, p. 448-451. 12 refs. Contract No. AF 41(609)-2421.

Thirty male rats were exposed to an altitude of 6,150 m for 36 days in a decompression chamber while 26 similar animals were maintained at sea level for the same time. Capillary counts in gracilis and plantaris muscles in some experimental and control animals were compared by utilizing a specific stain for endothelial cells. A significant increase in muscle capillary counts was found in experimental animals if the counts were expressed per unit area. However, the number of muscle fibers per square millimeter of tissue also increased. Because there were probably no new muscle fibers in these animals, the relative increase in fibers per unit area is thought to be due to the smaller size of the muscle fibers in the experimental animals. When the counts were compared in experimental and control animals on the basis of capillaries per muscle fiber, a difference between the two groups was not observed. On the basis of these data it appears to us that exposure to hypoxia results in an opening of preexisting capillaries rather than an increase in vascularity. (Author)

A71-20680 **Competition between vasoconstrictor and vasodilator mechanisms in skeletal muscle.** Jimmy C. Costin and N. Sheldon Skinner, Jr. (Emory University, Atlanta, Ga.). *American Journal of Physiology,* vol. 220, Feb. 1971, p. 462-466. 22 refs. NIH Grant No. HE-12566.

The vascularly isolated, innervated, reservoir-perfused, dog gracilis muscle was studied with constant blood flow. The data obtained indicate that local vasodilator mechanisms have sufficient potency to override central vasoconstrictor mechanisms in the pressure changes during ascent and descent are considered giving attention to the causes of barotitis media. It is found that oxygen absorption after landing may exacerbate a barotitis media which occurred during flight. Causes of barosinusitis, of abdominal distention, and aerodontalgia are discussed. G.R.

A71-20681 **Etiological studies of pulmonary oxygen poisoning.** J. N. Norman, J. MacIntyre, R. R. Ross, and G. Smith (Aberdeen, University, Aberdeen, Scotland). *American Journal of Physiology,* vol. 220, Feb. 1971, p. 492-498. 36 refs.

The pattern of lung changes caused by giving rats and mice oxygen at 2 Ata (atmospheres absolute) pressure to breathe for various periods of time was found and graded in terms of mortality and macroscopic and microscopic lung appearances. The modification of this picture caused by adding nitrogen at 1 atm pressure and then carbon monoxide at 1 atm pressure to the oxygen at 2 atm breathed was next found in order to distinguish between local effects of oxygen on the lungs and the pulmonary effects of generalized hyperoxia. The addition of nitrogen delayed the onset of pulmonary changes, whereas carbon monoxide failed to modify the picture significantly. G.R.

A71-20682 **Carbohydrate and fat in energy metabolism of red and white muscle.** S. V. Pande and M. C. Blanchaer (Manitoba, University, Winnipeg, Manitoba, Canada). *American Journal of Physiology,* vol. 220, Feb. 1971, p. 549-553. 52 refs. Research supported by the Medical Research Council and the Muscular Dystrophy Association of Canada.

The ability of the mitochondria from red and white skeletal muscle of rabbit to oxidize various substrates with coupled phosphorylation was determined to evaluate the relative capacities of the two muscle types to utilize carbohydrate and fat for aerobic energy production. The respiratory rates were highest with pyruvate and were similar with mitochondria of red and white muscle. White muscle and to some extent red muscle, appears potentially capable of deriving more usable energy by oxidizing carbohydrate than fat, and this correlates with the known observations that in vigorously exercising muscle carbohydrate utilization predominates over that of fat. G.R.

A71-20701 **Aerospace medicine (2nd edition).** Edited by H. W. Randel (NASA, Washington, D.C.). Baltimore, Williams and Wilkins Co., 1971. 752 p. $45.

Aerospace medical research dealing with environmental stresses on the human organism, reactions of body systems to these effects, and appropriate clinical and preventive treatment procedures. Specific problems considered include disturbed circadian rhythms, hypoxia, barotrauma, decompression sickness, toxicological hazards, and effects of accelerations, noise, and vibration. The design and use of protective devices and emergency equipment are described, including oxygen delivery systems, pressurized cabins, ejection seats, and survival techniques. Cardiopulmonary, ophthalmological, psychiatric, neurological, and psychological aspects of aerospace medicine are examined which directly relate to the selection and continuing evaluation of both civil and military pilots. The air transportation of patients is considered, together with general problems in the epidemiology and hygiene of air travel.

Individual items are abstracted in this issue. T.M.

A71-20702 **The earth's environment and aviation.** Hubertus Strughold. In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 22-34. 6 refs.

The environment in atmospheric flight is examined, and physics and chemistry of the atmosphere are considered. Effects of solar

radiation upon the atmosphere are investigated. The subdivisions of the atmosphere based on thermal and photochemical effects of solar radiation are described. A flight physiologic evaluation of the atmosphere is conducted taking into account relations between oxygen pressure and respiration, and between barometric pressure and body fluids. Effects of particle rays and UV solar radiation are considered, and such subjects as scattering of light, propagation of sound, meteoroids, aerothermodynamics, and aerodynamic support and resistance are discussed. G.R.

A71-20704 Circadian rhythms - Aerospace medical aspects. Hubertus Strughold. In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 47-55. 23 refs.

The various levels of wakefulness and sleep are considered, and rhythmic changes in the activities of the brain and other body organs are examined. The hormone secretion of the endocrine glands, which play an important role in the control of the circadian cycle, is discussed. Facts showing the stability of the circadian cycle are investigated, and times involved in adjusting to a phase shift of the day-night cycle after a flight into a different time zone are explored. Problems regarding the sleep and activity regime in astronautical activities are briefly considered. G.R.

A71-20705 Hypoxia. Fritz M. G. Holmstrom (Texas, University, San Antonio, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 56-85. 83 refs.

The features of hypoxic hypoxia which are likely to be of the greatest practical importance to the flight surgeon or aviation physiologist are reviewed. The most important events relating to the oxygenation of cells in a man living quietly at sea level are considered. The characteristics of a physiologic oxygen tension gradient as it occurs normally at sea level are established, and the effect of altitude in changing the form of that gradient is demonstrated. A concept describing the action of hypoxia to cause cellular and organ failure is advanced, and the effect of hypoxia on psychomotor performance is examined. The prevention of hypoxia by use of supplementary oxygen, altitude acclimatization, nutrition, and drug ingestion is considered. G.R.

A71-20706 * Barotrauma. Hugh W. Randel (NASA, Washington, D.C.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 86-98. 32 refs.

The symptoms and pathology resulting from pressure-induced expansion or contraction of undissolved air and gases within the body in aviation and in decompression chambers are discussed. The anatomical features of the middle ear are examined, and effects of air pressure changes during ascent and descent are considered giving attention to the causes of barotitis media. It is found that oxygen absorption after landing may exacerbate a barotitis media which occurred during flight. Causes of barosinusitis, of abdominal distention, and aerodontalgia are discussed. G.R.

A71-20707 Biodynamics of deceleration, impact, and blast. John P. Stapp (National Highway Safety Bureau, Washington, D.C.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 118-166. 73 refs.

The effects of mechanical forces on living tissues are examined. A mechanical analysis of survived human free falls is considered, and factors which determine the survivability of exposure to impact forces are investigated. Physiologic or anatomic effects of deceleration are explored, and studies undertaken to determine what body positions and protective restraints offer optimum safety in crashes are evaluated. Investigations of human response to impact force are reported, and aspects of the biomechanics of the head, neck, thorax, and abdomen are discussed. Conditions during ejection from a high performance aircraft are investigated. G.R.

A71-20708 Effects of radial, angular, and transverse acceleration. Ralph L. Christy (U.S. Navy, Bureau of Medicine and Surgery, Washington, D.C.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 167-197. 46 refs.

Physiologic effects of acceleration are investigated taking into account a great variety of forces which depend upon the maneuverability of the aircraft, wing loading, power, speed, altitude, and aircraft position and stability. Objective symptoms are discussed giving attention to respiration, pulse, and blood pressure. Studies conducted with centrifuges are evaluated, and a list of centrifuges with equipment for human testing available in the U.S. is provided. Positive, negative, and transverse accelerations are considered, and the use of protective devices is discussed. G.R.

A71-20709 Effects of vibration and buffeting on man. Henning E. Von Gierke (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio) and Neville P. Clarke (USAF, Aerospace Medical Div., Brooks AFB, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 198-223. 28 refs.

The characteristics of vibration exposure in aerospace environment are examined, and approaches for measuring vibration exposure are discussed. Sources of vibration in aircraft or spacecraft are investigated. Oscillations during ejections in escape systems are considered, and aircraft motions in low altitude high speed flight are analyzed. Vibration occurring in connection with storm and clear air turbulence, the generation of maneuvering loads, helicopter and V/STOL takeoff and landing, and the boost phase of rocket flight are discussed. Questions of the mechanical response of the human body are explored, and subjective and pathophysiologic effects of vibration are investigated. G.R.

A71-20710 Noise effects and speech communication in aerospace environments. Henning E. Von Gierke and Charles W. Nixon (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 224-253. 48 refs.

Characteristics of sound waves are described giving attention to radiation patterns of aerospace noise sources. The sound level meter, which consists of a microphone, amplifier, and an indicating meter, is described as the basic instrument for sound measurement. Sources of acoustic energy including continuous noise sources and impulse noise are investigated. Physiological responses to acoustic energy are examined, and the formulation of hearing risk criteria is considered. Aspects of the acoustic stress of the auditory system are explored, and psychologic responses are analyzed. Problems with sonic boom, control measures, and elements of hearing conservation programs are discussed. G.R.

A71-20711 * Labyrinthine and proprioceptive aspects of aerospace medicine. Richard E. Waite (Texas, University, Galveston, Tex.) and Milton R. De Lucchi (NASA, Manned Spacecraft Center, Neurophysiology Laboratory, Houston, Tex.). In: Aerospace

medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 254-267. 30 refs.

The structure of the labyrinth is described giving attention to the otolith organs and to the semicircular canals. Function and location of proprioceptors are discussed. Symptoms of motion sickness are considered, and causes of spatial disorientation are investigated. Examples of flight situations leading to spatial disorientation are presented in order to emphasize the need for pilot training in each of the different situations. Experiences of significance to labyrinthine and proprioceptive function which have been noted during weightless manned space flight are reported. Effects of rotation in space are discussed. G.R.

A71-20712 **Toxicology of aerospace systems.** Anthony A. Thomas (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 268-305.

Study of the importance of toxicology in the design and operation of aerospace vehicles. As a consequence of complex technology, occupational exposures in crews and systems support personnel are widely varied and encompass the gamut of 8-hr daily routine exposures, occasional high-level short-duration exposures, and long-term continuous exposures. These exposures occur throughout the spectrum of chemical compounds from well known common chemicals to exotic high energy compounds never before encountered. Toxic hazards in aerial application and medical aspects of propellant operations are discussed. F.R.L.

A71-20713 **Medical aspects of aircraft accidents.** Frank M. Townsend (San Antonio State Tuberculosis Hospital, San Antonio, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 306-324. 28 refs.

Examination of the techniques of the pathology of aircraft accidents which, since the British commercial jet Comet disaster in 1954, became fully integrated into the accident investigation armamentarium. The investigation of the medical aspects of aircraft accidents has several purposes: to assist the investigating board to establish the primary cause of the accident, to establish the mode of death, to establish the suddenness of the emergency, to distinguish specific injuries, and to evaluate the safety equipment. F.R.L.

A71-20714 **Oxygen and related equipment.** Algernon G. Swan (USAF, Special Weapons Center, Kirtland AFB, N. Mex.) and Ellis G. Aboud (USAF, Wiesbaden Air Base, West Germany). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 325-336. 8 refs.

Consideration of the range of altitudes where supplemental oxygen can be effectively used to ensure that crewmembers and passengers will be protected from the detrimental effects of hypoxia. The characteristics of oxygen are outlined, and the continuous flow oxygen system, the diluter demand system, the pressure demand system are described. Regulations directing the use of oxygen are discussed. F.R.L.

A71-20715 **Pressure cabins and rapid decompression.** Richard W. Bancroft (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 337-363. 45 refs.

Discussion of pressurization of aircraft cabins, considered to be the most satisfactory method for providing the protection of an atmosphere. By properly controlling the pressure environment of the flyer, based on well defined physiologic requirements and limitations, the major hazards encountered at high altitudes can either be eliminated or dealt with effectively. Moreover, only by this means is it possible for manned vehicles to penetrate above the earth's atmosphere into the vacuum of space. Advantages and disadvantages of the pressure cabin are evaluated, and the effects of rapid decompression are described. Because of the delicate nature of the pulmonary tissue and the intricate system of airways for ventilation, the lungs are the most vulnerable part of the body during a rapid decompression. F.R.L.

A71-20716 **Emergency pressurization of aerospace crews.** Charles L. Wilson (USAF, Aeronautical Systems Div., Wright-Patterson AFB, Ohio). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 364-375. 49 refs.

Review of the various methods which have been used to date to provide a sufficient gaseous environment under an appropriate total pressure so that crew and passengers may function in comfort and safety. The first successful high altitude pressure suit developed by Haldane and Davis, and later efforts in the U.S., USSR, Germany, France, Italy, and other countires, are described. Intravehicular high altitude pressure suits and extravehicular normal and emergency life support subsystems are discussed. F.R.L.

A71-20717 **Emergency escape from aircraft and spacecraft.** James B. Nuttall. In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 376-417. 49 refs.

Discussion of the development of aerospace emergency escape devices and procedures, and related physical, biophysical, and physiologic principles. The several phases of development are related primarily to the increases in speed and altitude of flight operations which have marked the progress of man's venture into the atmosphere and space. Concepts proposed for in-orbit escape or rescue systems are briefly reviewed. M.M.

A71-20718 **Medical aspects of survival and rescue.** Spurgeon Neel and Roland H. Shamburek (U.S. Army, Office of the Surgeon General, Washington, D.C.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 418-441. 23 refs.

Discussion of specific medical problems to assist the practitioner of aviation medicine or the general physician in fulfilling his responsibilities relating to the survival of aircrews and their passengers. The topics considered include survival medicine, maintenance of health, the application of resuscitation principles to the survival situation, general management of injuries, protection from heat and cold injuries, survival illnesses, survival medicine requirements, and rescue organization and operations. M.M.

A71-20719 **The physical examination for flying.** Stanley Lutz, Jr. (USAF, Strategic Air Command, Offut AFB, Neb.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 442-447.

Discussion of criteria for the guidance of flight surgeons in performing medical examinations of flying personnel. Detailed suggestions are made for the examination of individual areas of the body and for the evaluation of historical documentation and clinical findings supported by laboratory evidence. It is pointed out that, in cases in which the flight surgeon is unable to determine the proper

disposition of a flyer following a periodic or special physical examination, he may refer the case, with complete medical data, to higher medical authorities for review and certification. M.M.

A71-20720 Cardiopulmonary aspects of aerospace medicine. Lawrence E. Lamb (Baylor University, Houston, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 448-513. 69 refs.

Discussion of the medical problems related to flying which are cardiovascular or respiratory in origin. The functions of the cardiovascular and respiratory systems are inextricably interwoven. Significant alterations in either system influence the function of the other. The respiratory system represents a point of oxygen supply, or storage, providing communication with the external gaseous environment. The circulatory system may be thought of as a transport mechanism, transporting oxygen from the lungs to the tissues to provide for metabolism, and transporting excess carbon dioxide from the cells to the lungs. The circulatory system is a transport mechanism for many other functions, including renal clearance, hepatic function, and transport of essential nutrients. Alteration in the normal exchange of gases may be acutely life-threatening. F.R.L.

A71-20721 Aerospace ophthalmology. James F. Culver (USAF, Office of the Surgeon General, Washington, D.C.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 514-533. 12 refs.

Discussion of the fundamentals of aerospace ophthalmology, a good working knowledge of which is essential in providing proper counsel to patients, in applying standards, and in selection of flying personnel. Knowledge of the anatomy of the eye is necessary as it relates to function or requires consideration in treatment. The anatomy of the eye and orbit is reviewed with this concept in mind, emphasizing those features of most direct concern to the flight surgeon. At present between 35 and 40% of aircrew are over 40, and aviation medical examiners are now becoming more concerned with such problems as presbyopia, macular degeneration, cataracts, corneal dystrophy, and glaucoma. F.R.L.

A71-20722 Aerospace psychiatry. Carlos J. G. Perry (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 534-549. 25 refs.

Review of pertinent personality and environmental factors to form a basis for an approach to psychiatric evaluations. Special attention is given to personality reactions which compromise the person's successful relations to his occupation, thus forming a rational basis for treatment and prevention of untoward reactions. The special situations of combat and space activities may be regarded as fields for the extension of basic premises wherein unique environmental factors come into play. F.R.L.

A71-20723 Clinical aspects of aerospace neurology. E. Liske (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 550-564. 37 refs.

Consideration of the important types of central nervous system disease among flying personnel. From the operational standpoint the most challenging conditions are head injury, loss of consciousness, headache, spatial disorientations, abnormal laboratory findings pertinent to the central nervous system, cerebral vascular problems, and visual complaints. Neurological examination for aircrew involves the neurological history, physical and cerebrospinal fluid examinations, radiographic and contrast studies, brain scans, and electroencephalography. Women pilots should be warned of the increased incidence of migraine-like symptoms and headaches attributed to oral contraceptive medication. Insecticide toxicity, alcohol, cerebral oxygen toxicity, and neurologic dysbarism are factors to be taken into account by the neurologist. F.R.L.

A71-20724 Psychologic aspects of aerospace medicine. Bryce O. Hartman (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 565-585. 13 refs.

Exposition of three main areas of psychologic interest in aerospace medicine. Approaches to selection and training are summarized in broad terms to assist the flight surgeon in communicating knowledgeably when questions concerning this area are posed. The remaining two areas (effects associated with the operational environment and global factors related to the psychologic status of the operational aircrewman) are discussed in detail. The psychologic aspects of manned space flight are also examined, largely in terms of applications of more general concepts. Emphasis is placed on factors affecting the aircrewman's capacity to perform useful work. F.R.L.

A71-20725 Health maintenance of aircrewmen. Robert A. Farmer (USAF, Office of the Surgeon General, Washington, D.C.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 586-601. 10 refs.

Evaluation of the features of preventive and clinical medicine as they affect maintenance of the health of aircrewmen. As the flying population is predominantly young, physically and mentally, the main task of the flight surgeon is to keep them healthy rather than cure serious disease or disability. The recognition of early signs and symptoms of illness leads to early diagnosis, treatment, and disposition with less hazard to the person and to flying safety. F.R.L.

A71-20726 Aerial transportation of patients. Harold V. Ellingson (Ohio State University, Columbus, Ohio). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 602-613. 12 refs.

Consideration of certain hazards and their implications in the presence of specific disorders, when patients are transported by air. Military aeromedical evacuation and aspects of the air transportation of civilian patients are reviewed. Among the potential hazards are motion sickness, decreased atmospheric pressure and oxygen tension, fatigue, inactivity, and dehydration. Attention is given to transport of patients with cardiovascular, pulmonary, gastrointestinal, hematological, central nervous system, psychiatric, and eye, ear, nose, and throat disorders. Special procedures may be necessary for patients with communicable diseases or those suffering from certain types of injuries. F.R.L.

A71-20727 * Epidemiology and hygiene of air travel. Hugh W. Randel (NASA, Washington, D.C.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 614-639. 35 refs.

Discussion of the application of the principles of preventive medicine to safeguard crew and passengers in flight and at route stops. The rapid and frequent movement of people and goods from widely separated parts of the world has produced new potentials for

disease dissemination with corresponding demands for new methods of control. Dissemination may be via infected persons, arthropods, or, more rarely, by rodents. International sanitary regulations and international quarantinable diseases (plague, cholera, yellow fever, smallpox, typhus, and relapsing fever) and the disinsectization, deratization, and disinfection of aircraft are considered. Suggestions are made concerning the sanitization of aircraft water supplies, sanitary food service, aircraft sewage disposal, air shipment of biologic material, and preventive measures for air travelers. F.R.L.

A71-20728 **Civil aviation medicine.** Stanley R. Mohler (FAA, Office of Aviation Medicine, Washington, D.C.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 640-663. 33 refs.

Discussion of civil aviation medicine practice, which requires an appreciation of the Federal civil aviation legislation concerning civil airmen, aircraft, flight facilities, and operations. It is suggested that aeromedical practitioners should recognize that because many human factors contribute to accidents, there is an irreducible number of accidents involving 'unreachable' or intractable persons. Research into the medical and emotional factors underlying general aviation accidents and appropriate follow-up by educational activities are essential ingredients in general aviation safety. F.R.L.

A71-20729 **Spacecraft atmospheres.** A. I. Karstens and B. E. Welch (USAF, Aerospace Medical Div., Brooks AFB, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 664-683. 60 refs.

Review of the background information which makes it possible to grasp the overall aspect of the problem of spacecraft atmosphere selection. The areas of major physiologic concern are discussed, as well as certain areas of crew safety as it relates to atmosphere selection. It is desirable to maintain carbon dioxide tensions below 8 mm Hg. Inert gases and dysbarism, the effect of atmosphere composition and pressure on heat balance, trace constituents, and fire hazards are considered. F.R.L.

A71-20730 **Food, water, and waste in space cabins.** John E. Vanderveen (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 684-696. 27 refs.

Discussion of procedures to provide suitable food, potable water, and to dispose of waste in a spacecraft environment. Current space feeding systems use three types of dehydrated foods; ready-to-eat bite-sized foods, rehydratable solid foods, and rehydratable powdered foods. Special consideration should be given to the vitamin and trace element needs of crewmen during long space missions. Waste management systems must collect waste, treat waste materials which are a potential hazard to the closed environment, and handle waste by storage, reclamation, or disposal. Various methods of recovering potable water are briefly described. F.R.L.

A71-20731 * **Medical experience in manned space flight.** Charles A. Berry (NASA, Manned Spacecraft Center, Houston, Tex.). In: Aerospace medicine (2nd edition). (A71-20701 08-05) Edited by H. W. Randel. Baltimore, Williams and Wilkins Co., 1971, p. 697-718. 13 refs.

Results of observations of men exposed to the spacecraft environment in both a confined and relatively unconfined state, and during both intravehicular and extravehicular activities for a number of hours. It appeared that the body systems attempted to accommodate to the less demanding weightless environment, and that they did so with changes which have, to date, produced no particular difficulties in flight. At the conclusion of flight, however, the body must reaccommodate to the 1 g environment, particularly with respect to the cardiovascular and musculoskeletal systems. None of these changes, however, was longlived, and the body reaccommodated to a 1-g environment within a 50-hr period postflight. F.R.L.

A71-20746 **Numerical analysis of electroencephalographic data.** G. Dumermuth (Zürich, Universität, Zurich, Switzerland), Peter J. Huber, B. Kleiner, and T. Gasser (Eidgenössische Technische Hochschule, Zurich, Switzerland). *IEEE Transactions on Audio and Electroacoustics,* vol. AU-18, Dec. 1970, p. 404-411. 35 refs. Research supported by the Schweizerischer Nationalfonds zur Förderung der Wissenschaftlichen Forschung, the Emil Barell-Stiftung der F. Hoffmann-La Roche zur Förderung der Medizinisch-Wissenschaftlichen Forschung, and the Fritz Hoffmann-La Roche Stiftung zur Förderung der Wissenschaftlichen Arbeitsgemeinschaften.

Correlation of electroencephalographic data recorded simultaneously from several different regions, although promising important insights into the nature of the EEG generating process had been impeded by the prohibitive cost of special equipment or computer time until the introduction of the FFT. Now one is able to analyze the statistical structure of an EEG and explore the biological meaning of its parameters. Power spectra of EEGs in mono- and dizygotic-twins are shown to illustrate how modern techniques can be used to assess the individuality of the spontaneous working EEG. Other examples show the possibility of investigating the relations between simultaneous recordings from different parts of the brain while awake and asleep. EEG analysis is still at its beginning, subject to the data gap between the gross activity from macroelectrodes and the electrical activity from microelectrodes at individual neurons. (Author)

A71-20803 **The aural reflex and masking.** H. McRobert, M. E. Bryan, and W. Tempest (Salford, University, Salford, Lancs., England). *Journal of Sound and Vibration,* vol. 14, Feb. 8, 1971, p. 299-305. 9 refs.

A refined technique is described, which provides a direct estimate of the part played by muscle reflex action in contralateral remote masking measurements at high masking signal sound pressure levels. It is shown that the amount of masking due to muscle action at the highest masking level employed (115 dB) is approximately 3 dB, and that there is only one muscle effect apparent in the results. The significance of this last result is outlined. (Author)

A71-20811 **Excretion patterns of air traffic controllers.** H. B. Hale, E. W. Williams, B. N. Smith (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), and C. E. Melton, Jr. (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 127-138. 13 refs.

Twenty air traffic controllers at O'Hare Airport were studied during two 5-day work periods, during the evening and morning shifts. Traffic density was maximal during the early part of the evening shift, and it was minimal during the early part of the morning shift. Stress appraisal was made by means of urinalysis, using a battery of determinations. Urinary catecholamines provided evidence of sympathoadrenomedullary hyperactivity during each work shift, with full reversal in the postevening recovery period and incomplete reversal in the postmorning recovery period. Relatively high urea output characterized tower work, suggesting high protein catabolism. In many respects the stress of O'Hare tower work exceeded the stress induced by long or difficult flying operations, a 10-hr test in a flight simulator, or prolonged decompression. M.M.

A71-20812 Effect of changes in illumination level on electro-oculography (EOG). A. Gonshor and R. Malcolm (McGill University, Montreal, Canada). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 138-140. 6 refs.

Changes occur in the corneo-retinal potential of the eye when the level of ambient illumination is altered. These changes can seriously affect electro-oculographic (EOG) records, a technique frequently used for measuring nystagmus. EOG calibrations were done on seven human subjects for periods during which the illumination was varied between normal room light, red light and total darkness. The time dependence of the observed variations was established and seen to be reasonably consistent between all subjects. For purposes of EOG calibration, no difference was found between a red light environment and total darkness. When experiments are to be performed in the dark, or with eyes closed, it is strongly recommended that subjects be dark adapted for at least 50 minutes prior to calibrating and recording eye position. (Author)

A71-20813 Urticaria following the sequential breathing of various inert gases at a constant ambient pressure of 7 ATA - A possible manifestation of gas-induced osmosis. G. Douglas Blenkarn, Charles Aquadro, Brian A. Hills, and Herbert A. Saltzman (Duke University, Durham, N.C.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 141-146. 12 refs. Research supported by the Link Foundation, the Smithsonian Institute, and the U.S. Navy; NIH Grants No. HE 07896; No. HE 5662.

An erythematous maculopapular eruption was observed over the skin of each of three subjects soon after switching their breathing mixture from normoxic helium to normoxic nitrogen at the same simulated depth of 200 feet. The lesions and other symptoms occurred before the subjects had experienced any decompression; although they appeared very similar to the cutaneous reactions frequently termed 'skin bends.' They were not observed upon skin within the head-tent and hence over those areas exposed to the breathing mixture at all times. The urticaria has therefore been attributed to some cause arising from the concentration gradient maintained between cutaneous blood and chamber atmosphere in the affected areas rather than considered a manifestation of decompression sickness. Gas-induced osmosis is discussed as a possible initiating mechanism and is shown to be quantitatively consistent with the clinical observations. (Author)

A71-20814 Lipid metabolism. I - Effects of pressure and gas composition on acetate-C 14 incorporation into liver lipids. G. M. Adams and S. J. Norton (North Texas State University, Denton, Tex.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 146-148. 6 refs. Research supported by the Robert A. Welsh Foundation; Contract No. N 0014-70-A-0222-0001.

The rate of liver lipid biosynthesis was studied as a function of pressure and partial pressure of oxygen. The partial pressure of oxygen was maintained at either 0.2 atm or 1.0 atm in the pressure range of 125 psig to 1000 psig. Liver slices obtained from male Sprague-Dawley rats were incubated in the test environments in Krebs-Ringer bicarbonate buffer containing sodium acetate-C-14. The results obtained indicate that at oxygen partial pressures in the region of 0.2 atm, the rate of incorporation of radiolabel into neutral lipid and phospholipid is pressure-independent; whereas, at oxygen partial pressures near 1.0 atm, the rate of incorporation is pressure-dependent. These results are discussed with respect to their possible metabolic relationships to decompression sickness. (Author)

A71-20815 Flashblindness recovery with and without protection in simulated flight conditions. Brian Ward, W. H. Bowie (Technology, Inc., San Antonio, Tex.), and William H. Cushman (USAF, Oculo-Thermal Section, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 149-152. 7 refs. USAF-DASA-supported research.

Recovery from foveal flash blindness was measured using aircraft instrument reading criteria. The assumption was made that the pilot must be able to have useful vision outside the aircraft at night while wearing any protective device. Recovery of visual function to the levels required for the reading of vital instruments was recorded (a) without protection, (b) with the use of a monocular eye patch, and (c) using a 2% transmission gold-coated visor and supplementary instrument illumination. Recovery time was shown to be least when the eye patch was employed. Suggestions are made as to the operational usefulness of these two different approaches to flashblindness protection. (Author)

A71-20816 Effect on sleep of a sleep period time displacement. Wilse B. Webb, Harman W. Agnew, Jr., and Robert L. Williams (Florida, University, Gainesville, Fla.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 152-155. 15 refs. Contract No. AF 41(609)-67-C-0028.

Five young adult males slept from 0800 to 1600 and did performance tasks from 1100 to 0700 for four days. Electroencephalogram records for the displaced sleep periods were scored for sleep stages and compared with baseline sleep (1100-0700). The time awake after sleep onset was slightly increased. The effect on the total relative amounts of the sleep stages was minimal. The temporal distribution of the amounts of stage 4 and REM sleep obtained per hour was clearly affected but the cyclical character of REM in terms of time between periods was maintained. We infer from our data that observed decrements in performance due to time displacements are not likely to be due to disturbed sleep per se. (Author)

A71-20817 Neuroendocrine and metabolic responses to intermittent night shift work. H. B. Hale, E. W. Williams, B. N. Smith (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), and C. E. Melton (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 156-162. 38 refs.

Six men were studied nightly during three cycles of unaccustomed alternating shift work, with each cycle including five days on a morning shift and five days on an afternoon-evening shift. Neuroendocrine and metabolic functions were appraised by means of urinalysis, using a battery of determinations. Evidence was obtained of work-associated neuroendocrine and metabolic hyperactivity which was most distinct during the first week of morning work. Indication was obtained that the rotating shift schedule itself, not just the night work, acted as a stressor. An adaptive change was evident, since there was a lessening of the physiologic disturbance with each return to morning duty. Morning work consistently induced elevations in urinary potassium, and there were compensatory reductions in urinary potassium in the postwork (sleep) periods. Morning work consistently caused relative hypophosphaturia, and as an aftereffect there was always relative hyperphosphaturia. M.M.

A71-20818 Role of CO2 in compressed-air narcosis. C. M. Hesser, J. Adolfson, and L. Fagraeus (Kungl. Karolinska Institutet; Royal Swedish Navy, Naval Medical Research Group, Stockholm, Sweden). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 163-168. 19 refs. Research supported by the Swedish Medical Research Council and the Swedish Delegation for Applied Medical Defence Research.

Analysis of compressed-air narcosis into nitrogen and carbon dioxide components by comparing the effects of a variety of CO2 partial pressures in air at 6.0 ATA with the same partial pressures in O2 at 1.3 ATA. The inspired O2 pressures were approximately 1.2 ATA in both conditions, whereas the inspired N2 pressures differed by 4.7 ATA. The parameters examined were alveolar CO2 tension and performance responses as determined by the Moede perceptual-

motor ability test and the Stroop decision stress sensitivity test. The results indicate that (1) the CO2 component is negligible at alveolar CO2 tensions below 40 mm Hg, and (2) high alveolar N2 and CO2 pressures are simply additive in their effects on performance. In contrast, when related to the inspired gas tensions, the changes in performance induced by raising the N2 and CO2 pressures simultaneously were greater than the arithmetic sum of the changes induced by either gas alone. (Author)

A71-20819 Behavioral effects of pargyline in primates. Glayde Whitney, Dan J. Craig, and W. Carey Hanly (Florida State University, Tallahassee, Fla.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 168-171. 17 refs.

Pargyline-HCl is a possible therapeutic agent for decaborane intoxication. Decaborane in low doses is known to have severe disruptive effects upon behavior. Pargyline, in order to qualify as a therapeutic agent, must not lead to severe behavioral disruption. In this study each of five monkeys was given one injection of a therapeutic dose of buffered pargyline. Behavior was evaluated for four days following injection on a concurrent free-operant avoidance schedule with two superimposed discriminated avoidance tasks. Pargyline resulted in significant changes in two of the indices measured. In no case were effects of sufficient magnitude to effect the efficiency of shock avoidance. The results indicate that the effect of pargyline on these behaviors is quantitatively slight in comparison to the effects of decaborane; suggesting that behavioral disruption from pargyline need not be a major consideration in decisions concerning therapeutic use of pargyline-HCl for decaborane induced behavioral intoxication. (Author)

A71-20820 Soyuz-9 flight, a manned biomedical mission. Boris N. Mandrovsky. *Aerospace Medicine,* vol. 42, Feb. 1971, p. 172-177. 57 refs.

In June 1970, the Soviet Union launched an orbital mission with two men on board, for the primary purpose of determining the effect of an 18-day exposure to spaceflight factors on human physiology and work capacity. The article, based on Soviet open sources, describes the daily work and exercise programs designed as prophylactic measures. Critical monitoring of the cabin atmosphere and physiological parameters suggests that new life support systems may have been tested. Preliminary findings indicate that despite some difficulties in readaptation to gravity, man can live and work in weightlessness for at least one month. Soviet authorities regard the Soyuz-9 flight as a major step towards the creation of long-term orbital stations with rotating spacecrews. (Author)

A71-20821 * Biosatellite post-flight experiment - Some effects of forced electrolyte imbalance in Macaca nemestrina. R. M. Durham, E. Campeau, and R. Ringler (California, University, Los Angeles, Calif.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 177-182. Contract No. NAS 2-2503.

Two specimens of Macaca nemestrina were placed in Biosatellite III flight type couches, fitted with urinary catheters and instrumentation for recording of EEG in deep and surface brain sites, ECG and deep brain temperature. The monkeys were given daily diuretics (Diuril) in sufficient quantities to produce pronounced diuresis and fed a diet deficient in sodium, potassium and chloride. By Day 3 of experimentation, both animals showed definite signs of electrolyte imbalance with quite rapid depletion of the three ions being monitored. The aim of this test was to determine whether an hypothesized electrolytic imbalance might have accounted for the abnormal physiological patterns observed in the Biosatellite III flight monkey. There were, however, no signs of gradually-increasing bradycardia nor were there any indications of a concomitantly expected gradually developing hypothermia. (Author)

A71-20822 Re-evaluation of emergency pressurization requirements for brief flights above 50,000 feet. Charles L. Wilson (USAF, Aeronautical Systems Div., Wright-Patterson AFB, Ohio). *(Aerospace Medical Association, Annual Scientific Meeting, 41st, St. Louis, Mo., Apr. 27-30, 1970.) Aerospace Medicine,* vol. 42, Feb. 1971, p. 183-185. 6 refs.

Among diverse aeronautical mission requirements there are those in which valid provisions for emergency aircrew pressurization are distinctly indicated. On the other hand, the various liabilities of emergency aircrew pressurization equipment compel a continuing reconsideration of the need for such devices. Experience suggests that there is merit in waiving the requirement for capsule and suit pressure devices when the flight time slightly above 50,000 feet is infrequent and brief. In the initial design of aircraft, it appears economical in weight, design, and cost to require a pressure suit retrofit capability in the event that the mission requirements later change. (Author)

A71-20823 Reliability and validity of the brief vestibular disorientation test compared under 10-rpm and 15-rpm conditions. Rosalie K. Ambler and Fred E. Guedry, Jr. (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 186-189. 7 refs. Army-supported research.

Experimental study of the feasibility of the 10-rpm speed basis for the previously developed Brief Vestibular Disorientation Test (BVDT) used to assess the subjects' Coriolis vestibular reaction produced by head movements in a chair rotating at a speed of 15 rpm. Tests were conducted in 157 flight students for BVDT at 10 rpm and at 15 rpm and compared. It is concluded that the 10-rpm BVDT is a feasible procedure. It produced results nearly comparable to the 15-rpm procedure with regard to reliability and validity while reducing the magnitude of disturbance to the test persons. Both procedures also significantly augmented the existing selection tests, and cost effectiveness was demonstrated. O.H.

A71-20824 Vision loss from windshield tinting in a night visual flying accident. B. A. J. Clark (Department of Supply, Defence Standards Laboratories, Melbourne, Australia). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 190-195. 23 refs.

A light aircraft with a tinted windshield crashed into a mountain in clear conditions on a moonless night. The pilot's visual capability within the last few minutes of flight is investigated by reference to published visual performance and sky luminance data, coupled with photometric measurements and visual and photographic observations of the crash site and of the cabin of a similar aircraft. It is concluded that cabin lighting could have affected the pilot's vision during the two minutes in which the mountain might have been recognizable, and that the windshield tinting could have caused a further important loss of vision. The method presented is applicable to other aircraft and pilots in the night flying situation. Although the estimates of visual performance should be checked in simulated night flying conditions, there is little doubt that windshield tinting represents an unnecessary hazard in night flying. (Author)

A71-20825 Physiological aspects of aircraft accident investigation. C. W. Sem-Jacobsen (EEG Research Institute, Oslo, Norway). *(USAFE Medical Service Training Conference, Berchtesgaden, West Germany, Sept. 8-11, 1970.) Aerospace Medicine,* vol. 42, Feb. 1971, p. 199-204. 12 refs.

Today's fighter, helicopter, bomber and transport planes, to name the major categories, are flown by pilots. Thus human factors has to be considered in the operational design and use of these planes, whether military or commercial. Inflight biomedical monitoring has improved our knowledge and understanding of the

pilots, his limitations and capabilities, as well as demonstrated the great variability in the human stress tolerance. Today it is possible to monitor pilots during operational missions, without interfering with the mission or the pilot's performance or comfort. Physiological monitoring during operational flights should therefore vigorously be pursued to substantiate and expand our knowledge in our steady on-going stride to improve effectiveness and reduce accidents. In case of sudden incapacitation, heart failures, etc., a dangerous signature in the data monitored may on line be used to trigger automatic warning devices. A 'Dead Man's Button' is currently under development as a one or two step alarm system. (Author)

A71-20826 **Pilot vision during final approach-and-landing in turbojet transport operations.** David A. Hodgson. *(Aerospace Medical Association, Annual Scientific Meeting, 41st, St. Louis, Mo., Apr. 27-30, 1970.) Aerospace Medicine,* vol. 42, Feb. 1971, p. 205-208.

This paper examines the critical role of pilot vision during the final approach-and-landing phase in turbojet transport operations. A brief look at the statistics for fatal turbojet transport accidents reveals that visual and other non-precision approaches remain a problem as a cause or contributory cause. An examination is made of the basic information requirements for a pilot during final approach under visual and instrument conditions, together with the decisions and actions associated with this information. Emphasis is given to the landing geometry for third-generation jets. Finally, some needed research pertaining to landing vision problems is identified. Areas of concern included information requirements, criteria for evaluating windshields, illusions, visual accommodation, and systemic physiological conditions. (Author)

A71-20827 **An automatic device for recording blood pressure.** Heriberto Fernandez and Robert Robinson, III (Bowman Gray School of Medicine, Winston-Salem, N.C.). *Aerospace Medicine,* vol. 42, Feb. 1971, p. 209, 210. NIH Grant No. NS-06655.

Description of a system designed for the automatic indirect measurement of blood pressure. This system makes possible the determination of digital or brachial blood pressure for detecting Korotkoff sounds. The device is useful for any situation in which prolonged blood pressure monitoring is necessary. It has been developed for use in the carotid compression test. M.M.

A71-20856 **Effect of magnetic fields on the sensitivity of bacteria to antibiotics.** S. A. Pavlovich. (*Elektronnaia Obrabotka Materialov,* May-June 1969, p. 76-81.) *Applied Electrical Phenomena,* May-June 1969, p. 230-234. Translation.

Bacterial strains were subjected to subinoculations under the action of constant (H = 6000 Oe), varying (H = 180 Oe), and pulsed (H = 22,000 Oe) magnetic fields. The sensitivity of the bacteria to 11 antibiotics was determined. It was found that the sensitivity of bacteria to antibiotics after prolonged subinoculation in a magnetic field can either increase or decrease. It is thought that the observed changes were caused principally by differences in the specific characteristics of the bacteria tested. The 'magnetization' of the bacteria was usually accompanied by a decrease in sensitivity to antibiotics. The largest changes in sensitivity were usually noted for cultures subinoculated in the pulsed magnetic field. G.R.

A71-21000 * **The retinal threshold gradient in the presence of a high-luminance target and in total darkness.** Richard F. Haines (NASA, Ames Research Center, Moffett Field, Calif.). *Perception and Psychophysics,* vol. 9, 1970, p. 197-202. 39 refs.

The retinal threshold was measured along the horizontal meridian for the dark-adapted eye in seven male subjects and for the same retinal region light-adapted by stray light from a small foveally fixated high-luminance target. The angular distance between the fovea and the intersection of the steep component with the shallow component of each threshold curve tended to shift toward the target's edge with an increase in target luminance. These data are interpreted as an indication that a dynamic neural mechanism is involved in producing the irradiation phenomenon. M.M.

A71-21025 # **Influence of Zond 5 space flight conditions on seeds, bulbs, and spiderwort (Vliianie uslovii kosmicheskogo poleta na stantsii 'Zond-5' na semena, lukovitsy i tradeskantsiiu).** N. L. Delone, E. M. Morozova, and V. V. Antipov. *Kosmicheskie Issledovaniia,* vol. 9, Jan.-Feb. 1971, p. 156-159. 12 refs. In Russian.

Effects of Zond 5 circumlunar flight on spiderwort (Tradescantia paludosa) plants, onion bulbs, and dry seeds of wheat, barley, peas, carrots, tomatoes, mustard, and pine. The germinating capacity was higher for pea seeds subjected to space flight than for control seeds. Growth stimulation was observed in onion bulbs, and the percentage of chromosome rearrangements increased for barley and pine seeds. Spiderwort roots did not exhibit a statistically reliable increase of chromosome rearrangements. T.M.

A71-21057 # **Automatic activity of myocardial fibers due to the variations in the ion conductivity of the membrane (Avtomaticheskaia aktivnost' miokardial'nykh volokon, vyzvannaia izmeneniiami ionnoi provodimosti membrany).** E. B. Babskii, S. Iu. Berdiaev, and V. A. Makarychev (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 195, Nov. 11, 1970, p. 496-498. 9 refs. In Russian.

Description of 64 experiments in a study of spontaneous activity in slices of the ventricle of a frog at 15 to 24 C in a Ringer solution with or without additions of tetraethylammonium chloride or ethylenediaminotetra acetate, using intracellular KCl-filled glass microelectrodes for potential measurements. Reduction of the concentration (or elimination) of the potassium ion in the Ringer solution did not effectuate a spontaneous activity of the fibrous membranes in these slices. On the other hand, action potentials were recorded when tetraethylammonium chloride was added to the Ringer solution, especially when the calcium ion was eliminated from the solution. It is concluded that simultaneous reduction of potassium conductivity and enhancement of sodium conductivity induce a spontaneous rhythmic activity of myocardial fibers. V.Z.

A71-21058 # **Activity of myocardial lysosomic enzymes in adaptation to high-altitude hypoxia and during cardiac disorders (Aktivnost' lizosomnykh fermentov miokarda pri adaptatsii k vysotnoi gipoksii i pri porazheniiakh serdtsa).** F. Z. Meerson, L. F. Panchenko, L. Iu. Golubeva, O. N. Liubimtseva, and N. G. Portenko (Akademiia Meditsinskikh Nauk SSSR; Vtoroi Moskovskii Meditsinskii Institut, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 195, Nov. 11, 1970, p. 499-502. 8 refs. In Russian.

Pressure chamber study of the effect of high altitude adaptation on the activity of free and bonded DNAase, RNAase, and phosphotase of the myocardium of male albino rats subjected periodically to low pressure corresponding to an altitude of 6000 m over a period of 40 days. The purpose of the study was to verify the hypothesis that a lysosome system periodically activated by hypoxia keeps acidic hydrolases in a latent state and thus prevents them from attacking the tissues. It was found that the hydrolase activity was higher by factors of 1.25 to 1.33 in experimental rats than in control rats. It is concluded that tissue damages caused by hypoxia may be linked with the activity of lysosomic enzymes. V.Z.

A71-21176 **Cardiac actions of a myocardial depressant factor isolated from shock plasma.** Alan R. Thalinger and Allan M. Lefer (Virginia, University, Charlottesville, Va.). *Society for Ex-*

perimental Biology and Medicine, Proceedings, vol. 136, Feb. 1971, p. 354-358. 22 refs.

Study of the effect of a highly purified preparation of a myocardial depressant factor (MDF) on the isolated perfused cat heart in order to differentiate the coronary vascular, dromotropic, and inotropic effects of MDF under conditions of controlled heart rate, coronary perfusion pressure, and cardiac preload. It was found that MDF has a direct negative inotropic effect on the isolated cat heart, and that this cardiotoxic effect is not a result of restriction of coronary flow, nor of the induction of arrhythmias. O.H.

A71-21189 # **Anomalous stereoscopic depth perception.** Whitman Richards (MIT, Cambridge, Mass.). *(Association for Research in Ophthalmology, Annual Meeting, Sarasota, Fla., May 1-5, 1970.) Optical Society of America, Journal,* vol. 61, Mar. 1971, p. 410-414. 14 refs. Contract No. AF 44(620)-69-C-0108.

Normal or complete stereoscopic depth perception is based upon at least two and probably three mechanisms. These mechanisms may be isolated by studying depth judgments made by stereoanomalous individuals who are unable to discriminate disparities over wide ranges of disparity. The nature of the reductions observed among these stereoanomalous observers suggests that at least three ranges of the disparity are sampled in order to create three different pools of binocular activity. The pools correspond roughly to crossed, near-zero, and uncrossed disparities. (Author)

A71-21227 **Detection performance in a simulated real-time airborne reconnaissance mission.** Bernard R. Bernstein (Honeywell, Inc., Minneapolis, Minn.). *Human Factors,* vol. 13, Feb. 1971, p. 1-9. 13 refs. Contract No. AF 33(615)-67-C-1501.

The ability of fifty-four subjects to find and designate tactical military targets on a cathode-ray-tube display was evaluated as a function of five experimental variables. Results indicated that probability of detection was sensitive to variations in target type, target-to-background contrast, and image rate of motion, or time available for search. False positive rate was affected only by available search time. Implications of these results for the design of real-time reconnaissance systems are discussed. (Author)

A71-21229 # **The visual effects of exposure to electroluminescent instrument lighting.** H. N. Reynolds (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). *Human Factors,* vol. 13, Feb. 1971, p. 29-40. 44 refs.

This report describes two experiments with electroluminescent aircraft instrument lighting. In the first experiment, white electroluminescent, green electroluminescent, and red incandescent lighting were compared for their effects on dark-adapted, scotopic absolute and acuity thresholds, using a simulated T-38 instrument panel for light exposure. In the second experiment, white, green, and yellow electroluminescent and red incandescent light were compared in terms of legibility of a transilluminated letter-acuity chart. Exposure to red incandescent lighting at 0.05 ft.-l. produced the lowest absolute and acuity thresholds, with white and green electroluminescent producing higher thresholds in that order. Although threshold differences between lighting colors were statistically significant, the absolute differences in visual sensitivity were small for practical purposes. Luminances required for equal legibility of transilluminated letters of various sizes were about the same for red incandescent, and white, green, and yellow electroluminescent lamps. Electrolumiscent lighting of aircraft instruments is discussed. (Author)

A71-21230 # **Psychophysical assessment of whole-body vibration.** Richard W. Shoenberger and C. Stanley Harris (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). *Human Factors,* vol. 13, Feb. 1971, p. 41-50. 10 refs.

Study of the mechanical, physiological, and psychological response of man to diverse sinusoidal whole-body vibration stimuli in the Z-axis - i.e., with the motion directed along the longitudinal axis of the body. Using the methods of magnitude estimation and intensity matching, curves of equal subjective vibration intensity were constructed over the frequency range from 3.5 to 20 Hz. Twenty subjects made magnitude estimations of the intensity of variation at 0.08, 0.16, 0.24, 0.40, and 0.56 g(Z) with vibration at 0.32 g(Z) serving as a standard. These intensities were judged at each of the frequencies of 3.5, 5, 7, 9, 11, and 20 Hz. For each frequency, the results were plotted as straight-line functions on log-log graphs of subjective intensity against physical intensity. The slopes of the lines varied as a function of frequency, the steepest slope occurring at 5 Hz. Additional experiments were conducted in which ten subjects matched the intensity of 9-Hz vibration at 0.6, 0.36, and 0.56 g(Z) with vibration at each of the other six above frequencies, and ten subjects made similar equality judgments against 9-Hz vibration at 0.08, 0.26, and 0.46 g(Z). Equal intensity curves derived from the magnitude estimation data show the same general shape and comparable levels as corresponding curves determined experimentally using the intensity matching procedure. O.H.

A71-21231 * **Recreational preferences in potential space crew populations.** Edward W. Karnes, J. Kirby Thomas, and Leonard A. Loudis (Martin Marietta Corp., Denver, Colo.). *Human Factors,* vol. 13, Feb. 1971, p. 51-58. Contract No. NAS 8-24000.

Leisure-time preferences were surveyed in three populations which are potential sources for future space crews. A questionnaire was designed to provide rating scale measures of preferences for various spacecraft recreational equipment items, leisure-time activity categories, content within activity categories, and various kinds of snack items. The questionnaire was administered to samples from three populations: test pilots, military pilots, and aerospace engineers and scientists. Statistical analyses of the obtained data indicated that preferences for types of spacecraft leisure-time equipment were similar in the three populations. However, certain significant differences were obtained among the populations in terms of the amount of time spent in earthbound leisure-time activities. Implications for space mission off-duty concepts are discussed. (Author)

A71-21232 **Measuring the physiological effects of cooling.** Paul Webb (Webb Associates, Yellow Springs, Ohio). *(Symposium on Individual Cooling, Kansas State University, Manhattan, Kan., Mar. 17, 18, 1969.) Human Factors,* vol. 13, Feb. 1971, p. 65-78. 25 refs.

Discussion of several physiological measurements with the purpose of assessing what measurements are meaningful in determining the physiological effect of cooling. The physiological effect of wearing both air and water cooling garments developed for men exposed to severe external heat loads or working hard and producing large amounts of metabolic heat is considered. It is shown that such an effect can be stated in terms of reduced physiological strain on the cooled vs the uncooled individual. To assess the value of a particular cooling approach, subjects were put into thermally stressful conditions, cooling was applied, and measurements were taken. The following measurements are described and illustrated with experimental data: tolerance times to a physiological or performance end point; heart rate; sweat rate; temperatures in body compartments, especially the skin, core, and muscle mass; and heat flows to the cooling garment. It is found that all of these measurements are useful in various ways, particularly those dealing with heat storage and rates of heat removal. O.H.

A71-21311 # **Protection against ionizing radiation from external sources: A report by Committee 3 of the International Commission on Radiological Protection.** Oxford and New York, Pergamon Press (ICRP Publication No. 15), 1970. 40 p. 20 refs. $3.75.

Recommendations on the safe use of ionizing radiation and radioactive substances, regarding the external exposures that will occur from this use. The radiation sources that are used for nonmedical purposes are often similar to those that are used in medical diagnosis or therapy, and the basic precautions to protect the staff are essentially the same irrespective of the use. By utilizing the practices outlined, it should in general be possible to maintain radiation doses below the maximum permissible levels recommended, and to provide adequate protection to the patient. The current maximum permissible doses are summarized in an appendix. It is stressed that recommendations for the installation and operation of X-ray and other equipment or for dealing with radioactive materials are not in themselves sufficient to guarantee adequate protection. F.R.L.

A71-21330 **Mathematical problems of electrocardiographic monitoring.** L. Julian Haywood, Robert E. Kalaba, V. K. Murthy, and John M. Richardson (Southern California, University, Los Angeles, Calif.). In: Hawaii International Conference on System Sciences, 4th, University of Hawaii, Honolulu, Hawaii, January 12-14, 1971, Proceedings. (A71-21312 08-10) Conference sponsored by the University of Hawaii and the U.S. Army. Edited by Shu Lin. North Hollywood, Calif., Western Periodicals Co., 1971, p. 241, 242. 5 refs.

Consideration, in terms of patient care, of the unique problems presented to the physician when monitoring ECG signals on-line and in real time. Solutions of the problem of the ideal monitor involve mathematical, statistical, and bioengineering considerations. Examples of problems encountered in the ongoing analysis of events in a time series are given, and their practical and theoretical solutions are discussed. F.R.L.

A71-21371 **Theory of transparency of the eye.** G. B. Benedek (MIT, Cambridge, Mass.). *Applied Optics,* vol. 10, Mar. 1971, p. 459-473. 18 refs. Research supported by the Retina Foundation and the Sarah Reed Fund for Research on Diseases of the Eye.

Study of the turbidity of the eye in relation to the microscopic spatial fluctuations in the eye's index of refraction. Proof is given for the principle that light is scattered only by those fluctuations in the index of refraction whose wavelengths are larger than one-half of the wavelength of light in the medium. A physical explanation is presented for the complex mathematical analysis of the relative positions of fibers in corneal stroma by Hart and Farrell (1969), which shows how their main numerical results can be easily approximated. A theoretical computation is offered for the turbidity of a swollen pathologic cornea, numerically supporting the view that lakes present in the electron micrographs are responsible for the opacity of these edematous corneas. Finally, a calculation is developed for the turbidity of the cataractous lens under the assumption that the opacity is produced by high molecular weight protein aggregates whose index of refraction differs from that of the background proteins. This calculation provides a quantitative relationship between the turbidity of the lens and the molecular weight, index of refraction, and concentration of such aggregates. M.V.E.

A71-21446 # **A method of automatic recording of the results of EEG amplitude-spectral analysis on a digital computer (O metodike avtomaticheskoi registratsii rezul'tatov amplitudno-spektral'nogo analiza EEG na tsifropechatnoi mashine).** K. Sh. Nadareishvili (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia,* vol. 60, Nov. 1970, p. 429-431. In Russian.

Description of a simple method of recording on a computer the peak values of the output signal potentials of the Japanese EA-201 electroencephalogram analyzer. An arrangement is described which makes it possible to perform automatic measurements of the absolute value of the voltage of each peak with digital readout of the measurement results and simultaneous marking of the termination of an analysis epoch. The manner in which the problem of marking the beginning and end of an analysis epoch on the computer was solved is outlined. A.B.K.

A71-21750 * **Stress induced osmotic changes as a function of deprivation state.** Edward Deaux (Antioch College, Yellow Springs, Ohio) and Jan W. Kakolewski (Fels Research Institute, Yellow Springs, Ohio). *Psychonomic Science,* vol. 22, Feb. 10, 1971, p. 171, 172. 7 refs. NSF-NASA-supported research; NIH Grant No. M-4529.

A series of experiments determined the relationship between the internal osmotic balance of rats and the direction and magnitude of stress-induced, body-fluid osmolality (BFO) changes. The state of BFO was varied by food or water deprivation. Two forms of stress were applied: rotation or sham stomach loading. The results indicate that animals deprived of food or water failed to respond to rotation, but deprivation conditions had no influence on the BFO change induced by sham stomach loading. Although the change of BFO in response to nonspecific, stressful stimuli appeared to be in the hyperosmotic direction, the magnitude of BFO increase was a function of the severity of stress and the state of BFO. (Author)

A71-21788 # **Dynamics of formation and length of retention of trace processes in humans during ontogenesis (Dinamika formirovaniia i dlitel'nost' khraneniia sledovykh protsessov u cheloveka v ontogeneze).** L. G. Voronin, V. F. Konovalov, and I. S. Serikov (Akademiia Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 195, Dec. 21, 1970, p. 1468-1471. 13 refs. In Russian.

Determination of the length of retention of traces of so-called indifferent stimuli causing a number of somatic and vegetative components of the orientation reflex. The study was performed on groups of children ranging from 5 to 17 years of age. The indicator used for the length of trace retention was the skin-galvanic reaction. It is found that the rate of formation and the dynamics of trace reactions are different in different age groups. In the younger children the skin-galvanic reaction 'to time' arises faster than in the older subjects. In the younger children the response reactions to the stimuli are more stable and take longer to extinguish. The younger children also show a greater degree of stimulus trace retention by the nervous system. It is concluded that time interval estimation in younger children occurs via a phasic reaction, while in the older subjects it occurs via an exact matching of the tonic wave of the skin-galvanic reaction to the length of the interval between stimuli. An attempt is made to verify this conclusion on the basis of a study of trace retention in cerebrosclerosis patients and chronic alcoholics. A.B.K.

A71-21793 # **Influence of energy metabolism inhibitors on the suppression of the automatism of ventrical controllers by high-frequency stimulation (Vliianie ingibitorov energeticheskogo obmena na podavlenie avtomatii voditelei ritma zheludochkov serdtsa vysokoi chastotoi vozbuzhdenii).** E. B. Babskii and S. K. Saidkarimov (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 195, Dec. 11, 1970, p. 1233-1236. In Russian.

The influence of the deactivation of single energy-metabolism events on the phenomenon of suppression of automatism is studied. Experiments were performed with rabbit hearts isolated according to Langendorf. Automatism was suppressed by electric stimulation at frequencies twice the frequency of spontaneous ventricular stimulation. The results indicate that suppression of automation may be attributed to the relatively small intensity of active ion transport intrinsic to the potential rhythm controllers. This intensity is insufficient for restoring the positive K and Na ion concentration gradients on either side of the cellular membrane, after disturbance of these concentrations by high-frequency stimulation. V.P.

A71-21794 # **Functional organization of the efferent visceral field of the cerebellum (O funktsional'noi organizatsii efferentnogo vistseral'nogo polia mozzhechka).** M. I. Talan (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 195, Dec. 11, 1970, p. 1245-1248. 17 refs. In Russian.

The possible existence of efferent zones similar to those described by Beller (1965) for the anterior limbic cortex, in the cerebellar cortex. The experiments were performed with intravenously anesthetized cats. A kymograph was used to record the peristalsis of the duodenum, the motor activity of the urinary bladder, and the blood pressure. The cerebellum cortex was stimulated electrically through an opening made by trepanation of the occipital bone. The results indicate that stimulation of the caudal portion of the vermis cerebelli produces distinct changes in the peristalsis of the duodenum, the motor activity of the urinal bladder, and the blood pressure level, the stimulating and inhibiting nature of the reactions being independent of the stimulating-current parameters. V.P.

A71-21797 # **Effect of cystamine on chromosomal aberrations of lymphocytes of human peripheral blood during local fractionated gamma irradiation (Vliianie tsistamina na khromosomnye aberratsii limfotsitov perifericheskoi krovi cheloveka pri mestnom fraktsionirovannom gamma-obluchenii).** L. B. Berlin (Voenno-Meditsinskaia Akademiia, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 195, Dec. 1, 1970, p. 998-1000. 17 refs. In Russian.

Study of the effect of cystamine on the frequency of chromosomal aberrations in the lymphocytes of the peripheral blood of women suffering from tumors of the uterus. It is found that, while cells with aberrations amount to only 1.5% in unirradiated patients, an increase up to 2.7% occurred in patients subjected to a single local irradiation of 500 rad without having been given cystamine beforehand. However, in patients who had received cystamine prior to irradiation at the same dose the number of cells with aberrations increased only to 1.6%. It is concluded that the number of cells with aberrations in patients who had taken cystamine before each irradiation reliably differs from the number of aberrant cells in patients who had not been given cystamine. This conclusion is confirmed by the results of a regression analysis. A.B.K.

A71-21816 **Airport noise, sonic booms, and public health.** Alexander Cohen (U.S. Public Health Service, Bureau of Occupational Safety and Health, Washington, D.C.). In: Society of Automotive Engineers and U.S. Department of Transportation, Conference on Aircraft and the Environment, Washington, D.C., February 8-10, 1971, Proceedings. Part 1. (A71-21811 08-34) New York, Society of Automotive Engineers, Inc., 1971, p. 42-55. 60 refs.

Different adverse effects of noise are treated in the context of defining public health problems posed by exposure to operational aircraft noise around airports and to sonic booms. These aircraft sounds can affect states of social and mental well-being through masking speech communication or other desired sounds, disrupting behavior and subjective feelings, and interfering with one's needs for privacy, rest, and sleep. Such adverse effects fall short of what may be called mental disorders but the long-term cumulative impact of these noise disturbances remains to be fully evaluated from the standpoint of mental as well as physical health. With regards to the latter, there may be some potential risk of hearing loss caused by the maximum current aircraft noise exposures in neighborhoods bordering airports. Evidence for other physical ailments connected with exposures to aircraft sounds intruding in airport communities is suggestive at present and will require more medical verification. The most pressing research needs are for retrospective and prospective studies of the physical and mental health status of communities subjected to different amounts of aircraft noise and sonic booms. (Author)

A71-21817 **Noise Exposure Forecasts as indicators of community response.** William J. Galloway (Bolt Beranek and Newman, Inc., Cambridge, Mass.). In: Society of Automotive Engineers and U.S. Department of Transportation, Conference on Aircraft and the Environment, Washington, D.C., February 8-10, 1971, Proceedings. Part 1. (A71-21811 08-34) New York, Society of Automotive Engineers, Inc., 1971, p. 56-63. 5 refs.

It is pointed out that the concept of Noise Exposure Forecasts involves a methodology for obtaining a single number rating of the cumulative noise produced in the vicinity of an airport by aircraft operations. A number of computational methods have been developed in different countries. Each method accounts in lesser or greater detail for the noise produced by each event and provides rules for summing the contributions of a succession of events. Relationships between noise exposure and community response in residential areas have been developed for each index. The encouraging aspect, when the studies are compared for a set of specified operations, is their convergence in relating noise exposure to average community response. G.R.

A71-21839 **Neuroelectric signal analysis using nuclear instrumentation techniques.** A. D. Carlson (New York, State University, Stony Brook, N.Y.) and B. Souček (Brookhaven National Laboratory, Upton, N.Y.). *(Institute of Electrical and Electronics Engineers, Nuclear Science Symposium, 17th, New York, N.Y., Nov. 4-6, 1970.) IEEE Transactions on Nuclear Science,* vol. NS-18, Feb. 1971, pt. 1, p. 41-45. 10 refs. AEC-supported research.

A real-time system for nerve spike recognition and separation has been developed. The system is based on the techniques, commonly used in nuclear instrumentation, which have been adapted here for biological signal measuring and processing. Techniques used are signal shaping and optimum noise filtering; pulse peak stretching; peak sampling; pulse shape discrimination and multichannel pulse height analysis. Spectra for nerve pulse heights of the cockroach are shown, for the case of spontaneous activity as well as for evoked activity (e.g. for a living object exposed to radiation wind or light). Similarities and contrasts between nuclear and biomedical signal analysis are discussed. (Author)

A71-21887 **Cardiovascular observations on Tarahumara Indian runners - The modern Spartans.** Dale Groom (Oklahoma, University, Oklahoma City, Okla.). *American Heart Journal,* vol. 81, Mar. 1971, p. 304-314. 7 refs.

Description of results of cardiovascular investigations carried out on Tarahumara Indian endurance runners, who reside in an isolated area of mountains encompassing the continental divide of northern Mexico. The most remarkable finding is that the human cardiovascular system can be conditioned to withstand the extremes of endurance demonstrated in Tarahumara races of 100 miles and more. Apparently the limiting somatic factor in these marathons is skeletal

rather than cardiac muscle. Contrary to traditional belief, no enlargement in these 'athlete's hearts' was evident on physical examination or X rays. Also no abnormality was seen in EKGs either before or immediately after a 28-mile race. M.M.

A71-21888 Backward transmission of the left atrial V wave and premature pulmonary valve closure. Donald A. Spring and George G. Rowe (Wisconsin, University, Madison, Wis.). *American Heart Journal,* vol. 81, Mar. 1971, p. 327-334. 13 refs. Research supported by the Wisconsin Heart Association; NIH Grants No. HE-07754; No. HE-14,928; No. HE-5364; No. HE-5738.

Discussion of the concept that premature pulmonary valve closure may result from severe mitral insufficiency. Five patients with severe mitral valve insufficiency had pulmonary arterial mean pressure which exceeded simultaneously recorded right ventricular mean systolic pressure. A high delayed pressure wave was present in the pulmonary artery of these subjects, and in four subjects the pulmonary arterial pressure rose above the right ventricular pressure. In two of the five, the timing and morphology of this pressure wave were suggestive of early closure of the pulmonary valve by retrograde transmission of the left atrial 'V' wave through the pulmonary vessels. The roles played by pulmonary arteriolar resistance, compliance of the left atrium and pulmonary vasculature, the state of left ventricular function, and amount of mitral regurgitation in the production of this phenomenon are discussed. M.M.

A71-21889 Precordial palpation. John F. Stapleton and Bertron M. Groves (Georgetown University Hospital, Washington, D.C.). *American Heart Journal,* vol. 81, Mar. 1971, p. 409-427. 25 refs.

Discussion of features, criteria and significance of the precordial palpation technique. It is pointed out that informative palpation requires careful attention to such movement characteristics as location, timing, duration, and amplitude. Preliminary inspection is indispensable as are simultaneous auscultation and palpation. The apical impulse is normally a left ventricular pulsation. Abnormality usually indicates left ventricular enlargement. Volume-overloading conditions, such as aortic regurgitation, cause a brisk, systolic impulse which is displaced to the left. Pressure-overloading conditions, such as aortic stenosis, cause less displacement but lead to a more sustained systolic impulse. Occasionally, the impulse of left ventricular pressure overload extends to the lower, left parasternal area. M.M.

A71-21937 # Central mechanisms for regulation of the acidic-alkaline equilibrium in ontogenesis (Tsentral'nye mekhanizmy reguliatsii kislotno-shchelochnogo ravnovesiia v ontogeneze). E. L. Golubeva (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Akusherstva i Ginekologii, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk,* vol. 1, Apr.-June 1970, p. 3-25. 128 refs. In Russian.

Data available in the literature and some results of original research are used to describe the functional system sustaining acidic-alkaline equilibrium in the organism. Attention is given to the role played by the mesencephalic nucleus of the trigeminal nerve in the mid-brain reticular formation. The heterochronic development of these structures during the intrauterine life period is described. The origin of pulmonary respiration and further heterochronic development of the entire respiratory system in post-natal ontogenesis is outlined. T.M.

A71-21938 # Functions of the central nervous system under conditions of hyperoxia (Funktsii TsNS v usloviiakh giperoksii). N. A. Agadzhanian and L. V. Kaliuzhnyi (Ministerstvo Zdravookhraneniia, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk,* vol. 1, Apr.-June 1970, p. 26-40. 82 refs. In Russian.

Survey of experimental studies on the influence of high oxygen concentrations (at normal and elevated pressures) on the functional state of the central nervous system (CNS). Original experimental data are given for the influence of 96% and 53% oxygen mixtures (at 1 atm) on the following CNS indices in rabbits: (1) variation in the conditional food-surging reflex with parallel change of the EEG during free movement of the animal, (2) change in the EEG reactions to low and high frequencies of rhythmic optical stimulation, (3) change in the self-stimulus and evasion reactions, and (4) change in the evoked potential of the visual cortex region in response to light flashes. The changes in the CNS functions caused by hyperoxia are shown to be dependent on the partial oxygen pressure, duration of exposure to the hyperoxic medium, and the atmospheric pressure. T.M.

A71-21939 # Significance of the change of cardiac output in regulation of the organism's oxygen regime during hypoxia (O znachenii izmenenii serdechnogo vybrosa v regulirovanii kislorodnogo rezhima organizma pri gipoksii). N. V. Lauer and M. M. Koganovskaia (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Uspekhi Fiziologicheskikh Nauk,* vol. 1, Apr.-June 1970, p. 41-55. 132 refs. In Russian.

Mechanisms responsible for cardiac output variations are described, and attention is given to the role played by these variations in regulation of the arterial oxygen transport during the transient state induced by hypoxia. It is argued that the adaptation process does not involve maintenance of the initial arterial oxygen transport level by an increased cardiac output, but occurs in a more economical manner based on a redistribution of blood flows and a more economical utilization of the blood's oxygen by depletion of oxygen reserves in the mixed venous blood. T.M.

A71-21940 # Neurophysiological aspects of psychic effects (O neirofiziologicheskikh aspektakh psikhicheskikh iavlenii). N. P. Bekhtereva (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Uspekhi Fiziologicheskikh Nauk,* vol. 1, Apr.-June 1970, p. 56-70. 76 refs. In Russian.

Survey of present knowledge on the neurophysiological mechanisms of psychic processes as obtained from direct studies of the physiology of the human brain. Therapeutic and diagnostic studies of patients were conducted over many years by a complex method including (1) observations of the dynamics of physiological indices in the brain during psychic activity, and (2) observations of the dynamics of spontaneous and evoked psychic processes during the application of local electric stimuli in the brain. Data gained from these studies lead to the conclusion that the brain's participation in psychic process occurs by way of a cortical-subcortical structurally functional system with interconnections of differing significance. Possible new developments in psychotherapy based on recent discoveries are discussed. T.M.

A71-21941 # Important aspects of complex studies of the visceral-system regulation processes in the human organism (Vazhneishie aspekty kompleksnykh issledovanii protsessov reguliatsii vistseral'nykh sistem organizma cheloveka). V. V. Parin and R. M. Baevskii. *Uspekhi Fiziologicheskikh Nauk,* vol. 1, Apr.-June 1970, p. 100-112. 42 refs. In Russian.

Investigation of problems associated with complex studies of the visceral systems in the human organism during manual labor and during adaptation to environmental conditions. Such research involves the use of multichannel biotelemetric systems for gathering information and requires digital computers for data processing. Recent scientific and technological advances led to increased intellectual and emotional stress levels in man with a significant

reduction of physical loads. This causes an ever increasing disproportion between nervous-psychological and vegetative-visceral processes, subsequently resulting in disturbed control functions of the organism. The problem of 'norms' and the study of limits to normal variation of functional indices under different conditions become increasingly important. Diurnal periodicity of functions and temporal synchronization between different processes are also increasingly important questions. Attention is given to the hierarchy of organizational levels in a living system involving structure, energy, information, and time. The inclusion of a time category in studies of different control processes makes it possible to apply mathematics to the analysis and provides an approach for their prediction. Mathematical methods of analyzing the cardiac rhythm and the circadian rhythms of certain physiological parameters are considered for purposes of illustration. T.M.

A71-21942 # **Problems of the physiology of olfaction (Voprosy fiziologii obonianiia).** A. V. Minor (Akademiia Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk,* vol. 1, Apr.-June 1970, p. 113-134. 168 refs. In Russian.

Survey of recent advances in studies of the physiology of olfaction in vertebrates. The role of olfaction in orientation, sexual behavior, and population control is described. Emphasis is placed on electrophysiological studies of the olfactory system. The electrical activity of olfactory receptor cells is outlined, with explanations of electroolfactograms, generating potentials, and the pulse characteristics of individual receptors. Evoked potentials in the olfactory bulb during electrical stimulation are described, together with the response characteristics and the functional properties of bulb neurons. Current views on the inhibitory mechanisms in the olfactory bulb are explained, and special attention is given to the centrifugal regulation of bulb activity. T.M.

A71-21955 # **Functional disturbances of the gastrointestinal tract in subjects working in a microwave field (Funktsional'nye narusheniia zheludochno-kishechnogo trakta u rabotaiushchikh v SVCh pole).** F. D. Tikhonov. *Voenno-Meditsinskii Zhurnal,* Dec. 1970, p. 44-46. In Russian.

Study of the state of the gastrointestinal tract in subjects working for long periods of time in the presence of a microwave field of small intensity (centimeter and decimeter ranges). A wide range of disturbances was noted in the subjects examined, all of whom were radar specialists. Among the disturbances detected were dyspeptic disorders, edema of the gums, bleeding gums, alteration of the sense of taste and reduction of taste sensitivity, alteration of the acidity of the gastric juice, and a reduction in the tonus and evacuator function of the stomach. A.B.K.

A71-21956 # **Determination of vestibulovegetative stability from nystagmus data (Opredelenie vestibulo-vegetativnoi ustoichivosti po dannym nistagma).** I. A. Sidel'nikov. *Voenno-Meditsinskii Zhurnal,* Dec. 1970, p. 49-51. In Russian.

Study of the effect of linear accelerations on the otolithic and vestibular apparatus in subjects with different vestibular stabilities. The purpose of the study was to determine the nature of the nystagmic reaction to a stop stimulus after cumulative action on the otolithic apparatus of linear accelerations alternately varying in sign. Data obtained from tilt table tests confirm the presence of two types of changes in the nystagmus intensity during the action of linear accelerations on the otolithic apparatus; in vestibularly stable subjects activation of the nystagmus indices occurs, while in unstable subjects inhibition of these indices occurs with activation of the vestibulovegetative motion sickness syndrome. A.B.K.

A71-21957 # **Use of oxygen in decompression and therapeutic recompression of divers (Ispol'zovanie kisloroda pri dekompressii i lechebnoi rekompressi vodolazov).** B. A. Kheifets-Tetel'baum and E. E. Rozov. *Voenno-Meditsinskii Zhurnal,* Dec. 1970, p. 52-54. 6 refs. In Russian.

Analysis of the effectiveness of oxygen in the treatment of divers suffering from decompression sickness. It is noted that the regulation exposure time at maximum pressure is not always sufficient for reverse development of gas bubbles in the blood and tissues of the organisms. It is therefore recommended that during the stage of pressure reduction in therapeutic treatment the divers breathe oxygen instead of atmospheric air for two to three hours. Such treatment not only accelerates the elimination of indifferent gas dissolved in the tissues, thereby providing safer conditions of recompression, but makes it possible to decrease the length of the therapeutic treatment. A case of successful use of oxygen in the treatment of decompression sickness is described. A.B.K.

A71-21958 # **Dependence of dark adaptation on climatic factors (Zavisimost' temnovoi adaptatsii ot klimaticheskikh faktorov).** V. M. Vinokurenko. *Voenno-Meditsinskii Zhurnal,* Dec. 1970, p. 62, 63. In Russian.

Results of a year-long study of the adaptive ability of the organ of vision as a function of climatic factors in subjects not natives of the region living under Arctic conditions. No appreciable fluctuation in adaptive ability among subjects of various age groups was noted during the course of the year, although a slight decrease in the investigated indices was noted in subjects over 30 and in subjects suffering from stomach ulcers, chronic gastritis, blepharoconjunctivitis, chronic alcoholism, etc., during fall and winter months. It is recommended that persons suffering a decrease in dark adaptation under conditions of extreme cold be treated with vitamin C and vitamin B complex to restore their adaptive ability. A.B.K.

A71-21959 # **A case of acute hypoxic hypoxia (Sluchai ostroi formy gipoksicheskoi gipoksii).** A. V. Kobakhidze and I. G. Anoshkin. *Voenno-Meditsinskii Zhurnal,* Dec. 1970, p. 66. In Russian.

Description of the symptoms experienced by a pilot subjected to acute oxygen deficiency at high altitude. The pilot, unconscious, was brought to the field hospital, where he was made to breathe pure oxygen and was given various medications to restore his lagging pulse. He then experienced acute nausea and chills. His condition was serious, and he was hospitalized for 20 days. The importance of timely explanation of the conditions of occurrence and prevention of hypoxic hypoxia to flight personnel is stressed. A.B.K.

A71-21960 # **Rheoencephalographic study of cerebral hemodynamics during mental work (Reoentsefalograficheskoe izuchenie mozgovoi gemodinamiki v protsesse umstvennogo truda).** I. P. Markhasina (Sverdlovskii Institut Narodnogo Khoziaistva, Sverdlovsk, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 70, Dec. 1970, p. 9-11. In Russian.

A rheoencephalographic study of healthy subjects engaged in mental work showed left-hemisphere hyperemia concurrently with vessel-filling period extension; in the temporal regions, the inflowing blood volume expands. Toward the work day's end, these changes are replaced by disturbances in the volumetric regulation of blood flow in the temporal regions. M.V.E.

A71-21961 # **Functional condition of the temperature analysor under different ambient temperatures (O funktsional'nom sostoianii temperaturnogo analizatora pri razlichnoi temperature**

okruzhaiushchei sredy). N. A. Kokhanova (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) and P. N. Zhilin (Nauchno-Issledovatel'skii Institut Gigieny, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 70, Dec. 1970, p. 12-14. 10 refs. In Russian.

Temperature threshold discrimination changes and alterations of the latent period of sensomotor reaction to thermal stimulation were investigated in children during summer vacation toward determining the functional state of the temperature analysor. An inverse correlation was found to exist between both the latent period and the temperature threshold discrimination on the one hand and the ambient temperatures on the other. These findings are indicative of the continuous fluctuations in the functional condition level of the temperature analysor instrumental in maintaining the organism in proper balance with external thermal conditions. M.V.E.

A71-21962 # **Data for the study of the effector structure of vascular reactions (Materialy k izucheniiu effektornoi struktury sosudistykh reaktsii).** V. L. Fantalova (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 70, Dec. 1970, p. 15-18. In Russian.

The vascular component in an orientation reaction of peripheral vessels to sound was investigated by means of a plethysmogram and rheogram of two adjacent fingers simultaneously recorded, as well as with the aid of a rheoencephalogram for brain vessels. It was found that the orientation reaction accompanying hyperemia drops in peripheral vessels may be effected under leading participation of various mechanisms - e.g., a decrease in arterial blood inflow and an increase in venous blood outflow. In the light of rheoencephalogram indications, the behavior of cerebral vessels appears characterized by a certain autonomy, as well as by features common to peripheral circulation. M.V.E.

A71-21963 # **Gas exchange and heat regulation activity of muscles under environmental oxygen deficiency (Gazoobmen i termoreguliatsionnaia aktivnost' myshts pri nedostatke kisloroda v okruzhaiushchei srede).** A. G. Zhironkin and G. V. Troshikhin (Akademiia Nauk SSSR, Laboratoriia Fiziologii Dykhaniia, Leningrad, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 70, Dec. 1970, p. 26-29. 17 refs. In Russian.

Rats exposed for one hour to hypoxia in a gas mixture containing 11.4% oxygen show reductions in gas exchange and in rectal temperature, while the electrical activity of muscles remains almost unaffected. After a one-hour exposure to an environment with an oxygen level of only 7.4%, another rat group shows, in addition to a commensurate drop in gas exchange, an inhibition in muscular thermoregulation activity and a more marked drop in body temperature. One hour after return to normal breathing the gas exchange and body temperature in rats of the first group show some rise, though not all the way to control values, whereas in rats of the second group the electric activity of muscles becomes normal, the body temperature increases somewhat, but the gas exchange remains on a reduced level. M.V.E.

A71-21964 # **Change in the rate of absorption and incorporation of C14 glucose under the action of hypoxia (Izmenenie skorosti vsasyvaniia i vkliucheniia v organy i tkani gliukozy C14 pri vozdeistvii gipoksii).** K. V. Smirnov and O. I. Babkina. *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 70, Dec. 1970, p. 29-31. 10 refs. In Russian.

Investigation of the effects of acute hypoxia on glucose absorption and incorporation. In experiments with rats receiving by mouth C14 glucose, the observed effects of hypoxia included: (1) a certain inhibition of the gastric evacuative function; (2) an increase in the absorption rate of C14 glucose and a rising incorporation of glucose radiocarbon into organs and tissues; and (3) glucose elimination decreases in urine and increases in feces. M.V.E.

A71-21965 # **Mitotic activity of a kidney undergoing compensatory hypertrophy in high-mountain areas (Mitoticheskaia aktivnost' pochki, preterpevaiushchei kompensatornuiu gipertrofiiu v vysokogor'e).** A. A. Braun and F. Kh. Sharipov (Tadzhikskii Meditsinskii Institut, Tadzhik SSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 70, Dec. 1970, p. 76-79. 8 refs. In Russian.

In experiments conducted in a valley (820 m above sea level) and at alpine (3,379 m) elevation on 420 albino male rats weighing 105 to 120 g, it was established that in the kidney of nonadapted animals undergoing the process of compensatory hypertrophy under the influence of alpine conditions, the mitotic activity begins to intensify on the second day, reaches its maximum on the fifth day, and remains above normal for two months. By comparison, the maximum rise of mitotic activity is 2.5 times less than in the valley. M.V.E.

A71-21966 # **Study of the preservation of radiation injuries of chromosomes in generations of irradiated cells of human diploid strains (Izuchenie sokhraniaemosti radiatsionnykh povrezhdenii khromosom v pokoleniiakh obluchennykh kletok diploidnykh shtammov cheloveka).** N. V. Chervonskaia (Moskovskii Nauchno-Issledovatel'skii Institut Virusnykh Preparatov, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 70, Dec. 1970, p. 89-92. 19 refs. In Russian.

Investigations were conducted on cells of human diploid strains which preserved their diploid karyotype and initial properties for a period of 50 plus or minus 10 passages. In the first passage of the culture after a 50-r dose of X irradiation, the number of cells with chromosomal aberrations amounted to 8.0 to 8.5% against 3.2% of aberrant cells in the controls. In the second passage of the culture after irradiation, the number of cells with chromosomal aberrations did not exceed control data. The spectrum of chromosomal aberrations in the irradiated cells also approached that in the control culture. M.V.E.

A71-21967 # **Mechanochemistry of sphincter structures in the microcirculation paths of the organ of hearing (K mekhanokhimii sfinkternykh struktur v putiakh mikrotsirkuliatsii organa slukha).** V. N. Levin (II. Moskovskii Meditsinskii Institut, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 70, Dec. 1970, p. 96, 97. 8 refs. In Russian.

Studies of intraorganic vascular channels of the organ of hearing disclosed certain argyrophil sphincter formations (rings and bracelets). The reactions of these structures to histological staining, myotrophic preparations, muscle relaxants, and silver ions differ from comparable reactions of cellular elements of myosin nature. It is suggested that the functions of these newly uncovered structures are based on principles which do not conform with the generally accepted notion of mechanochemical processes occurring in muscular tissues during contraction. M.V.E.

A71-21968 # **Pancreas pathomorphology under general acute hyperthermia (Patomorfologiia podzheludochnoi zhelezy pri obshchei ostroi gipertermii).** A. I. Tiukov (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 70, Dec. 1970, p. 98-101. 15 refs. In Russian.

Overheating-induced alterations of the pancreatic gland were investigated. 110 guinea pigs and albino rats were placed for one hour into a chamber at 45 C. The animals were sacrificed 1, 6, and 24 hr and 2.5 and 9 days after overheating. Different histological methods were used for investigating the pancreas. The most marked changes found were hemodynamic ones, characterized by dilatation and blood-overfilled vessels, as well as by intravascular leukocytosis. Two days after the experiment, the glandular morphology gradually normalizes, with the exception of small areas of residual manifestations that disappear in subsequent days. M.V.E.

A71-21969 # **The motor analysor and its place within the system of analysors (Dvigatel'nyi analizator i ego mesto v sisteme analizatorov).** A. S. Batuev (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR) and L. A. Kukuev (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 20, Nov.-Dec. 1970, p. 1115-1122. 54 refs. In Russian.

Review of the analysor system controlling the reactions of the organism to changing external conditions, and discussion of the structure and function of the motor analysor, in particular, in the light of the literature of the last two decades. It is shown that the motor analysor represents not only a self-regulation system, but also an agent of interanalysor integration. Thus, no adequately accurate orientation of an animal through surrounding space can be provided by the motor analysor without the participation of visual, dermal, and vestibular perception. The functional structure of motor activity includes, in addition to the motor analysor, the visual, dermal, and vestibular analysors, in accordance with their specific significance which is dependent on the kind of motion concerned. M.V.E.

A71-21970 # **Conditioned reflex to time and its course under conditions of hypoxia (Uslovnyi refleks na vremia i ego protekanie v usloviiakh gipoksii).** E. N. Sokolov and R. P. Steklova (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 20, Nov.-Dec. 1970, p. 1123-1130. 8 refs. In Russian.

Motor conditioned reactions and EEG responses are studied against a background of inhibition caused by acute hypoxia in an altitude chamber. At pressures corresponding to altitudes of 5000-6000 m, an EEG shift is observed toward theta and delta oscillations. The greatest changes are recorded in the frontal and parietal areas. A decrease in EEG activation and in the rhythm assimilation by the cortex of light flashes takes place. The predominance of theta and delta waves in the anterior parts of the brain at high-altitude pressures coincides with a poorer differentiation of intervals between flashes. Movements consisting in simply following a signal are not substantially affected by pressures corresponding to altitudes of 5000-6000 m. M.V.E.

A71-21971 # **Biomechanical and vegetative reactions in man during reproductive suggestion in hypnosis of various gravitational effects (Biomekhanicheskie i vegetativnye reaktsii u cheloveka pri reproduktivnom vnushenii v gipnoze razlichnykh gravitatsionnykh vozdeistvii).** L. P. Grimak. *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 20, Nov.-Dec. 1970, p. 1155-1160. 19 refs. In Russian.

Study of the effectiveness of certain body ponderability engrams when reactivated. In everyday life, man often experiences momentary changes in body ponderability. The subjective and vegetative components of these changes are retained as long-term memories. In the attempt to stir these memories into action, experiments of reproductive suggestion of changes in body ponderability were conducted with three subjects. Under suggested body weight reduction (to 1/6 g), the subjects displayed body peculiarities and certain biomechanical characteristics that coincided with those obtained by physical methods of motor activity modeling in subgravitation. M.V.E.

A71-21972 # **Local changes in the excitability of the visual analysor as aftereffects of optical point stimuli (Lokol'nye izmeneniia vozbudimosti zritel'nogo analizatora v posledeistvii tochechnykh svetovykh razdrazhitelei).** N. I. Chuprikova (Akademiia Pedagogicheskikh Nauk SSSR, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 20, Nov.-Dec. 1970, p. 1204-1211. 18 refs. In Russian.

Excitability shifts produced in the visual analysor by short (100 msec) point light stimuli were studied in human subjects by the method of paired stimuli. The reaction time of motor response to each test stimulus was recorded. It is shown that single optical stimuli directed at limited retinal areas lead to prolonged excitability changes of a contrast nature in the projection system of the visual analysor. The locally enhanced excitability in areas of optical point signal projections stands in contrast to the excitability in all the other areas of the analysor, where it diminishes below the unmodified background excitability level of the same brain structures. M.V.E.

A71-21973 # **Spinal reflex effects under static work in man (Spinal'nye reflektornye vliianiia pri staticheskoi rabote u cheloveka).** V. I. Kurbatov and A. V. Ovsiannikov (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Fizicheskoi Kul'tury, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 20, Nov.-Dec. 1970, p. 1310-1312. 5 refs. In Russian.

Investigation of some segmental chiasmatic effects under local static work conditions in eight subjects aged 20 to 25. The obtained results suggest a certain interaction of the segmental chiasmatic connections of the spinal cord with the activated spinobulbar-spinal tract. M.V.E.

A71-21974 # **Line-fed microelectrode amplifier (Mikroelektrodnyi usilitel' s pitaniem ot seti).** V. I. Sergeev and S. A. Nevrovskii (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Zhurnal Vysshei Nervnoi Deiatel'nosti,* vol. 20, Nov.-Dec. 1970, p. 1313-1317. 7 refs. In Russian.

Description of the design of a microelectrode amplifier system intended for use in electrophysiological experimental investigations. Line feed frees the system of the large zero drift unavoidable under battery feed, and the use of a low noise pentode in a remote cathode follower makes possible a drastic reduction in amplifier-generated noise. Schematic diagrams illustrate the design and operation of the system. M.V.E.

STAR ENTRIES

N71-16905# Advisory Group for Aerospace Research and Development, Paris (France).

REST AND ACTIVITY CYCLES FOR THE MAINTENANCE OF EFFICIENCY OF PERSONNEL CONCERNED WITH MILITARY FLIGHT OPERATIONS

Nov. 1970 110 p refs Presented at the AGARD Aerospace Med. Panel Specialist Meeting, Oslo, 13 –14 May 1970
(AGARD-CP-74-70 Avail: NTIS

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2. INVESTIGATIONS CONCERNING REACTION TIME IN RELATION TO DURATION OF SLEEP AND TIME OF DAY J. Rutenfranz, J. Aschoff, and H. Mann (Max-Planck-Inst. fur Arbeitsphysiologie) 5 p refs (See N71-16907 07-04)

3. SLEEP AT UNUSUAL HOURS, DRUGS AND SUBSEQUENT PERFORMANCE M. F. Allnutt (Royal Air Force Inst. of Aviation Med.) 8 p refs (See N71-16908 07-04)

4. EVALUATION OF SLEEP, PERFORMANCE AND PHYSIOLOGICAL RESPONSES TO PROLONGED DOUBLE CREW FLIGHTS. C-5 OPERATION COLD SHOULDER: A PRELIMINARY REPORT V. Pegram, W. Storm (Aerospace Med. Div. Aeromedical Res. Lab. (6571st), B. O. Hartman, D. A. Harris, and H. B. Hale (School of Aerospace Med.) 16 p refs (See N70-16909 07-05)

5. A SUBJECTIVE ASSESSMENT OF FATIGUE IN TRANSPORT AIRCREW L. G. Innes (Canadian Armed Forces Inst. of Environ. Med.) 9 p refs (See N70-16910 07-04)

6. SIMULATED TIME-ZONE SHIFTS AND PERFORMANCE ABILITY: BEHAVIORAL, ELECTROENCEPHALOGRAPHIC AND ENDOCRINE EFFECTS OF TRANSIENT ALTERATIONS IN ENVIRONMENTAL PHASE J. Berkhout (Calif. Univ., Los Angeles) 11 p refs (See N70-16911 07-04)

7. INFLUENCE OF DUTY HOURS ON SLEEP PATTERNS IN AIRCREW OPERATING IN THE LONG HAUL TRANSPORT ROLE. A STUDY OF SINGLE CREW OPERATIONS AND DOUBLE CREW CONTINUOUS FLYING OPERATIONS A. N. Nicholson (Royal Air Force Inst. of Aviation Med.) 11 p refs (See N71-16912 07-04)

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10. WORK-REST CYCLES IN AIR TRAFFIC CONTROL TASKS V. D. Hopkin (Royal Air Force Inst. of Aviation Med.) 11 p refs (See N71-16915 07-04)

11. TECHNICAL EVALUATION A. J. Benson (Royal Air Force Inst. of Aviation Med.) 5 p (See N71-16916 07-04)

N71-16906# Max-Planck-Institut fur Verhaltensphysiologie, Seewiesen uber Starnberg (West Germany).

CIRCADIAN RHYTHMS OF SOME PSYCHOLOGICAL FUNCTIONS UNDER DIFFERENT CONDITIONS

R. Wever *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 11 p refs (See N71-16905 07-04)
Avail: NTIS

Just as nearly all physiological functions, most measurable psychological functions show clear circadian rhythms. Their measurement requires, in contrast to that of physiological functions like rectal temperature, the wakefulness of the subjects. Therefore, measurements during night time can only be obtained, either when the subjects become awakened several times from sleep, or when they are continuously awake. In the first case, there are clear circadian rhythms, for instance in reaction time, with high performance during day time and low performance during night time. In the second case, the circadian amplitude of several functions decreases, coming from an approximation of the night values to the day values. This means: performance during night time is higher when subjects are continuously awake than when they are awakened from sleep at the same time, and this difference seems to be the greater the more performance depends on decisions. This may be of interest with regard to alert readiness. Author

N71-16907# Max-Planck-Institut fur Arbeitsphysiologie, Dortmund (West Germany).

INVESTIGATIONS CONCERNING REACTION TIME IN RELATION TO DURATION OF SLEEP AND TIME OF DAY

J. Rutenfranz, J. Aschoff, and H. Mann *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 5 p refs (See N71-16905 07-04)
Avail: NTIS

The maintenance of the efficiency of personnel who have to work shift duties depends upon an alteration of their circadian rhythm to match the new work and rest cycles or at least some form of adaptation to the duty at unfamiliar hours. The temporal transposition of an individual's circadian rhythm to coincide with work and rest at unusual times of day is limited because it is very difficult to alter the prime synchronizers of the rhythm, such as knowledge of time of day and social contacts. When a stabilized shift system is operated, the circadian rhythm may come into phase with the duty period after two or more weeks, but with a rotating shift system such an alteration in the phase of the rhythm cannot be expected to occur. Author

N71-16908# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

SLEEP AT UNUSUAL HOURS, DRUGS AND SUBSEQUENT PERFORMANCE

M. F. Allnutt *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 8 p refs (See N71-16905 07-04)
Avail: NTIS

A recent experiment in which eight trainee pilots were sent to bed at 20 00 hours, and then woken up at 03 00 hours to spend the rest of the day carrying out tests of performance is reported. There were four experimental conditions (no drug, placebo, mogadon, and seconal), each subject spending two nights under each condition. During every alternate 24 hour period of the three weeks for which the experiment lasted, the subjects were off duty and free to sleep as they pleased. In addition to objective measures of performance and subjective measures of mood and sleep, continuous EEG recordings were made throughout each experimental night. Author

N71-16909# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N.Mex.

EVALUATION OF SLEEP, PERFORMANCE AND PHYSIOLOGICAL RESPONSES TO PROLONGED DOUBLE CREW FLIGHTS. C-5 OPERATION COLD SHOULDER: A PRELIMINARY REPORT

Vernon Pegram, William Storm, Bryce O. Hartman (School of Aerospace Med.), D. A. Harris (School of Aerospace Med.), and Henry B. Hale (School of Aerospace Med.) *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 16 p refs (See N71-16905 07-04)

Avail: NTIS

A real-world experiment designed to determine the effects on aircrewmen of marrying two crews to a jet transport and flying operational missions is reported. Two basic crews were flown in a C-141 aircraft, utilizing either a 4/4 or 16/16 work/rest cycle. A battery of measures were conducted on each crew (a) oral temperature, (b) endocrinemetabolic trends, (c) electroencephalogram (EEG) for determining sleep, and (d) crew performance evaluations. The oral temperature data showed that flight per se induced a low-grade hypothermia which was more pronounced in individuals occupying key crew positions. The endocrinemetabolic data tentatively suggested that the aircraft commanders, as a group, experienced more stress than the other crewmembers. The sleep EEG analysis showed that both human and primate subjects suffer a significant reduction in deep sleep and dream sleep when exposed to actual or simulated flight conditions. When combined with the sleep and physiological changes, the performance data from both humans and primates suggests caution in the application of in-flight double crews. Author

N71-16910# Canadian Armed Forces Inst. of Environmental Medicine, Toronto (Ontario).

A SUBJECTIVE ASSESSMENT OF FATIGUE IN TRANSPORT AIRCREW

L. G. Innes *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 9 p refs

Avail: NTIS

Two questionnaire studies were carried out on fatigue reactions of transport aircrew on transatlantic flights of approximately 12 hours duration. The first questionnaire assessed exhaustion fatigue due to the flight for all crew positions, and identified crewmembers having unusually high ratings. The second questionnaire study assessed nervous fatigue in the same type of operation, and again two crew positions only were identified as being of concern. There was no relationship between fatigue ratings and sleep patterns, nor with easterly or westerly direction of flight. Analysis of the use of questionnaire items showed that frequency of check marks against fatigue statements did not correspond well with fatigue rating. Author

N71-16911# California Univ., Los Angeles. Space Biology Lab.

SIMULATED TIME-ZONE SHIFTS AND PERFORMANCE ABILITY: BEHAVIORAL, ELECTROENCEPHALOGRAPHIC AND ENDOCRINE EFFECTS OF TRANSIENT ALTERATIONS IN ENVIRONMENTAL PHASE

Jan Berkhout *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 11 p refs (See N71-16905 07-04)

(Contract AF 49(638)-1387)

Avail: NTIS

Three subjects were maintained on an experimental sleepactivity time-line which simulated a flight assignment crossing ten time-zones eastbound and return within 72 hours. The subjects were required to operate an automobile and an array of electronic equipment during the simulated flights. Sleep periods were assigned during the simulated local night, involving a ten hour translation of normal habits, and occasioning two 12 hour epochs of sleep deprivation. Including baseline and recovery periods, the subjects were studied continuously for nine days. Mental calculating ability, motor coordination and auditory perceptual acuity were determined several times per day throughout this period. Electroencephalograms were recorded during all assigned sleep periods and during the administration of behavioral tests. All urine produced during the experiment was collected, and volume, osmolarity, creatinine and 17-OHC levels were determined as a function of time-of-day. Author

N71-16912# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

INFLUENCE OF DUTY HOURS ON SLEEP PATTERNS IN AIRCREW OPERATING IN THE LONG HAUL TRANSPORT ROLE. A STUDY OF SINGLE CREW OPERATIONS AND DOUBLE CREW CONTINUOUS FLYING OPERATIONS

A. N. Nicholson *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 11 p refs (See N71-16905 07-04)

Avail: NTIS

Military aircrew operating in the strategic long haul role experience repeated time zone changes and irregular and often long hours of duty. A satisfactory sleep pattern is of prime importance in maintaining their well-being and operational efficiency. The normal regular nightly period of sleep during non-flying duty at base is replaced by a complex sleep pattern while operating world-wide East-West routes. However, the sleep obtained over three days preceding each duty period is usually similar in duration to that obtained over three day periods while on non-flying duty and the ability of the pilot to obtain a similar amount of sleep appears to be an essential factor in preventing subjective fatigue. There is a cumulative effect of repeated adaptation to time zones and irregular hours of duty. Aircrew find it increasingly difficult to maintain an acceptable sleep pattern as the number of days route flying increases. It would appear that the work load (average hours duty/day) compatible with an acceptable sleep pattern diminishes in a logarithmic manner with the number of duty days. This implies restrictions to the deployment of aircrew if serious sleep disturbances are to be avoided. Author

N71-16913# Air Transport Command, Trenton (Ontario).

DIFFERENCES BETWEEN MILITARY AND COMMERCIAL AIRCREWS REST AND ACTIVITY CYCLES

Kay Staack *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 6 p (See N71-16905 07-04)

Avail: NTIS

Aircrew members flying the Boeing 707 have been interviewed with respect to their flying duty, ground duty and duty-free time. The results of these interviews show, that the difficulties arising are not so much caused by the duration of flights and even less by the disturbed diurnal rhythm, but very much more by certain administrative procedures, by prolonged layover times and, most of all, by the ground duty times. In this respect, there is a marked difference between military aircrews and aircrews of commercial airlines. Good leadership and team spirit as well as an effective organization are of great importance. Author

N71-16914# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.

WORKLOAD AND PERFORMANCE LIMITING FACTORS OF AIR TRAFFIC CONTROL RADAR OPERATORS

Hans J. Zetzmann *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 14 p refs (See N71-16905 07-04)
Avail: NTIS

In the servo loops of the man-machine system of air traffic control man continues to play a decisive role in ensuring safe and expeditious running of traffic. An important source of information in this system is the radar equipment whose display gives the controller an important basis for evaluating the air situation. These displays are discussed from the aspect of human engineering. Where traffic is dense, particularly high demands are placed on correctness and rapidity of controller decisions to ensure a safe dispatch of traffic. The physiological environment of ATC activities and how readily human beings may here be subject to stress are reported. The definitions of the terms workload and stress are discussed; it is shown that, and why, all efforts towards an exact assessment of controller capability under peak loads have failed to lead to fully satisfactory results so far. Author

N71-16915# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

WORK-REST CYCLES IN AIR TRAFFIC CONTROL TASKS

V. D. Hopkin *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 11 p refs (See N71-16905 07-04)
Avail: NTIS

There is no established practice or international agreement on the total weekly hours worked in air traffic control tasks, or on the optimum lengths of watches or shifts. Tasks range from those with a high vigilance component, where efficiency is associated with short work periods and frequent brief rests, to those requiring long hand-over periods, where unacceptable double-manning would occur if the work periods were short. Continuous eight hour shifts, with meals at the working position, are not unknown; these shifts may include high workload, though not all the time. The air traffic controller has little influence on his own workload. Traditionally, his colleagues expect him to deal with whatever traffic enters his sector. He does so, at the cost of hard and sustained effort when workload is high, which sometimes results in extreme tiredness which may prevent him from relaxing after the end of his shift. The effects of work-rest cycles on performance have been the subject of much discussion in air traffic control circles, but of relatively little scientific work. What has been done is reported; what could be done is suggested. Author

N71-16916# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

TECHNICAL EVALUATION

A. J. Benson *In* AGARD Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Mil. Flight Operations Nov. 1970 5 p (See N71-16905 07-04)
Avail: NTIS

The text, discussion and technical evaluation of ten papers presented at the AGARD Aerospace Medical Panel's Specialist Meeting which was held in Oslo, Norway on 13 and 14 May 1970 are presented. The meeting was convened in response to a request from the Military Committee of NATO for advice on the influence of work and rest schedules on the operational efficiency of personnel concerned with flight operations. The papers presented fell into three main categories: a) laboratory investigations of normal and abnormal work/rest schedules, b) in-flight studies of aircrew operating long-haul transports, c) duty cycles in air traffic control tasks. Author

N71-16978# Joint Publications Research Service, Washington, D.C.

THE OPERATION OF THE VESTIBULAR ANALYZER

14 Jan. 1971 34 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 5, 1970 p 643-659, 673-678
(JPRS-52173) Avail: NTIS

CONTENTS:

1. MODERN VESTIBULOMETRIC CHAIRS AND STANDS FOR THE OBJECTIVE STUDY AND TRAINING OF THE VESTIBULAR ANALYZER S. S. Markaryan p 1-23 refs (See N71-16979 07-05)

2. MODIFICATION OF RATE OF VESTIBULAR COMPENSATORY PROCESS IN RELATION TO POSITION OF HEAD IN SPACE A. A. Shipov et al p 24-33 refs (See N71-16980 07-04)

N71-16979# Joint Publications Research Service, Washington, D.C.

MODERN VESTIBULOMETRIC CHAIRS AND STANDS FOR THE OBJECTIVE STUDY AND TRAINING OF THE VESTIBULAR ANALYZER

S. S. Markaryan *In its* Operation of the Vestibular Analyzer 14 Jan. 1971 p 1-23 refs (See N71-16978 07-05)
Avail: NTIS

Vestibulometric chairs and stands that allow dosaged (subthreshold, threshold, and transthreshold) stimulation of the vestibular analyzer were devised. The designs of the chairs and stands provide for a wide range of angular rotation and acceleration and vertical up-and-down movements during applied speeds and accelerations, coriolis-type accelerations, positioning of a person in any position in relation to the axis of rotation, minimal noise level, absence of external light (where necessary) and air currents, continuous sound and light communication between subject and physician, maximal number of recording parameters. The indicated equipment makes it possible to investigate vestibular, visual, and proprioceptive analyzers either individually or in combination. Author

N71-16980# Joint Publications Research Service, Washington, D.C.

MODIFICATION OF RATE OF VESTIBULAR COMPENSATORY PROCESS IN RELATION TO POSITION OF HEAD IN SPACE

A. A. Shipov et al *In its* The Operation of the Vestibular Analyzer 14 Jan. 1971 p 24-33 refs (See N71-16978 07-05)
Avail: NTIS

The role of the position of the head in space on the course of the compensatory process was investigated using as a model a unilaterally labyrinthectomized rabbit. It was shown that the rate of the compensatory process in animals is slowed down when the position of their head was forcibly kept on a horizontal plane. This fact is explained by the characteristic redistribution of proprioceptive impulsation of the neck muscles reaching vestibular nuclei. Author

N71-17062# Hawaii Univ., Honolulu. Dept. of Physiology.

EFFECT OF IMMERSION AT DIFFERENT WATER TEMPERATURES ON GRADED EXERCISE PERFORMANCE IN MAN

T. O. Moore, E. M. Bernauer, G. Seto, Y. S. Park, and S. K. Hong

Aug. 1970 31 p refs
(Grant NSF GH-62)
(PB-194822; SEAGRANT-70-3; UHI-med-70-03) Avail: NTIS CSCL 06S

Eight subjects performed graded leg exercise at loads from light to forced maximal in air and totally submerged in water at 30, 22, and 16 C. There was no significant decrement in performance between the air and immersed environments. Heart rate, minute volume (VE), oxygen consumption (VO2), and carbon dioxide production had high linear correlation coefficients with imposed work load. Oxygen consumption and carbon dioxide production were higher in water under all work loads and at the two lower water temperatures. Heart rate was the same at rest under all conditions, but significantly less at high work loads in 16 C water when compared to air. It is concluded that monitoring of a diver's heart rate will cause underestimation of work load in surface-equivalent terms at high loads in water of low temperature. Author (GRA)

N71-17066# Joint Publications Research Service, Washington, D.C.
ALTITUDE AND HEAT ADAPTATION STUDIES
19 Jan. 1971 24 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (Moscow), v. 56, no. 9, 1970 p 1208-1214 and 1282-1287
(JPRS-52200) Avail: NTIS

CONTENTS:

1. PHYSIOLOGICAL INDICES OF STATE OF BRAIN AND MUSCLE DURING HIGH-ALTITUDE ACCLIMATION A. A. Aydaraliyev et al p 1-12 refs (See N71-17067 07-04)

2. EFFECT OF MUSCULAR TRAINING ON MAN'S ENDURANCE OF HEAT F. T. Agarkov et al (See N71-17068 07-04)

N71-17067# Joint Publications Research Service, Washington, D.C.
PHYSIOLOGICAL INDICES OF STATE OF BRAIN AND MUSCLE DURING HIGH-ALTITUDE ACCLIMATION
A. A. Aydaraliyev et al *In its* Altitude and Heat Adaptation Studies 19 Jan. 1971 p 1-12 refs (See N71-17066 07-04)
Avail: NTIS

Results are presented of studies carried out on the changes in tissue oxygen tension (pO2), redox potential (Eh), tissue blood flow (Bf), and temperature (T) of the brain cortex and gastrocnemius muscle during adaptation to high mountainous altitudes. The investigation results demonstrate that a 60-day stay in the mountains is accompanied by changes in the physiological indices of the brain cortex and skeletal muscles. It is noted that in the brain cortex the redox potential, tissue blood flow, and temperature increase, while tissue oxygen tension decreases, indicating intensification of the oxidation processes. This intensification continues up to the 15th day, after which the physiological indices gradually return to normal. In the gastrocnemius muscle, a reverse pattern is observed: a decrease of T, Eh, Bf, and pO2. The maximum decrease occurs by the 15th day, after which the physiological indices of the gastrocnemius muscle return to their initial level. Author

N71-17068# Joint Publications Research Service, Washington, D.C.
EFFECT OF MUSCULAR TRAINING ON MAN'S ENDURANCE OF HEAT
F. T. Agarkov et al *In its* Altitude and Heat Adaptation Studies 19 Jan. 1971 p13-23 refs (See N71-17066 07-04)
Avail: NTIS

Studies were made of the effect of physical training achieved through heavy athletics, gymnastics, and boxing, on the endurance of the athletes' organism in relation to intensive extreme-heat action. Such training, while increasing physical endurance and efficiency, also ensures the development of a state of nonspecific higher resistance to heat action. This is due to the improvement of physical and chemical thermoregulation and the formation of adaptive reactions which guarantee the body's improved endurance of disruptions of the homeostatic (temperature) stability of the internal medium. Muscular training, while raising the thermal stability of the human organism, is shown to be less effective than some specific heat training. Author

N71-17096# Royal Aircraft Establishment, Farnborough (England). Engineering Physics Dept.
CABIN AIR REQUIREMENTS FOR CREW COMFORT IN MILITARY AIRCRAFT
T. L. Hughes London Aeron. Res. Council 1970 76 p refs Supersedes RAE-TR-68304; ARC-31220
(ARC-CP-1094; RAE-TR-68304; ARC-31220) Copyright. Avail: NTIS; HMSO: 85p; BIS: $3.40

The effects of various crew and aircraft parameters on cabin air supply requirements are discussed. The relationships between these parameters are given in the form of design curves and their validity is discussed. The relative importance of the factors influencing cabin air requirements were studied and recommendations are made on possible cockpit improvements. Author (ESRO)

N71-17097# Hawaii Univ., Honolulu. Dept. of Physiology.
ALVEOLAR GAS EXCHANGES AND CARDIOVASCULAR FUNCTIONS DURING BREATH-HOLDING WITH AIR
S. K. Hong, Y. C. Lin, D. A. Lally, B. J. B. Yim, and N. Kominami Aug. 1970 34 p refs
(Grant NSF GH-62)
(PB-194823; SEAGRANT-70-4; UHI-med-70-04) Avail: NTIS CSCL 06S

During 4 min breath-holding (BH) with TLC or 160 see BH with FRC PAO2 decreased continuously, reaching approximately 30 mm Hg at the end, while PACO2 increased during first 30 sec after which it leveled off at approximately 50 mm Hg. During 4 min BH the lung supplied 700 ml of O2 into the blood while it gained only 160 ml of CO2 from the blood, indicating a significant retention of CO2. Both PaO2 and PaCO2 changed during BH in a manner similar to those of alveolar gas. Arterial O2 content decreased by 12.5 vols. % and CO2 content increased by 17.0 vols. % during 4 min BH. Mixed venous O2 pressure and content approached arterial blood values toward the end of BH. Author (GRA)

N71-17098# National Physical Lab., Teddington (England). Aerodynamics Div.
ON THE STABILITY OF AUDITORY THRESHOLD
M. E. Delany Jul. 1970 31 p refs
(NPL-AERO-Ac-44) Copyright. Avail: NTIS

Using experienced subjects it is shown that the total replication variance for threshold tests repeated within a period of 27 months was of order 3 sq db at 1 kHz, rising to 15 sq db at 80 Hz and to 30 sq db at 12 kHz. The component due to true long-term changes was of order 1 to 2 sq db. Even with experienced subjects the mean hearing level on any given day improved by about 1 db on second and subsequent tests, while inexperienced subjects showed additional improvements due to familiarization varying from 1 to 9 db. Author (ESRO)

N71-17146# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.

ON THE ALTERATION OF PSYCHOMOTOR PERFORMANCE DURING ACUTE ALTITUDE EXPOSURE OF SEVERAL HOURS' DURATION BETWEEN 2000 AND 4000 m [UEBER DIE VERAENDERUNG DER PSYCHOMOTORISCHEN LEISTUNGSFAEHIGKEIT WAEHREND MEHRSTUENDIGER AKUTER HOEHENEXPOSITION AUF 2000 BIS 4000 m]

Christa Rehme (Ph.D. Thesis–Bonn Univ.) Sep. 1970 53 p refs In GERMAN; ENGLISH summary

(DLR-FB-70-37) Avail: NTIS; ZLDI Munich: 15,10 DM

The effects of pressure reductions on the psychomotor performances of 12 students was studied for 5 hours in a low pressure chamber. Performance was measured by pellet recorders, optical reaction times, and memory tests. The reaction times and the complex psychomotor performances deteriorated with long exposure time. The times for the appearances of the first significant changes as functions of altitude are discussed. Author (ESRO)

N71-17237# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Meckenheim (West Germany).

PROCEEDINGS OF THE EIGHTH WGLR MEETING ON HUMAN FACTORS ENGINEERING [BERICHT UEBER DIE 8. SITZUNG DES WGLR-FACHAUSSCHUSSES FUER ANTHROPOTECHNIK]

Apr. 1970 103 p refs In GERMAN; ENGLISH summary Conf. held at Munich, 28 Nov. 1969

(DLR-Mitt-70-11) Avail: NTIS; ZLDI Munich: 21,20 DM

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1. HUMAN REACTIONS TO MECHANICAL VIBRATIONS H. Dupuis (Max-Planck-Inst. fuer Landarbeit und Landtechnik) p 7–14 refs (See N71-17238 07-04)

2. METHODOLOGICAL STUDIES FOR THE APPLICATION OF SECONDARY TASKS FOR MEASURING THE PSYCHOLOGICAL WORK LOAD S. Fichtbauer (DFVLR, Hamburg) p 15–55 refs (See N71-17239 07-04)

3. METHODS FOR MEASURING THE PSYCHOLOGICAL STRESS DURING PILOT PERFORMANCE G. W. Radl (Forschungsinst. fuer Anthropotechnik) p 57–93 refs (See N71-17240 07-04)

4. PSYCHOLOGICAL STRESS AND BIOSENSORS L. Vogt (DFVLR, Bad Godesberg) p 95–101 (See N71-17241 07-04)

N71-17238# Max-Planck-Institut fuer Landarbeit und Landtechnik, Bad Kreuznach (West Germany).

HUMAN REACTIONS TO MECHANICAL VIBRATIONS [UEBER DIE BEANSPRUCHUNG DES MENSCHEN DURCH MECHANISCHE SCHWINGUNGEN]

H. Dupuis *In* DGLR Proc. of the 8th WGLR Meeting on Human Factors Eng. Apr. 1970 p 7–14 refs In GERMAN N71-17237 07-04)

Avail: NTIS; ZLDI Munich: 21,20 DM

Recent research in the field of human reactions to mechanical vibrations, especially for drivers of transport vehicles, is reviewed. ESRO

N71-17239# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Inst. fuer Flugmedizin.

METHODOLOGICAL STUDIES FOR THE APPLICATION OF SECONDARY TASKS FOR MEASURING THE PSYCHOLOGICAL WORK LOAD [METHODENFRAGEN ZUR ANWENDUNG VON NEBENAUFGABEN ZUR MESSUNG DER PSYCHISCHEN ARBEITSBEANSPRUCHUNG]

S. Fichtbauer *In* DGLR Proc. of the 8th WGLR Meeting on Human Factors Eng. Apr. 1970 p 15–55 refs In GERMAN (See N71-17237 07-04)

Avail: NTIS; ZLDI Munich: 21,20 DM

The method, single and multiple channel theories of the central human information processor, and other fundamental problems are described. The practical application of the method, mainly in connection with pilot problems, is discussed. ESRO

N71-17240# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

METHODS FOR MEASURING THE PSYCHOLOGICAL STRESS DURING PILOT PERFORMANCE [METHODEN ZUR MESSUNG DER PSYCHISCHEN BEANSPRUCHUNG BEI FLUGFUEHRUNGSAUFGABEN]

G. W. Radl *In* DGLR Proc. of the 8th WGLR Meeting on Human Factors Eng. Apr. 1970 p 57–93 refs In GERMAN (See N71-17237 07-04)

Avail: NTIS; ZLDI Munich: 21,20 DM

After discussion of the psychological stress concept, methods of measuring it are reviewed. Particular attention is given to pilot performance. ESRO

N71-17241# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany) Inst. fuer Flugmedizin.

PSYCHOLOGICAL STRESS AND BIOSENSORS [PSYCHISCHE BEANSPRUCHUNG UND BIOSENSOREN]

L. Vogt *In* DGLR Proc. of the 8th WGLR Meeting on Human Factors Eng. Apr. 1970 p 95–101 In GERMAN (See N71-17237 07-04)

Avail: NTIS; ZLDI Munich: 21,20 DM

Methods for indicating changes in the human body under stress circumstances are described. The best methods should correlate with psychological stress, not vary randomly, and disturb the test person as little as possible. ESRO

N71-17255# Federal Aviation Administration, Oklahoma City, Okla. Office of Aviation Medicine.

EFFECTIVE APPROACHES TO DISORIENTATION FAMILIARIZATION FOR AVIATION PERSONNEL

William E. Collins Nov. 1970 22 p refs

(FAA-AM-70-17) Avail: NTIS

Techniques are discussed for providing familiarization of aviation personnel with disorientation problems. The procedures are spelled out in detail. Methods of modifying existing equipment as well as an evaluation of available commercial equipment are presented. The techniques have been used with notable success both at the Civil Aeromedical Institute and in the field. They are relatively inexpensive, effective both for participants and observers, and are readily accepted by flyers as pertinent to the aviation situation. Author

N71-17344*# George Washington Univ., Washington, D.C. Biological Sciences Communication Project.

A REPORT ON THE SUMMER INSTITUTE FOR BIOMEDICAL RESEARCH IN TECHNOLOGY UTILIZATION

John Johnston 23 Oct. 1969 107 p refs Conf. held at Greenbelt, Md., 23 Jun.–29 Aug. 1969

(Contract NSR-09-010-057)

(NASA-CR-116410) Avail: NTIS CSCL 06A

A chronicle is presented of the planning, development, and

management of the Summer Institute. The material is aimed at providing some of the input necessary to evaluate the Summer Institute in terms of meeting its objectives, NASA/TUD's objectives, and general educational goals. D.L.G.

N71-17410*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SURFACE CHARACTERISTICS OF USED HIP PROSTHESES

Max A. Swikert and Robert L. Johnson Washington Feb. 1971 13 p refs

(NASA-TN-D-6153; E-5915) Avail: NTIS CSCL 06B

McKee-Farrar total hip prostheses removed from patients after relatively short service were subjected to critical examination for surface characteristics. Evidence suggested that the wear process was initiated by adhesion and subsequently progressed to abrasive wear. Wear tended to be concentrated in isolated areas, suggesting localized load bearing areas and lack of conformability of the femoral ball and the acetabular socket. Measurement of unworn areas indicated the initial geometric variations to be greater than would be expected in precision bearing fabrication. Author

N71-17429# Joint Publications Research Service, Washington, D.C.

THE BIOSPHERE

4 Feb. 1971 23 p refs Transl. into ENGLISH from Priroda (Moscow), no. 8, 1970 p 2-9 and 24-27

(JPRS-52325) Avail: NTIS

CONTENTS:

1. THE BIOSPHERE AND MAN N. V. Timofeyev-Resovskiy p 1-15 refs (See N71-17430 07-04)

2. PROTECTING THE BIOSPHERE FROM TOXIC CHEMICALS S. D. Zaugol'nikov et al p 15-22 refs (See N71-17431 07-04)

N71-17430# Joint Publications Research Service, Washington, D.C.

THE BIOSPHERE AND MAN

N. V. Timofeyev-Resovskiy *In its* The Biosphere 4 Feb. 1971 p 1-15 refs (See N71-17429 07-04)

Avail: NTIS

The relationship between the numerical growth and expanding industrial and technological power of man and the biosphere is discussed. The requirement for greater symbiosis of man with the biosphere is emphasized. R.B.

N71-17431# Joint Publications Research Service, Washington, D.C.

PROTECTING THE BIOSPHERE FROM TOXIC CHEMICALS

S. D. Zaugolnikov et al *In its* The Biosphere 4 Feb. 1971 p 15-22 refs (See N71-17429 07-04)

Avail: NTIS

The hygienic effects of man's activity on nature and on the populations of individual regions and countries, as well as on a global scale, are considered. Recommendations are given for protecting the environment from polution by toxic chemicals. R.B.

N71-17440*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

FEASIBILITY OF MINIATURIZING A HEATER FOR A THIN-FILM OXYGEN PARTIAL-PRESSURE SENSOR

Carl R. Pearson Washington Feb. 1971 16 p refs

(NASA-TN-D-6134; L-6999) Avail: NTIS CSCL 14B

The feasibility of using a miniature heater for a zinc oxide thin-film oxygen partial-pressure sensor was investigated. A silicon heater 0.25 millimeter square by 13 millimeter long was used to obtain the desired operating temperature for the zinc oxide film, 650 K. Experimental data are presented for the resistance-temperature characteristics, the temperature distribution, and power requirements of the heater. Results show the temperature of the heater can be determined by the change in resistance of the heater at its operating temperature. The work also indicates that this heater concept is feasible, but more effort will be required to deposit the zinc oxide film on the heater surface. Author

N71-17442*# Oakland Univ., Rochester, Mich. School of Engineering.

BIOSYSTEMS ENGINEERING RESEARCH. VOLUME 2: AN INVESTIGATION OF TWO HYBRID COMPUTER IDENTIFICATION TECHNIQUES FOR USE IN MANUAL CONTROL RESEARCH Final Report, 15 Mar. 1969-30 Jun. 1970

G. A. Jackson Nov. 1970 106 p refs

(Grant NGR-23-054-003)

(NASA-CR-116514; TR-70-6) Avail: NTIS CSCL 05H

Two hybrid computer techniques for the identification of the gain and time delay parameters of the crossover model of a compensatory control system are discussed. These techniques were specifically developed to perform accurate parameter identification when limited amounts of input-output data are available from the system being identified. The methods are thus useful in those cases where it is desired to know the system parameters that existed over a short time span, and there is not enough input-output data for identification by pure analog, or pure digital, means. One method is a hybrid version of the continuous parameter tracking method, while the second is a modified stochastic approximation method. With proper programming either method can be used as an on-line device which will continually yield those average parameter values which existed over the last fifteen seconds of operation. Author

N71-17448# Joint Publications Research Service, Washington, D.C.

PERCEPTION OF THE RESPIRATORY MEDIUM AND GAS PREFERENCE IN MAN AND ANIMALS

I. S. Breslav 4 Feb. 1971 68 p ref Transl. into ENGLISH from the book "Vospriyatiye Dykhatel'noy Sredy i Gazopreferendum u Zhivotnykh i Cheloveka" Leningrad, Nauka, 1970 p 23-60, 73-84, 117-120, 132-136

(JPRS-52332) Avail: NTIS

Gas preference reactions to hypoxic, hyperoxic or hypercapnic environments are discussed with respect to the effect of such environments on the vital physiological functions of higher animals and man. Emphasis is given to the most important adaptation responses to altered carbon dioxide and oxygen content in the atmosphere referable to the respiratory and related systems, and the thresholds of such responses; and the effectiveness of such compensatory changes with respect to ability to maintain an adequate gas regimen for the organism and normal vital activity. Author

N71-17449*+ National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING

BIBLIOGRAPHY WITH INDEXES, NOVEMBER 1970
Dec. 1970 123 p refs
(NASA-SP-7011(83)) Avail: NTIS CSCL 06B

Subject coverage 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. Each entry consists of a standard citation accompanied by its abstract. Author

N71-17450*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, DECEMBER 1970
Jan. 1971 148 p refs
(NASA-SP-7011(84)) Avail: NTIS CSCL 06B

Subject coverage 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. Each entry consists of a standard citation accompanied by its abstract. Author

N71-17592*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ENERGY TRANSFER RATES OF AN INTEGRATED LIFE SUPPORT SYSTEM DURING MANNED AND INTERMITTENTLY MANNED TESTS
O. Karl Houck Washington Feb. 1971 29 p refs
(NASA-TN-D-6207; L-7482) Avail: NTIS CSCL 06B

The identification and distribution of thermal and electrical energies within a typical life support system have been determined from data obtained from manned and intermittently manned tests of an integrated life support system (ILSS) at the Langley Research Center. Less than one-half of the energies supplied to the ILSS were directly used for its operation, with the remainder being lost as heat within the equipment plumbing and the test-chamber atmosphere or transferred through the test-chamber wall. The normal ILSS cyclic subsystem and unit operation and the energy coupling between thermal transport fluids produced minor fluctuations in the test-chamber atmosphere temperature. These findings are significant for the development of subsystem designs, fluid transport plumbing, and accessory equipment to improve energy utilization and demands of regenerative life support systems. Author

N71-17593*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PNEUMATIC ARTIFICIAL HEART DRIVING SYSTEM PROVIDING QUASI-STEADY-STATE REGULATION AND PRESSURE WAVEFORM CONTROL
John A. Webb, Jr., Michael J. Crosby, and Miles O. Dustin Washington Feb. 1971 28 p refs
(NASA-TN-D-6171; E-5827) Avail: NTIS CSCL 06B

The design of an artificial heart control system for reproducing the pumping and flow regulating functions of the natural heart is presented. The quasi-steady-state characteristics of the natural heart are reproduced in an artificial heart by means of feedback control. The system also uses a specially designed servovalve to provide adjustable pressure waveforms. Average position drift of the pumping element is minimized by feedback control. An analog computer in the driving system provides flexible control and monitoring capabilities. Author

N71-17599* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
BIOLOGICAL ISOLATION GARMENT Patent
Fred R. Spross, inventor (to NASA) Issued 23 Jun. 1970 (Filed 9 Sep. 1969) 11 p Cl. 128-142.5; Int. Cl. A62b7/00
(NASA-Case-MSC-12206-1; US-Patent-3,516,404; US-Patent-Appl-SN-856258) Avail: US Patent Office CSCL 06K

A completely enclosable, one piece human garment fabricated primarily from a tightly woven, permeable cotton fabric with all seams internally sealed is described for contamination proof wearing apparel. Medical rubber gloves are sealed to the ends of the arms for hand coverings, and the headpiece includes a full width visor for wearer vision and an integral oronasal respirator for filtering the wearer's inspired and expired breath. Size adjustments are provided on the legs and torso for adaptation of the garment to different sizes, and a pressure-sealing closure zipper extends diagonally from the crotch across the chest and curves over one ear to the top of the headpiece for donning and removing the garment. NASA

N71-17660 Howard Univ., Washington, D.C.
THE EFFECTS OF ALTITUDE AND DRUG ADMINISTRATION ON GLUCOSE TOLERANCE: THE ROLE OF CORTICOTROPIN AT ALTITUDE
Martin Taub (Ph.D. Thesis) 1969 81 p
Avail: Univ. Microfilms: HC $4.40/Microfilm $3.00 Order No. 70-2001

The fact that ACTH causes a significantly elevated rise in pancreatic and femoral vein insulin within one minute in both intact and adrenalectomized dogs shows that ACTH acts directly on the pancreas to release insulin and that the adrenal glands do not play a role in this action. Since, the increased glucose tolerance seen at altitude could be prevented by drugs (Thorazine and Demerol) which prevent the release of ACTH, it can be concluded that this increased glucose tolerance is due to an ACTH-induced release of insulin from the pancreas. It can also be concluded that exposure to simulated altitude produces a non-specific stress reaction which is independent of the partial pressure of oxygen since ACTH is released under both hypoxic and mormoxic conditions. Dissert. Abstr.

N71-17666 Syracuse Univ. N.Y.
A STUDY OF THE MEASUREMENT OF OZONE AND SOME EFFECTS OF OZONE AND NITROGEN OXIDES ON THE ACTIVITY OF RATS
Alvin Stuart Konigsberg (Ph.D. Thesis) 1969 102 p
Avail: Univ. Microfilms: HC $5.20/Microfilm $3.00 Order No. 70-1960

A study of the effects of a range of trace concentrations of both ozone produced by high voltage corona discharge in oxygen and ozone produced by high voltage corona discharge in air on the gross motor activity of rats was undertaken. Discharge in air invariably results in the production of traces of other gases, primarily nitrogen oxides, in addition to the ozone formed. Several other factors including urination and defecation during treatment, sleep, and tendency to attack on aluminum foil plate were also measured. The effect of both types of discharge was to reduce the gross motor activity of the rats. This reduction was statistically significant at the 0.5% level. The tests on the ozone meter showed it to be insensitive to sulfur dioxide and hydrogen sulfide, except at levels far exceeding those encountered in normal and even in

polluted atmospheres. Sensitivity to both chlorine and nitrogen dioxide was more pronounced, but neither of these gases could affect the ozone meter at atmospheric concentrations. Dissert. Abstr.

N71-17667 Texas Technological Coll., Lubbock.
AN INVESTIGATION OF THE EFFECTS OF LOW-FREQUENCY VIBRATION ON WHOLE BODY ORIENTATION
Waymon Layton Johnston (Ph.D. Thesis) 1969 235 p
Avail: Univ. Microfilms: HC $10.60/Microfilm $3.05 Order No. 70-1474

Human performance under a low-frequency vibratory environment was investigated. The variables of interest were whole body orientation, response time, and travel time during the movement. Frequencies studied were 0, 2, 5, and 8 cycles per second. Amplitude was held constant at 0.09 inch resulting in acceleration intensities from 0.04 g to 0.58 g. Performance was studied before, during, and after exposure to the vibration environment. Twenty male subjects participated in the investigation in both the sitting and standing body configurations. Vibration exposure times were 20 minutes for all sessions. The task used in this investigation was a body orientation task in which, upon command from a signal display, subjects oriented their bodies as quickly and as accurately as possible towards a series of colored lights serving as targets. The targets were located at angles of 15, 30, and 60 degrees on either side of a zero reference plane and therefore subjects oriented in both clockwise and counterclockwise rotary movements. Dissert. Abstr.

N71-17699# RAND Corp., Santa Monica, Calif.
COMMENTS ON CYBERNETICS AND MANAGEMENT OF LARGE SYSTEMS
E. C. De Land Mar. 1970 11 p Presented at the Symp. on Global Systems Dyn., Charlottesville, Va., 17 - 19 Jun. 1969
(AD-715251; P-4303) Avail: NTIS CSCL 5/11

The document comments on the premise that a technologist has a citizens responsibility to contribute to and attempt to develop a rational social structure. At the same time there must be a way to leave responsible room for the Arts and Letters, for human needs and feelings, for human fallibility, and for human genius. In short, there must be a way for humans living within a technological society to maintain the upper-hand over the machine and over the organization. Author (GRA)

N71-17704* Stanford Univ., Calif.
THEORETICAL STUDIES ON HIGH FREQUENCY WAVE PROPAGATION IN BLOOD VESSELS
John Alexander Hope Bailie (Ph.D. Thesis) 1969 138 p
Avail: Univ. Microfilms: HC $6.60/Microfilm $3.00 Order No. 70-1495

A simple plate theory model is utilized to demonstrate that Korotkoff sounds generated during the systolic phase of the auscultatory measurement of blood pressure can be interpreted as a phenomenon of dynamic instability of the partially collapsed brachial artery. Under conditions of instability the brachial segment acts like a mechanical amplifier capable of magnifying certain perturbations inherent in the arterial pressure pulse beyond the audibility threshold. A similar instability phenomenon is also hypothesized as the cause of the sounds heard at systole when the intraluminal pressure exceeds sufficiently the cuff pressure. The theory presented agrees in many respects with evidence obtained from experimental studies on physical models. For large curvatures of the wall and certain types of fluid perturbations, the predicted stability boundaries cannot be explained on physical grounds. Dissert. Abstr.

N71-17750# School of Aerospace Medicine, Brooks AFB, Tex.
A THIRD STUDY OF FACTORS AFFECTING AIRCREW MORALE Final Report, Sep. 1969 - Apr. 1970
Richie S. Dryden, Leonard J. Kirschner, and Bryce O. Hartman Oct. 1970 19 p refs
(AD-715015; SAM-TR-70-55) Avail: NTIS CSCL 5/10

A survey of morale and job satisfaction in helicopter aircrewmen of the Aerospace Rescue and Recovery Service was conducted as part of a worldwide, on-site investigation of accident trends. Analysis of forms returned by 253 officers and 228 enlisted aircrewmen yielded the following findings: (a) additional duties were an area of concern for both officer and enlisted aircrewmen; (b) scheduled time off was reported as the second major problem area; (c) overall levels of job satisfaction were somewhat lower than in the two earlier studies. Author (GRA)

N71-17763# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
FLARE RANGE ESTIMATION: EVALUATION OF AIDS
Robert L. Hilgendorf and John C. Simons Feb. 1970 48 p refs
(AD-715287; AMRL-TR-69-128) Avail: NTIS CSCL 17/8

Devices for estimating the range to a simulated pyrotechnic flare were evaluated against several unaided conditions. Two devices based on a photometric concept and two based on a geometric concept were used. One was a human-engineered triangulation device (Ritchie Ranger modified). The errors of naked eye judgments are discussed. Also discussed are technological requirements for operational ranging devices and future plans for an inflight evaluation of methods for flare range estimation. Author (GRA)

N71-17830# School of Aerospace Medicine, Brooks AFB, Tex.
ALTITUDE-INDUCED CHANGES IN THE GLUCOSE METABOLISM OF ESCHERICHIA COLI B Interim Report, Nov.1969 - May 1970
Garth E. Ziege Oct. 1970 11 p refs
(AD-715212; SAM-TR-70-69) Avail: NTIS CSCL 6/19

In a study of the effects of altitude on glucose metabolism, respiration of the bacterium Escherichia coli B was measured at ground level and at 10,000 ft. in the presence and absence of glucose. Endogenous (without glucose) QO2 values at ground level and altitude showed no significant difference, thus eliminating hypoxia as a possible cause of glucose removal. The degree of stimulation of respiration by glucose at altitude exceeded that at ground level, though the variability of results made the differences marginal. Author (GRA)

N71-17880# School of Aerospace Medicine, Brooks AFB, Tex.
EFFECTS OF LIMITED MOVEMENT ON THE IMPEDANCE PLETHYSMOGRAPH SIGNAL Preliminary Study, Feb. 1969 - May 1970
John W. Yates Sep. 1970 31 p refs
(AD-715211; SAM-TR-70-67) Avail: NTIS CSCL 6/2

The impedance plethysmograph was evaluated as a means of monitoring respiration of personnel in a space-flight environment. Emphasis was placed on studying the effects of limited movement (tapping of electrodes and skin stretching) on the impedance plethysmograph signal. A bridge circuit and servospirometer were used to make extremely sensitive measurements of body impedance change and tidal volume. The linear relationship between tidal volume and thoracic impedance was determined by analog and digital methods. These methods were also used to investigate the amount of interference caused by various body movements on the impedance signal. Possible ways of eliminating error from such artifacts were also studied. Very high linear correlation (r = .85 to

.95) was obtained using a bridge circuit. The effects of artifact were reduced by the use of analog filtering, digital programming technics, and a careful choice of display. Author (GRA)

N71-17881# School of Aerospace Medicine, Brooks AFB, Tex.
RETINAL DAMAGE FROM REPEATED SUBTHRESHOLD EXPOSURES USING A RUBY LASER PHOTOCOAGULATOR Final Report, Apr. –May 1970
Gordon L. M. Gibson Sep. 1970 15 p refs
AD-715210; SAM-TR-70-59) Avail: NTIS CSCL 6/18

A ruby laser photocoagulator was used to deliver single and multiple subthreshold exposures to the retina of Macaca mulatta. The subexposures parameters were 0.5-msec. pulse, 1.3-mm.-diameter focal spot, and energy density of about 375 mJ/sq cm. Single exposures produced no microscopic changes on sacrifice at 1 to 30 days following exposure. Repetitive exposures (7 to 17 exposures) at the same energy level invariably caused characteristic damage in the outer retinal layers. These cumulative effects are similar to and more widespread than the minimal-damage lesions produced by single suprathreshold exposures using higher energy density (900 to 1000 mJ/sq cm). Current safety criteria are based on the assumption that laser damage occurs on an all-or-none basis so that damage is not cumulative if a single exposure causes no visible lesion. This work indicates that single subthreshold exposures which are less than half of a threshold dose are cumulative and therefore each subthreshold exposure must damage or in some manner increase the retinal susceptibility to subsequent exposures. Author (GRA)

N71-17885# School of Aerospace Medicine, Brooks AFB, Tex.
EFFECTS OF OXYGEN AND DECREASED TOTAL PRESSURE ON TESTICULAR FUNCTION IN THE RABBIT Final Report, Jun. –Aug. 1969
Robert John Russell and Frode Ulvedal Sep. 1970 23 p refs
(AD-715209; SAM-TR-70-53) Avail: NTIS CSCL 6/19

This investigation examined the effects of increased partial pressure of oxygen at reduced total pressure (380 mm. Hg) on testicular function in the rabbit. Ejaculates were collected with an artificial vagina. Ejaculate volume, sperm concentration, percentage of live sperm, percentage of sperm with normal morphology, and sperm motility were measured. At the end of the experimental period the rabbits were sacrificed and gonadal and epididymal sperm reserves were measured. Histologic studies were made on the pertinent organs. Changes were observed in testicular and other sexual functions, although the semen sample variables fell within normal range in all groups. All the rabbits remained healthy throughout the periods of exposure. Author (GRA)

N71-17909*# Sandia Corp., Albuquerque, N.Mex.
PLANETARY QUARANTINE PROGRAM Quarterly Progress Report, Period Ending 31 Mar. 1969
Mar. 1969 22 p refs Sponsored by AEC
(NASA Order R-09-019-040; NASA Order W-12853; NASA Order H-13245A)
(NASA-CR-116430; TID-25077; QPR-12) Avail: NTIS CSCL 06M

Progress is reported on contamination control study, bioburden experimentation and modeling, lunar information system, sterilization modeling, and laboratory support work. Figures are presented to show vertical laminar airflow research facility; number of viable particles per two-minute intervals; and ratio of number of particles vs angle. NSA

N71-17945*# Esso Research and Engineering Co., Linden, N.J. Government Research.
INVESTIGATION OF HEATLESS DESORPTION TECHNOLOGY FOR CARBON DIOXIDE CONTROL IN MANNED SPACECRAFT
Martin Lieberman and Alvin Skopp [1970] 101 p refs
(Contract NAS1-9356)
(NASA-CR-111815; GR-2055-70) Avail: NTIS CSCL 06K

The results are described of an investigation to improve the cyclic process of physical adsorption for removing carbon dioxide and water vapor from air using molecular sieve and silica gel sorbents. Heatless Desorption, a fractionation process not requiring the addition of heat energy, was investigated to develop system design criteria appropriate for manned spacecraft application. Primary emphasis was given to evaluating: (1) Low purge-to-feed ratios, low space velocity, and a composite bed of two sorbers for water vapor removal, and (2) the use of purge gas which would otherwise be vented to vacuum to increase the rate of vacuum desorption of CO2. The use of Heatless Desorption for air conditioning in space without a radiator or refrigerant was examined. Potential applications of Heatless Desorption were studied including an add-on water save system for the primary Skylab vacuum desorbed system. Author

N71-17988*# Indiana Univ., Bloomington. Dept. of Microbiology.
INTRODUCTION TO BIOLOGICAL STUDIES
Thomas D. Brock *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 87–91 (See N71-17966 07-13)
Avail: NTIS CSCL 06C

The presence of bacteria in Icelandic hot springs of different temperature and pH values was investigated. The studies show that at neutral and alkaline pH values, bacteria live in springs even at the boiling point, but that there is an upper limit for life processes in springs of higher acidity. Samples of plant stands on Surtsey were taken to test the validity of the hypothesis that blue-green algae are the primary colonizers of virgin land areas. Preliminary analysis indicates that blue-green algae are not the primary colonizers, except in thermal areas where higher plants cannot grow. R.B.

N71-17989*# Oregon Univ., Eugene. Dept. of Biology.
PRELIMINARY REPORT ON THERMOPHILIC BLUE-GREEN ALGAE AND MICROORGANISMS IN ICELAND AND SURTSEY
Richard W. Castenholz *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 92–93 refs (See N71-17966 07-13)
Avail: NTIS CSCL 06C

An earlier study indicated the low number of thermophilic algal species in Iceland's hot springs compared to the hot springs in North America and Europe. Dispersal problems were suggested as the main causes of this situation. Samples were collected in 1970 from several of the same hot springs and in five additional hot spring areas in northern and southwestern Iceland. All samples were examined in a cursory manner and there are no indications of additional species not previously found in Iceland. The samples containing blue-green algae have also been inoculated in appropriate culture media and incubated under conditions that would normally enrich species common to other hot spring areas, as a further check for new species. Author

N71-17990*# Indiana Univ., Bloomington. Dept. of Microbiology.
BIOLOGICAL ASPECTS OF ACID THERMAL WATERS IN

ICELAND

William N. Doemel *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 94-95 (See N71-17966 07-13)

Avail: NTIS CSCL 06C

The thermal springs, fumaroles, and soils in Iceland and throughout the world are divided into two general classes which are distinguished by their characteristic flora and are defined by the pH of their environment, thermal areas with a pH greater than 5.0 and thermal areas with a pH less than 5.0. Thermal areas with a pH greater than 5.0 are referred to as alkaline and those with a pH less than 5.0 as acidic, although this contradicts the chemical definition of alkalinity and acidity. In the alkaline thermal areas of Iceland, the predominant organisms are the blue-green algae and various species of bacteria. In the acid areas, the blue-green algae are absent and the predominant organisms are various species of eucaryotic algae. Bacteria as well as fungi may also be present but represent only a small percentage of the total biomass. Author

N71-17991*# St. Louis Univ., Mo. Dept. of Biology.

SOME PRELIMINARY OBSERVATIONS ON THE INSECTS OF ICELAND AND SURTSEY

Dorothy Feir *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 96 98 (See N71-17966 07-13)

Avail: NTIS CSCL 06C

Hot springs, glaciers and glacial moraines, fresh water and marine environments, large areas of bare rock, and areas covered with vegetation were surveyed for insect life. The survey revealed small numbers of insects, except for the presence of lake midges in large numbers around Lake Myvatn. The effects of continuous light or darkness on insect life are also discussed. R.B.

N71-17992*# Florida State Univ., Tallahassee. Dept. of Oceanography.

MICROBIOLOGICAL STUDIES OF SURTSEY: 1970

Paul A. LaRock *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 99 103 refs (See N71-17966 07-13)

Avail: NTIS CSCL 06M

Ash samples were collected from various locations on Surtsey and processed by conventional bacteriological techniques. The determinations were made to screen the samples for subsequent detailed analysis by photomicrography using colored infrared film, and to estimate the changes in the microbial population since Merek and Young's investigation in 1967. Author

N71-17993*# Nijmegen Univ. (Netherlands). Dept. of Botany.

INFLUENCE OF DEGASSING FROM LAVA ON THE PRIMARY COLONIZATION BY ORGANISMS: A HYPOTHESIS

H. F. Linskens *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 104 108 refs (See N71-17966 07-13)

Avail: NTIS CSCL 06C

Rock samples of various ages were collected and the starting phases of various organisms were studied in the laboratory. Fresh unspoiled surfaces were tested by bringing the substrate in direct contact with the rock surface and adding various types of plant diaspores, and by introducing pieces of lava of various ages into a closed system of covered petri dishes. Preliminary studies show that the outgassing processes from lava influences the primary settlement of organisms. The surface of young lava from Surtsey appears to be unsuitable for attachment and colonization by organisms because of the outgassing process, which renders it antibiotic. R.B.

N71-17994*# Montana Univ., Missoula. Dept. of Botany.

PLANT SUCCESSION AT SKAFTAFELLSJOEKULL

Richard P. Sheridan *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 109 111 (See N71-17966 07-13)

Avail: NTIS CSCL 06C

The development of an ecosystem from an originally unvegetated glacial ice front to a well-developed birch community was studied on the southern coast of Iceland. The outwash plain of Skaftafellsjoekull glacier was surveyed for plant succession. The succession of terrestrial flora on the alluvium is divided into three stages of pioneer, meadow, and early shrub, while that of aquatic flora is limited to green alga in melt water. R.B.

N71-17995*# Hawaii Univ., Honolulu. Dept. of Microbiology.

BIOCHEMICAL DIFFERENTIATION OF EQUISETUM SPECIES FROM ICELANDIC AND NORTH AMERICAN LOCATIONS

Barbara Z. Siegel *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 112-114 (See N71-17966 07-13)

Avail: NTIS CSCL 06C

The reasons for lack of development of endemic species in Iceland are considered. Some of the reasons given are: (1) the mutation rate in the subarctic is slower than that in the subtropics, (2) new organisms have arisen but because of a harsher environment have not found niches in which to survive, (3) that extensive changes have occurred at the subcellular level affecting rates of catalysis and biosynthetic pathways, but may not be reflected at the gross morphological level, and (4) that Iceland is so continually and heavily contaminated by 'continental' organisms that endemics have failed to evolve. Analysis of isoperoxidases and catalases in Equisetum species indicate that although the heme enzymes are morphologically similar, the variation in their number and location is significant. R.B.

N71-17996*# Hawaii Univ., Honolulu. Dept. of Botany.

A ROLE FOR LICHENS AS ANTAGONISTS TOWARD SEED PLANTS

Sanford M. Siegel *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 115 (See N71-17966 07-13)

Avail: NTIS CSCL 06C

The hypothesis that lichens break down rock surfaces and prepare the way for ferns and seed plants is considered. Preliminary studies of lichens collected from a lava lake area of Iceland reveal a growth inhibitor activity on barley seeds. This phenomenon is similar to that observed for some other geographic species of lichens. R.B.

N71-17997*# Hawaii Univ., Honolulu. Dept. of Botany.

DWARFING, LIGNIFICATION, AND LAND PLANT EVOLUTION

Sanford M. Siegel *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 116 (See N71-17966 07-13)

Avail: NTIS CSCL 06C

The relationship of lignin content to height in dwarf and

giant variants of alpine plants is considered. Dwarf forms of regular-sized plants from Iceland are compared with their closest relatives of larger size for height and lignin content. R.B.

N71-17998*# Hawaii Univ., Honolulu. Dept. of Microbiology and Botany.
SEARCH FOR A PRECAMBRIAN RELICT MICROORGANISM, KAKABEKIA BARGHOORNIANA
Barbara Z. Siegel and Sanford M. Siegel *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 117–121 (See N71-17966 07-13)
Avail: NTIS CSCL 06M

Kakabekia barghoorniana is defined as a living microorganism, morphologically similar to a form first described as a fossil from the Gunflint chert of south Ontario and dated at about two billion years. Studies were conducted on the moss- and turf-covered slope below the palagonite-covered sea-floor outcrops near Neykjavik, Iceland and other areas of the island to determine the existence of the relict form. The presence of the microorganism in Iceland indicates a longitudinal range of about 150 deg and a latitudinal range of about 18 deg in the northern latitudes. R.B.

N71-17999*# Oregon Univ., Eugene. Dept. of Biology.
PRELIMINARY REPORT ON THE DISPERSAL OF THERMOPHILIC ALGAE TO SURTSEY
Conrad E. Wickstrom *In* NASA. Ames Res. Center Boston Coll. Environ. Center Summer Inst. on Surtsey and Iceland Feb. 1971 p 122–124 refs (See N71-17966 07-13)
Avail: NTIS CSCL 06C

The water transport scheme for dispersal of thermophilic microorganisms to Surtsey from the mainland is discussed. The water transport scheme is suggested as the most likely mechanism because of fewer organisms found in rain and air samples, it provides a constant inoculum, it is a more direct route for the inoculum with fewer chance events, and the environmental conditions during water transport seem to be less severe than during air transport. R.B.

N71-18056*# Sandia Corp., Albuquerque, N.Mex. Planetary Quarantine Dept.
PLANETARY QUARANTINE PROGRAM Quarterly Progress Report, Period Ending 31 Dec. 1970
Dec. 1970 63 p refs
(NASA Order W-12853; Proj. 0064010)
(NASA-CR-116420; QPR-19) Avail: NTIS CSCL 06M

The following activities are discussed: (1) oxygen dependency in radiation inactivation of organisms at elevated temperatures; (2) formation of a model for thermoradiation inactivation of spores that includes a term representing breakage; (3) a behavioral model for spore inactivation as a function of water activity; and (4) a computerized bioassay identification system for Apollo 10, 11, 12 and 14 spacecraft biological data. G.G.

N71-18256# Harvard School of Public Health, Boston, Mass. Guggenheim Center for Aerospace Health and Safety.
THE EFFECTS OF PHYSICAL AND SYMBOLIC STRESSORS ON PERCEPTUAL MECHANISMS Final Report
Ross A. McFarland and Warren H. Teichner Jun. 1970 13 p refs
(Brant AF-AFOSR-1575-68)
(AD-715308; AFOSR-70-2619TR) Avail: NTIS CSCL 6/16

The research has had two major activities, (1) An attempt to develop a bridge between basic theory and application over the huge empirical knowledge gap between task and environmental variables on the one hand, and performance measures on the other, and (2) The conduct of experimental studies of relevance to the postulates of the stress theory. A third conceptual activity was added which concerned the question of what tasks should be used in conjunction with environmental simulation studies. Author (GRA)

N71-18288# Commissariat a l'Energie Atomique, Chatillon-sur-Seine (France). Centre de Production de Plutonium de Mareoule.
HUMAN FACTOR IN ACCIDENTS TO PERSONNEL IN THE NUCLEAR FIELD [LE FACTEUR HUMAIN DANS LES ACCIDENTS DU TRAVAIL SURVENUS DANS LE SECTEUR NUCLEAIRE]
1969 15 p refs In FRENCH Presented at Symp. on Educ. and Training of Workers in Radioprotection, Brussels
(CEA-CONF-1514; CONF-691211-1) Avail: AEC Depository Libraries

Accidents known to have occurred since the beginning of the nuclear era shows that to a very large extent their causes are of human origin: lack of technical knowledge of the material and method used; lack of theoretical knowledge of the nature of radiations and their biological effects; ignorance of elementary ideas on radiation shielding safety signaling; regulations concerning the use of artificial radioelements or X-ray generators; absence or poor functioning of detection instruments because of lack of maintenance; manipulations badly prepared and carried out; failure to comply with instructions or safety signals; forgetfulness or underestimation of danger, negligence, and inattention; voluntary disconnecting of safety devices; and etc. Author (NSA)

N71-18363# Air Force Systems Command, Wright-Patterson AFB, Ohio. Aerospace Medical Research Lab.
LONG TERM ADAPTATION OF PURSUIT ROTOR PERFORMANCE TO IMPULSIVE ACOUSTIC STIMULATION Final Report, Apr.–Jun. 1970
C. Stanley Harris Sep. 1970 11 p refs
(AD-715289; AMRL-TR-70-92) Avail: NTIS CSCL 5/10

In a previous experiment, performance on a pursuit rotor task was found to adapt to impulsive acoustic stimulation by the fourth day of exposure. The purpose of the present study was to determine if performance would regain sensitivity to the stimulus after an interval of time. Six subjects who participated in the initial experiment were retested after intervals ranging from five to eight months. After a retraining day, the subjects were presented a retention test day in which the procedure was identical to that used on the four test days of the prior experiment. The stimulus (peak intensity of 112 dB with a 400 millisecond duration) was presented nine times in a semi-random fashion. The results are reported. Author (GRA)

N71-18364# Whirlpool Corp., St. Joseph, Mich. Life Support Systems Group.
DEVICES FOR STORING AND DISPENSING REHYDRATABLE FOODS ABOARD A SPACE VEHICLE Final Report, Jan.–Sep. 1969
William T. Martin, John J. Symons, and Norman G. Roth Sep. 1970 29 p
(Contract F46109-69-C-0019)
(AD-715036; SAM-TR-70-58) Avail: NTIS CSCL 6/8

The feasibility of dispensing rehydratable food from bulk storage aboard a space vehicle was studied. Three candidate systems--Revolving Wheel, Butterfly Valve, and Gas Entrainment -- are described and analyzed. Author (GRA)

N71-18399*# Stanford Univ., Calif. Dept. of Applied Mechanics.
EXPERIMENTAL INVESTIGATION OF PLANAR MOTIONS OF A HUMAN BEING UNDER THE ACTION OF A BODY-FIXED THRUST
J. D. Yatteau and T. R. Kane Jan. 1971 109 p refs
(Grant NGR-05-020-209)
(NASA-CR-116799; TR-202) Avail: NTIS CSCL 05E

The feasibility of providing a weightless astronaut with a simple manuevering device by attaching a single thruster to one part of the body was investigated in a space operations simulator. The results show that man can perform well controlled planar motions when acted upon by a body-fixed thrust. F.O.S.

N71-18415# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
DEVELOPMENT OF A HYDRAULIC GRIP DYNAMOMETER Final Report, Oct. 1969 - May 1970
Robert E. Van Patten and Michael Rubenstein Sep. 1970 20 p refs
(AD-715911; AMRL-TR-70-71) Avail: NTIS CSCL 6/12

A lightweight, compact grip dynamometer and its associated circuitry was developed for use in studies pertaining to the cardiovascular effects of sustained submaximal contractions and protection of aircrew men against the effects of elevated gravitational fields. Author (GRA)

N71-18421*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFLUENCE OF THE PERICAPILLARY PLASMA ON CHEMICAL EXCHANGE FROM BLOOD TO TISSUE
John T. Howe Washington Mar. 1971 15 p refs
(NASA-TN-D-6227; A-2711) Avail: NTIS CSCL 06P

The transport of chemical species from blood to tissues is studied for capillaries that have an extra annulus of plasma outside the endothelium. The equations of flow and diffusive transport are solved in closed form in the blood compatible with transport into the surrounding tissue, which consumes the species according to first order kinetics. Results show that the plasma annulus increases the supply of species and thus the rate of chemical exchange between blood and tissues, raising the concentration (and the consumption rate) in tissue spaces. If permeabilities are reassigned so that the endothelium is very leaky and the blood-tissue interface is the chemical barrier (low permeability), the species concentration the tissue is increased again. The reason is that the blood velocity in the endothelium is much larger than that of the annulus. Thus the high rate of supply of species in the leaky endothelium is available to the annulus, and although the permeability of the blood-tissue interface is low, its large surface area is bathed by a high chemical concentration. The result is an increase in the species flux to the tissues and an increase in concentration. The effect increases with capillary radius (lower capillary hematocrit). Author

N71-18492# Joint Publications Research Service, Washington, D.C.
HYDRODYNAMICS OF XIPHIOIDAE GROUP FISHES
Yu. G. Aleyev 1 Feb. 1971 9 p refs Transl. into ENGLISH from Zool. Zh. (Moscow), v. 49, no. 11, 1970 p 1676-1683
(JPRS-52299) Avail: NTIS

An experimental study of the hydrodynamics of Xiphioidae fishes is reported. Based on experiments in hydrodynamic channels, and in wind and cavitation tunnels, the role of the rostrum and other features of body shape and integumenta of Xiphioidae representatives is shown in the determination of the pattern of distribution of dynamic pressure and other elements of the streamlining pattern important for reducing total hydrodynamic resistance. Author

N71-18493# Joint Publications Research Service, Washington, D.C.
EMISSION OF ULTRASOUND ECHOLOCATING SIGNALS BY COMMON PORPOISE
N. A. Dubrovskiy et al 1 Feb. 1971 8 p refs Transl. into ENGLISH from Akust. Zh. (USSR), v. 16, no. 4, 1970 p 521-525
(JPRS-52291) Avail: NTIS

The common porpoise's ability to detect and differentiate targets and also its ability to perceive auditory signals, is used to present a hypothesis postulating the presence of ultrasound echo-locating signals in this animal. Special experiments confirmed this hypothesis and showed that in performing detecting tasks the common porpoise uses echo-locating signals in a frequency range up to 100 kilocycles per second. Author

N71-18495# Rochester Univ. N.Y. Dept. of Radiation Biology and Biophysics.
BIOLOGICAL EFFECTS OF MICROWAVE EXPOSURE: AN OVERVIEW
Sol M. Michaelson [1970] 14 p refs Presented at Microwave Power Symp., Scheveningen, Neth. Sponsored by AEC
(UR-49-1256; CONF-701010-1) Avail: NTIS

A review of the literature on the biological effects of microwaves is presented. Electrical and scattering properties of tissues are discussed with relation to effects of electromagnetic radiation on organisms. It is emphasized that effects of microwaves are a manifestation of thermal conversion, while the harmful effects of X- or gamma rays are caused by ionization. A discussion of the relative importance of thermal and non-thermal effects of microwaves is given. Studies on cataractogenic effects of microwaves on eyes of rabbits are reviewed. A review of studies on human populations exposed to microwaves includes radar operators and microwave personnel. Studies on lenticular opacities in microwave workers showed that there were no clinically significant defects in terms of decreased visual acuity. NSA

N71-18536# Army Medical Research Lab., Fort Knox, Ky.
REAL-EAR EVALUATION OF EARPLUGS USING ONE-THIRD OCTAVE BANDS OF NOISE Interim Report
James D. Mosko 20 Oct. 1970 10 p
(AD-715748; USAMRL-907) Avail: NTIS CSCL 6/17

The objective of the test was to evaluate the attenuation characteristics of three earplugs using noise bands as the test signal, and to compare the attenuation characteristics of the Sound Sentry protective device using noise bands to those using pure tones. A real-ear attenuation method using noise bands was utilized to evaluate the attenuation characteristics of the earplugs. Comparison of these data with other data obtained in this laboratory and from a manufacturers brochure was accomplished for the Sound Sentry device, and two separate studies from this laboratory were used to compare attenuation data for the V.51R earplug for pure tones and noise signals. GRA

N71-18562*# Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
SURVIVAL OF SOIL BACTERIA DURING PROLONGED DESICCATION
M. Chen and M. Alexander [1971] 19 p refs
(Grant NGR-33-010-013)
(NASA-CR-116807) Avail: NTIS CSCL 06M

A determination was made of the kinds and numbers of bacteria surviving when two soils were maintained in the laboratory under dry conditions for more than half a year. Certain nonspore-forming bacteria were found to survive in the dry condition for long periods. A higher percentage of drought-tolerant than drought-sensitive bacteria were able to grow at low water activities.

When they were grown in media with high salt concentrations, bacteria generally became more tolerant of prolonged drought and they persisted longer. The percent of cells in a bacterial population that remained viable when exposed to drought stress varied with the stage of growth. Author

N71-18573*# National Aeronautics and Space Administration, Washington, D.C.
RELATIONSHIPS BETWEEN CARDIAC VOLUME, BODY WEIGHT, PHYSICAL WORK CAPACITY AND BLOOD VOLUME IN HEALTHY MEN AND WOMEN WITH VARYING RANGE OF PERFORMANCE [BEZIEHUGEN ZWISCHEN HERZVOLUMEN, KOERPERGEWICHT, KOERPERLICHER LEISTUNGS-FAEHIGKEIT UND BLUTVOLUMEN BEI GESUNDEN MAENNERN UND FRAUEN UNTERSCHIEDLICHER LEISTUNGSBREITE]
K. Musshoff et al Feb. 1971 30 p refs Transl. into ENGLISH from Acta Radiol. (Stockholm), v. 57, 1962 p 377–400
(NASA-TT-F-13439) Avail: NTIS CSCL 06P

An investigation was conducted to establish the relationships between cardiac volume on the one hand and body weight, blood volume, and physical working capacity on the other, as well as the mutual relationships among the four values in a group of men and women with different performance ranges. The test subjects were 36 males 18 to 19 years of age, 39 men 20 to 40 years of age, 25 women, and 44 male outstanding athletes. Correlations established in the study include: (1) The cardiac volume per kilogram body weight is greater for athletes than for untrained men and in the case of the latter greater than for untrained women. (2) The maximum absorption of oxygen and maximum pulse oxygen per kg body weight are highest in athletes and successively decrease in untrained men in the 18 to 19 year age group, untrained men in the 20 to 40 year age group, and women. (3) In the case of athletes and untrained men 18 to 19 years of age, the ratios formed by the cardiac volume and maximum oxygen absorption per minute and per pulse beat are approximately equal. It is moderately increased for men 20 to 40 years of age and considerably so for women. D.L.G.

N71-18697*# Environmental Research Associates, Essex, Md.
LUNAR SHELTER HABITABILITY EVALUATION
G. Samuel Mattingly, Harry L. Loats, Jr., and George M. Hay Feb. 1971 72 p ref
(Contract NAS1-8975-1)
(NASA-CR-111824) Avail: NTIS CSCL 06K

The results are reported of an investigation to determine the capability of pressure suited personnel to deploy lunar shelter/airlock structures, install mockup life support, power and miscellaneous equipment within and outside the shelter, and adequately utilize this equipment after installation. Information was obtained on: (1) dimensional requirements for lunar shelter interiors, hatches, and airlocks, (2) limitations imposed on lunar shelter design by pressure suited crewmen, (3) times associated with various work tasks, and (4) redesign recommendations for a lunar stay time extension module (STEM). Author

N71-18741# Human Factors Research, Inc., Goleta, Calif.
THE EFFECTS OF DISPLAY ALTERNATION ON MONITORING PERFORMANCE
Charles Abrams, C. H. Baker, and Donald N. Buckner Nov. 1970 26 p refs
(Contract Nonr-4120(00))
(AD-715777; Rept-750-14) Avail: NTIS CSCL 5/8

Target detection performance on a radar and sonar task was assessed as a function of time on watch for two display conditions. In one condition, the display alternated between radar and sonar sensors every four minutes; in the other condition, the radar and sonar sensors were displayed in a conventional, non-alternating, manner. Comparison of the data obtained under the alternating and non-alternating radar display conditions revealed no differences in performance between conditions but declines in detection performance as a function of time on watch were evident under both conditions. Detection performance on the sonar display benefited from the display alternation during the second half of the main watch. Author (GRA)

N71-18768# Washington Univ., Seattle.
OBSERVATIONS OF CARBON DIOXIDE AND PLANT GROWTH IN AN ARCTIC ECOSYSTEM Final Report
John J. Kelley and Philip L. Johnson Nov. 1970 133 p refs
(Contract N00014-67-A-0103-0007)
(AD-715789; SR-8) Avail: NTIS CSCL 6/6

This report presents the results of analyses of atmospheric carbon dioxide and ecological factors at Meade River Camp and at North Meadow Lake (Barrow), Alaska. The data summarize reference gas calibrations used in the CO2 program, with a discussion of methods used to obtain the data for CO2 concentrations in air at both stations. Variations of CO2 in the air, at the ground level, and at 16 m above the ground are given for both the Meade River Station and North Meadow Lake. Meteorological observations are presented for the period of observations. The percent rate of growth of five species of tundra plants is shown, and the correlation between CO2 concentration in the atmosphere and the percent of maximum ground is given. The data for the amounts of chlorophyll and dry weight production in each of four types of communities are presented. A list of publications resulting from the interpretation of these data is included. Author (GRA)

N71-18792# School of Aerospace Medicine, Brooks AFB, Tex.
METHODS FOR STUDYING THE BIOCHEMICAL PROPERTIES OF BACTERIA
Yu B. Popov 1970 6 p refs Transl. into ENGLISH from Lab. Delo (Moscow), no. 10, 1967 p 621
(AD-715506; SAM-TT-R-1074-1170) Avail: NTIS CSCL 6/1

The purpose of this investigation is to test the simplest, more rapid and economical micromethods, allowing rather complete study of the biochemical properties of bacteria to be performed in short order. The work was performed using standard cultures of the following microorganisms: Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Bacillus cereus, Bacillus mesentericus, Micrococcus pyogenes var. aureus and Bacillus megatherium. Test methods for the following Saccharolytic properties; Test for urease; Test for the capability to form indole; Test for reduction of nitrates; and Test for reduction of nitrites. GRA

N71-18793# School of Aerospace Medicine, Brooks AFB, Tex.
HOMEOSTASIS IN WEIGHTLESSNESS [GEOMEOSTAZ VUSLOVIYAKH NEVESOMOSTI]
B. B. Egorov 1970 12 p Transl. into ENGLISH from the Russian Presented at the Intern. Astronautical Congr. (21st), Constance, West Germany, 4-10 Oct. 1970
(AD-715507; SAM-TT-R-1075-1270) Avail: NTIS CSCL 6/19

A long exposure to weightlessness is accompanied by a readjustment of a number of physiological processes due to disruption of reflexes from the muscles which support activity in the presence of gravity. At the same time, the activity of the muscles of the extremities, a powerful mechanism of extracardial regulation, is changed. The disappearance of hydrostatic pressure in weightlessness is accompanied by redistribution of the blood in the

body and by a decrease in the mass of circulating blood. The sharp imbalance between the level of the circulating blood mass, necessary to support the main processes of metabolism, and the mass of circulating blood, stable for conditions of weightlessness, causes periodic and regularly alternating phenomena of polyurea and water retention. This phenomenon is accompanied by a distruption of the electrolyte balance in the body. Author (GRA)

N71-18794# Office of Naval Research, London (England).
INTERNATIONAL SYMPOSIUM ON BEHAVIORAL THERMOREGULATION (FIRST)
Albert R. Dawe 4 Nov. 1970 29 p refs Symp. held at Lyon, France, 7–11 Sep. 1970
(AD-715783; ONRL-C-27-70) Avail: NTIS CSCL 6/16

The Symposium put together a week of papers covering an incredible range of thermoregulatory research. Almost 100 papers were given by representatives of seventeen countries. There was representation from almost every possible sub-specialty of science which writes, thinks, and publishes on problems of thermoregulation. Titles, authors and short remarks are indicated on the majority of papers. Author (GRA)

N71-18837# Scottish Research Reactor Centre, East Kilbride.
A COMPARISON OF METHODS TO ASSESS GEOMETRICAL VARIATIONS OF THE COUNTING RATE IN WHOLE BODY MONITORS
Keith Boddy, Priscilla C. King, Barbara M. Holmes, and Donald M. Dunn Dec. 1968 29 p refs Supported in part by Scot. Hosp. Endowments Res. Trust
(SRRC-31/69) Avail: NTIS

The variation in the counting-rate of a whole-body monitor, due to redistribution of an administered isotope in the body, was investigated by three methods. Point sources in simple water phantoms, a life-like phantom containing simulated organs, and human subjects were studied. The results from all methods were in reasonable agreement. The point source study showed that changes in the depth of the isotope in the body caused greater variation of the counting-rate than changes in longitudinal or lateral position and realistic quantitative estimates of the variation were obtained. It is suggested that this simple method might be a suitable basis for inter-laboratory comparisons. Confirmatory data on human subjects are supplied by the routine use of the whole-body monitor. It is concluded that the use of an elaborate phantom, which may be expensive to purchase, is comparatively time-consuming and is probably unnecessary. Author

N71-18894# Joint Publications Research Service, Washington, D.C.
SPACE BIOLOGY AND MEDICINE, VOLUME 4, NO. 6, 1970
16 Feb. 1971 132 p refs Transl. into ENGLISH of the book 'Kosmicheskaya Biologiya i Meditsina. Vol. 4, No. 6, 1970' Moscow, Meditsina Publishing House, 1970 p 1–87
(JPRS-52402) Avail: NTIS

Selected articles are presented on cosmonaut selection, the physiological and biological effects of prolonged space flight, and in-flight monitoring and postflight clinical examination of Soyuz 9 crew members. For individual titles, see N71-18895 through N71-18913.

N71-18895# Joint Publications Research Service, Washington, D.C.
GENERAL PRINCIPLES FOR SELECTING COSMONAUTS
N. N. Gurovskiy et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 1–8 refs (See N71-18894 08-04)
Avail: NTIS

The fundamental selection priciples, as well as practical methods for evaluating the health, functional capacity and psychological peculiarities of cosmonaut candidates, are based on careful study and analysis of the combined effect of spaceflight factors on the human body. Three selection stages are discussed: clinical evaluations, hospital examinations, and selection during training. The level of demands placed on different physiological systems is gradually increased from stage to stage. High priority is given to the peculiarites involved in the selection and training of cosmonaut-scientists. In certifying a candidate, particular attention is given to the degree and speed of human body adaptation to the hostile space environment. Author

N71-18896# Joint Publications Research Service, Washington, D.C.
EXPERIMENTAL VALIDATION OF ADMISSIBLE RADIATION DOSES FOR LONG SPACE FLIGHTS
Yu. G. Grigoryev et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 9–16 refs (See N71-18894 08-04)
Avail: NTIS

The results of a two-year study of 204 dogs exposed to chronic gamma irradiation are given. Total tissue doses were 42, 125, and 249 rad. Some of the animals were exposed to repeated irradiation once for four months in addition to chronic irradiation with a dose of 62.5 rad per year. Total absorbed tissue dose from exposure of the two groups to the combined irradiation was 241 and 377 rad. The dose level and exposure rate simulate irradiations which may occur during long space flights. The studies included determinations of hemopoietic, cytological, and immunological parameters. By the end of the two-year experiment some of the dogs which had received the highest doses exhibited changes which can be interpreted as early symptoms of chronic radiation sickness. Author

N71-18897# Joint Publications Research Service, Washington, D.C.
PATHOLOGIC ANATOMY OF DOG KIDNEYS DURING THE AFTEREFFECT PERIOD FOLLOWING IRRADIATION BY HIGH ENERGY PROTONS
B. S. Fedorenko et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 17–22 refs (See N71-18894 08-04)
Avail: NTIS

Renal pathologic anatomy of 17 dogs irradiated with 126- and 510-MeV protons in doses of 250, 350, and 550 rad was investigated two to four years after the exposure. Dystrophic and sclerotic changes were observed in the glomerular and tubular system: enlargement of basal membranes and the glomerular capsule, atrophy of the tubular epithelium, and excessive accumulation of mucopolysaccharides. The degree of structural changes increased with the irradiation dose regardless of proton energy. The changes were slowly progressing to involve mainly vascular disorders and lesions of the interstitial substance of glomerular basal membranes, and were similar to the processes involved in natural aging of the animal body. No specific results of proton exposure were noted. Author

N71-18898# Joint Publications Research Service, Washington, D.C.
DYNAMICS OF MORPHOLOGICAL CHANGES IN THE SUPRAOPTIC NUCLEUS OF THE HYPOTHALAMUS DURING PROLONGED TRANSVERSE ACCELERATION
V. K. Podymov *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 23–29 refs (See N71-18894 08-04)

Avail: NTIS

The dynamics of changes in the supraoptic nucleus of the hypothalamus in 45 white rats exposed to transverse accelerations for 3, 8, 16, and 24 hours was examined. Phase changes in the secretory reaction of the supraoptic nuclei were observed. This indicates direct participation of hypothalamic secretory neutrons in the adaptive reactions of the animal body to accelerations. Author

N71-18899# Joint Publications Research Service, Washington, D.C.

DEPENDENCE OF BIOELECTRIC ACTIVITY OF ANTAGONISTIC MUSCLES OF THE HIND LIMBS OF ANIMALS ON ROTATION DIRECTION AND HEAD FIXATION

Yu. M. Uflyand et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 30–33 refs (See N71-18894 08-04)

Avail: NTIS

Right-to-left and left-to-right horizontal rotation of animals caused an increase in bioelectric activity in tibial antagonistic muscles, and the level and latent period of the reaction. The bioelectric reaction of the antagonistic muscles was also dependent on head fixation. Author

N71-18900# Joint Publications Research Service, Washington, D.C.

MEDICAL SUPPORT AND PRINCIPAL RESULTS OF EXAMINATION OF THE SOYUZ-9 SPACESHIP CREW

Ye. I. Vorobyev et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 34–41 (See N71-18894 08-04)

Avail: NTIS

The collected data indicate that the physiological changes were of a transient or functional nature. The motor and autonomic systems exhibited adaptive changes during the first three or four days. Postflight shifts in vital physiological systems were far more pronounced than were inflight changes. It is suggested that adaptation to the terrestrial environment after prolonged weightlessness involves greater difficulties and places greater demands on the physiological functions than does adaptation to weightlessness. It is concluded that prolonged space missions make it necessary to formulate preventive measures alleviating post-weightlessness adaptation to a terrestrial environment. Author

N71-18901# Joint Publications Research Service, Washington, D.C.

METHOD FOR MONITORING PHYSIOLOGICAL FUNCTIONS OF SOYUZ-9 CREW

A. G. Zerenin et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 42–46 refs (See N71-18894 08-04)

Avail: NTIS

A distinctive characteristic of physiological monitoring of the Soyuz-9 mission was the fact that throughout the flight A. G. Nikolayev and V. I. Sevast'yanov repeatedly put on and removed the bioinstrumentation harness. These procedures, each requiring five to ten minutes, were performed without difficulty. The bioinstrumentation harness induced no unpleasant sensations or skin irritations. The telemetered data were of a high quality and helped to collect reliable information on the cardiovascular and respiratory functions of the cosmonauts during the extended space flight. Author

N71-18902# Joint Publications Research Service, Washington, D.C.

RESULTS OF ROUTINE MEDICAL MONITORING OF COSMONAUTS DURING FLIGHT ON THE SOYUZ-9 SHIP

A. A. Butusov et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1970 p 47–53 refs (See N71-18894 08-04)

Avail: NTIS

Peculiarities of in-flight medical monitoring associated with the specific characteristics of an extended space flight are discussed. The physiological changes induced by the 18-day flight, as well as circulatory reactions of a provocative test involving a standard physical load are described. The high motor activity and emotional stress associated with implementing the extensive program of scientific experiments appeared to bring about a lower vagotonic reaction as compared with that during previous manned space flights. This was suggested by the fact that in-flight cardiac and respiration rates were very similar to preflight levels. The type and level of physiological changes mainly corresponded to the operations performed during flight. The working capacity of crew members remained high throughout the entire mission. Author

N71-18903# Joint Publications Research Service, Washington, D.C.

RESULTS OF CLINICAL EXAMINATION OF A. G. NIKOLAYEV AND V. I. SEVASTYANOV

N. S. Molchanov et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 54–57 efs (See N71-18894 08-04)

Avail: NTIS

No pathological conditions were noted in crew members during the flight. Functional changes similar to those observed during earlier flights were detected. Immediately upon return to earth the following disturbances were noted: skin pallor, moderate hyperemia of the mucosa in the upper respiratory passages, congestion of scleral vessels, eyelid edema, noticeable muscular atrophy of the lower limbs, and reduced muscle tone. During the first postflight day a decrease in the periosteal and tendon reflexes and an inhibition of abdominal reflexes were reported. Muscular pain which had been noted on the first day increased by the fifth day due to greater mobility. Statokinetic and sensomotor disorders were observed. Dynamic monitoring revealed that rehabilitation processes developed in a gradual manner. Author

N71-18904# Joint Publications Research Service, Washington, D.C.

CHANGE IN OPTICAL DENSITY OF BONE TISSUE AND CALCIUM METABOLISM IN THE COSMONAUTS A. G. NIKOLAYEV AND V. I. SEVASTYANOV

Ye. N. Biryukov et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 58–63 refs (See N71-18894 08-04)

Avail: NTIS

The results of pre and postflight evaluations of bone tissue optical density and the calcium content in the blood serum and urine are given. Both cosmonauts exhibited an in-flight increase in calcium excretion in the urine and a decrease in bone optical density in an X-ray examination. In addition, one of them exhibited an insignificant increase in the postflight blood serum calcium content. The calcium excretion and bone optical density rapidly returned to normal levels after return to earth. These changes seem to be closely associated with different functional demands on the musculoskeletal system under conditions of weightlessness and terrestrial gravity. Author

N71-18905# Joint Publications Research Service, Washington, D.C.

SPACE FLIGHT EFFECT ON THE NEUROMUSCULAR SYSTEM OF COSMONAUTS

M. A. Cherepakhin et al *In its* Space Biol. and Med., Vol. 4, No.

6, 1970 16 Feb. 1971 p 64-69 refs (See N71-18894 08-04)
Avail: NTIS

The results of medical evaluations of Soyuz-9 crew members are given, including data on the effect exerted by weightlessness on the neuromuscular system. Muscle tone was evaluated on the basis of muscle firmness and bioelectric activity. Reflex excitability of the neuromuscular system was studied. After exposure to weightlessness the following changes were noted: decreased strength and tone of posture muscles, increased reflex excitability of the neuromuscular system, and a decreased circumference of the lower extremities. Author

N71-18906# Joint Publications Research Service, Washington, D.C.

REGULATION OF ERECT POSTURE OF COSMONAUTS AFTER AN 18 DAY ORBITAL FLIGHT

B. N. Petukhov et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 70-77 refs (See N71-18894 08-04)
Avail: NTIS

Displacements of the general center of gravity were registered by stabiligraphic methods and circulation parameters were monitored. After return to earth significant changes in the frequency and amplitude of changes in the general center of gravity were noted, which indicate distinct static disturbances. Changes in the rhythm of cardiac contractions and increase in mean arterial pressure were observed. These parameters gradually returned to normal by the tenth day following the flight. Author

N71-18907# Joint Publications Research Service, Washington, D.C.

SKIN AUTOMICROFLORA AND SOME INDICES OF NATURAL IMMUNITY OF THE COSMONAUTS A. G. NIKOLAYEV AND V. I. SEVASTYANOV BEFORE AND AFTER FLIGHT

S. N. Zaloguyev et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 78-84 refs (See N71-18894 08-04)
Avail: NTIS

The 18-day Soyuz-9 space flight resulted in dysbacteriotic disturbances in the composition of skin and nasal cavity automicroflora. These disturbances are accompanied by changes in some natural immunity parameters. Author

N71-18908# Joint Publications Research Service, Washington, D.C.

DIET OF SOYUZ-9 SPACESHIP CREW MEMBERS

V. P. Bychkov et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 85-87 (See N71-18894 08-04)
Avail: NTIS

The diet consumed by Soyuz-9 crew members consisted of canned foods, analytically determined as containing 139 g of proteins, 88 g of fats, and 345 g of carbohydrates. The caloric content of the daily diet was 1803 cal. The diets were supplemented with essential amino acids and contained normal concentrations of other irreplaceable nutrient ingredients. The diets provided a high work capacity for the cosmonauts, helping them to implement the stipulated flight program. Author

N71-18909# Joint Publications Research Service, Washington, D.C.

SPACE FLIGHT EFFECT ON THE ENZYME SECRETION FUNCTION IN THE DIGESTIVE SYSTEM OF COSMONAUTS

K. V. Smirnov et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 88-95 refs (See N71-18894 08-04)
Avail: NTIS

Postflight studies of the enzyme secretion function of the digestive system of Soyuz-9 crew members reveal phase changes in the activity of ivestigated enzymes. During the first postflight day the following shifts were detected: inhibition of the salivary glands, activation of abdominal and pancreatic enzymes, and lack of noticeable changes in the small intestine. These shifts in the functional state of the gastrointestinal tract are adaptive and indicative of a digestive system response to weightlessness. Author

N71-18910# Joint Publications Research Service, Washington, D.C.

RESULTS OF OTORHINOLOGICAL EXAMINATION OF SOYUZ-9 SPACESHIP CREW MEMBERS

I. I. Bryanov et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 96-99 refs (See N71-18894 08-04)
Avail: NTIS

The physiological reactions of the vestibular and auditory analyzers of the Soyuz 9 crew members were investigated. Preflight examination revealed definite changes in the otorhinolaryngological organs which were well compensated under conditions of terrestrial loading. During flight there were changes in the activity of analyzer systems, particularly of the vestibular analyzer. Adaption to weightlessness varied from one to three days between the two crew members. Both cosmonauts noted changes in the sense of smell and taste, which returned to normal shortly after landing. The postflight period of readaptation to terrestrial conditions was characterized by general asthenia, autonomic-vascular reactions (including the nasal cavity vascular system), and impairment of statics and coordination. Recovery to normal activity displayed varying dynamics and duration. R.B.

N71-18911# Joint Publications Research Service, Washington, D.C.

DYNAMICS OF ORTHOSTATIC STABILITY OF COSMONAUTS AFTER FLIGHT ABOARD THE SOYUZ-9 SPACESHIP

V. V. Kalinichenko et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 100-112 refs (See N71-18894 08-04)
Avail: NTIS

The dynamics of the orthostatic stability of the Soyuz 9 crew members was examined before and after their 18-day flight using five-minute active and ten-minute passive tests. The response to orthostatic tests was evaluated on the basis of medical monitoring and hemodynamic, gas exchange, and external respiration measurements. Both cosmonauts exhibited a postflight decrease in orthostatic stability which was restored slowly and nonmonotonically. The response of both cosmonauts was similar. The degree of orthostatic instability appears to be dependent on flight duration. Author

N71-18912# Joint Publications Research Service, Washington, D.C.

EFFECT OF PROLONGED CONFINEMENT OF MAN IN A SOYUZ-9 SIMULATOR ON THE FUNCTIONAL STATE OF THE CARDIOVASCULAR SYSTEM

L. P. Salmanov et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1971 p 113-117 refs (See N71-18894 08-04)
Avail: NTIS

The cardiovascular effect of 19- to 23-day confinement of man in a Soyuz 9 simulator was studied during normal and

modified work and rest cycles. In an experiment with a normal work and rest schedule there were no significant changes in the functional state of the circulatory system. Significant circulatory disturbances were observed in experiments with a modified work and rest schedule. Author

N71-18913# Joint Publications Research Service, Washington, D.C.

ELECTROENCEPHALOGRAPHIC CHANGES AND BEHAVIORISTIC REACTIONS UNDER THE INFLUENCE OF ACUTE HYPOXIA

N. A. Agadzhanyan et al *In its* Space Biol. and Med., Vol. 4, No. 6, 1970 16 Feb. 1970 p 118-126 refs (See N71-18894 08-04)

Avail: NTIS

Behavioristic, conditioned reflex, and motivation reactions, as well as concomitant changes in the EEG, ECG, and blood oxygen concentration were determined in experiments on rabbits and human subjects exposed to rapidly increasing hypoxia. It was found that these physiological changes correlate with behavioral reactions. Author

N71-18926*# Illinois Univ., Urbana. Lab. for Ergonomics Research.

A STUDY OF THE THERMAL BEHAVIOR OF LIVING BIOLOGICAL TISSUE WITH APPLICATION TO THERMAL CONTROL OF PROTECTIVE SUITS

A. Shitzer, J. C. Ohato, and B. A. Hertig Jan. 1971 217 p refs

(Grant NGR-14-005-103)

(NASA-CR-116873; ME-TR-207) Avail: NTIS CSCL 06P

A biothermal model of living tissue was studied which permits inclusion of the effects of blood flow, local heat generation, conduction, and storage of heat on the heat transfer processes occurring in the living tissue. A second order, partial differential equation, the bioheat equation, was obtained for the model. Due to the lack of reliable and detailed data on the thermophysical properties involved, the tissue is assumed to be isotropic and homogeneous and all properties are assumed to be constant. Transient, as well as steady-state, closed form, analytical solutions were obtained for cylindrical and rectangular geometries, and for various parameters. Author

N71-18935*# TRW, Inc., Cleveland, Ohio.

AIRCREW OXYGEN SYSTEM DEVELOPMENT Final Summary Report

A. D. Babinsky, R. G. Huebscher, B. J. Kiraly, T. P. O'Grady and J. D. Powell Washington NASA Mar. 1971 51 p refs

(Contract NAS2-4444)

(NASA-CR-1741) Avail: NTIS CSCL 06K

An onboard aircrew oxygen generating system for tactical aircraft has been developed. Oxygen is generated by water electrolysis and carbon dioxide is removed from the rebreather by an electrochemical carbon dioxide concentrator. A description of the water electrolysis and the CO2 concentrator subsystems, a summary of the subsystem test results, a description of integrated aircrew breathing system, and a summary of the preflight, flight, and post-flight test data are included. Author

N71-19017*# Sandia Corp., Albuquerque, N.Mex.

AN APPROACH TO COMPUTERIZED BACTERIAL IDENTIFICATION

Richard T. Dillon, Sr. Nov. 1970 86 p refs Sponsored in part by AEC

(NASA Order W-12853)

(NASA-CR-116815; SC-RR-70-779) Avail: NTIS CSCL 06M

The analysis and design is described of a general approach to bacterial identification which readily lends itself to computerization. This approach has been applied to the microbial sampling data of four Apollo spacecraft. These data were supplied by the PHS Spacecraft Bioassay Laboratory who obtained them in connection with NASA's lunar planetary quarantine responsibility. The approach described here was found to agree quite well with the PHS identifications assigned in the laboratory. The computer program used in this application is described in detail, and some analysis of the results of the use of this computer program with the Apollo data is given. Other possible applications of the general approach to bacterial identification described are mentioned. Author

N71-19018*# Houston Univ., Tex. Dept. of Biology.

TWO POPULATIONS OF ALIPHATIC HYDROCARBONS OF TERATOMA AND HABITUATED TISSUE CULTURES OF TOBACCO

John D. Weete, S. Venketeswaran, and John L. Laseter [1970] 11 p refs Prepared in cooperation with Louisiana State Univ., New Orleans

(Contract NSR-09-051-001)

(NASA-CR-116887) Avail: NTIS CSCL 06P

Teratoma and habituated tissue cultures of tobacco grown under identical conditions were examined for the presence of paraffinic hydrocarbons. The teratoma tissues contained n-C29, 2-methyl C30 (iso C31) and n-C31 as the major alkane components and their distribution pattern was qualitatively identical to the seedling tissue alkanes (C22 - C34). Habituated tissues contained a different population of alkanes ranging in carbon chain length from C17 to C28. The predominant alkane components were n-C23, n-C22, and n-C24 in decreasing concentrations respectively. A tissue culture system is presented where the population 1 hydrocarbons (C16 - C28) are present and synthesized separately and independently of population 2 hydrocarbons (C27 - C34). Author

N71-19023# Joint Publications Research Service, Washington, D.C.

INTERACTION OF THE ANALYZERS IN THE COMMON DOLPHIN WHEN DISCRIMINATING GEOMETRIC FIGURES UNDER WATER

A. Bagdonas et al 22 Feb. 1971 9 p refs Transl. into ENGLISH from Zh. Vysshei Nervnoi Deyatelnosti im I. P. Pavlova (Moscow), no. 5, 1970 p 1070-1074

(JPRS-52444) Avail: NTIS

The ability to discriminate between geometric figures with different optical and acoustic properties presented under different visibility conditions was developed in a dolphin by means of the motor-food conditioned reflex method. Squares and triangles were made of ebonite and Plexiglas, and experiments were run from 9 to 11 am and from 8 to 10 pm. Under adverse conditions for the functioning of the echo-location analyzer, the dolphin used mostly vision to discriminate the figures. When conditions were difficult for visual discrimination, it used its echo-location analyzer. The spatial orientation of dolphins under water involves the close interaction of the visual and acoustic analyzers. Author

N71-19051# Joint Publications Research Service, Washington, D.C.

SPACE BIOLOGY AND MEDICINE, VOLUME 4, NO 5, 1970

7 Jan. 1971 142 p refs Transl. into ENGLISH of the book 'Kosmicheskaya Biologiya i Meditsina, Vol. 4, No. 5, 1970'

Moscow, Meditsina Publishing House, 1970 p 1-87 (JPRS-52121) Avail: NTIS

Papers are presented on space biology and medicine including bioastronautics, life support systems, and spacecraft environment research. For individual titles see N71-19051 to N71-19077.

N71-19052# Joint Publications Research Service, Washington, D.C.

STUDY OF CONTROL OF THE CARBON DIOXIDE CONCENTRATION IN AN ANIMAL CHAMBER DURING ATMOSPHERIC REGENERATION BY CHLORELLA

V. I. Saukin et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 1-6 refs (See N71-19051 08-04)
Avail: NTIS

An experimental study was made of a system for controlling the CO2 concentration in an animal chamber involving the use of Chlorella as a biological component. Culture productivity was controlled by step-by-step changes in the illumination of the reactor surface, correlated with a known deviation of the CO2 concentration. The accuracy achieved in stabilizing this value was 0.5% CO2. Spontaneous fluctuations in culture productivity and changes in animal gas exhange were approached as changes affecting the control system. An analysis of the experimental data yielded the numerical values of these changes. In terms of the dynamic characteristics, the tested model is close to the CO2 system in a manned space cabin. Author

N71-19053# Joint Publications Research Service, Washington, D.C.

CHLORELLA CULTIVATION FOR CONTROLLING TOXIC GASEOUS CONTAMINANTS IN THE ATMOSPHERE

V. D. Rogozkin et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 7-14 refs (See N71-19051 08-04)
Avail: NTIS

The possibility is discussed of using Chlorella suspensions for absorbing toxic gaseous contaminants produced by heterotrophic organisms, including man, in an isolated environment. The experimental results show that the tested contaminants do not accumulate in the atmosphere of a closed Chlorella-animal system; although the load is several times greater than normal due to the decomposition of nonutilizable wastes. Author

N71-19054# Joint Publications Research Service, Washington, D.C.

PREVENTION OF RADIATION DAMAGE DURING SPACEFLIGHT

V. D. Rogozkin et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 15-20 refs (See N71-19051 08-04)
Avail: NTIS

The effectiveness of two types of radio-protectants, chemical and biological, was studied using short- and long-term irradiation of animals. Biological radioprotectants (amino acids, bacterial polysaccharides, hormones, and vitamins) gave a 16 to 25 percent increase in the number of mice surviving after prolonged irradiation. It is concluded that biological radioprotectants may well be used during spaceflight. Author

N71-19055# Joint Publications Research Service, Washington, D.C.

PROTECTION OF SPACESHIP CREW MEMBERS AGAINST RADIATION DAMAGE BY USE OF RADIOPROTECTANTS

P. P. Saksonov et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 21-24 refs (See N71-19051 08-04)
Avail: NTIS

General approaches to the radiation protection of spaceship crew members by the use of various drugs are discussed. Experimental data obtained on animals were extrapolated to humans. The validity of this extrapolation is confirmed by observations accumulated in the clinical use of radioprotectants during X-ray treatment. Author

N71-19056# Joint Publications Research Service, Washington, D.C.

EFFECTIVENESS OF SHIELDING DIFFERENT BODY PARTS DURING REPEATED PROTON IRRADIATION

G. F. Nevskaya et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 25-29 refs (See N71-19051 08-04)
Avail: NTIS

Dogs were exposed to proton irradiation (700 rad, two exposures of 350 rad each at 45-day intervals). The pelvic zone and upper portion of the abdomen, constituting 15 percent of the total body weight, were exposed. The protective effect was found to be related to the extent of the undamaged portion of the bone marrow. This amounted to 15 percent and 5 percent of the total bone marrow in the dog skeleton when the pelvis and abdomen, respectively, were shielded. During single or repeated irradiations with the minimum absolutely lethal doses, shielding of 5 percent of the bone marrow failed to repair hemopoiesis to a sufficient degree and the changes in the tested parameters were greater than in animals with 15 percent of the bone marrow shielded. These changes were manifested not so much in hemopoiesis inhibition as in the rate and degree of bone marrow repair and the level of restoration of blood indices. Author

N71-19057# Joint Publications Research Service, Washington, D.C.

USE OF A UNILATERAL LABYRINTHECTOMY MODEL FOR EVALUATING THE EFFECT OF DRUGS ON THE VESTIBULAR FUNCTION

Ye. L. Epshteyn et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 30-35 refs (See N71-19051 08-04)
Avail: NTIS

The effect of different intramuscularly injected drugs on functional-loss nystagmus developed in animals after a unilateral labyrinthectomy was investigated in guinea pigs. It was found that central M- and N-cholinolytics, adrenomimetics, and allylthiourea decreased, whereas cholinesterase inhibitors and adrenolytics increased the frequency of this form of nystagmus. It is suggested that unilateral labyrinthectomy can be successfully used as a model for evaluating and selecting antimotion drugs. Author

N71-19058# Joint Publications Research Service, Washington, D.C.

ISCHEMIC DEAFFERENTATION OF STRIATED MUSCLE TISSUE

V. I. Savchuk et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 36-37 (See N71-19051 08-04)
Avail: NTIS

On the basis of acute experiments on cats under combined chloralose-urethan narcosis, a study was made of the influence of acute impairment of circulation (ischemia) on the functional state of afferent receptors of the quadriceps femoris muscle. Criteria were the intensity of spontaneous activity of the sensitive fibers isolated from the split femoral nerve, intensity of the activation reaction arising with dilatation of the muscles by weights of 20, 50, and 100 g, and impairment in the relationship between spontaneous and induced impulsation. Author

N71-19059# Joint Publications Research Service, Washington, D.C.

CHANGES IN CIRCULATING BLOOD VOLUME DURING LOWER BODY NEGATIVE PRESSURE EXPOSURE

I. S. Balakhovskiy et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 38–42 refs (See N71-19051 08-04)
Avail: NTIS

A modified method is given for measuring the circulating blood volume. The method is based on calculations of the carboxyhemoglobin concentration in the blood after inhalation of a known quantity of carbon monoxide. The method was tested during exposure to lower body negative pressure (LBNP) (−80 mm Hg) for reducing the circulating blood volume. Changes in carboxyhemoglobin concentration were observed in the experiment and control. During the tenth minute of the LBNP exposure, the circulating blood volume decreases significantly but the level of this decrease does not determine individual tolerance to the test. Author

N71-19060# Joint Publications Research Service, Washington, D.C.

CHANGES IN PERMEABILITY OF THE HEMATO-OPHTHALMIC BARRIER OF RABBITS AFTER THEIR EXPOSURE TO ACCELERATIONS

Z. N. Nakhilnitskaya et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 43–50 refs (See N71-19051 08-04)
Avail: NTIS

Rabbits were subjected to single and repeated accelerations of 10 g for four minutes. At different times after acceleration, their anterior chambers were examined for intravenously injected fluorescein. Following a single exposure the changes, though showing great variability, were as follows: during the first hours the penetration of fluorescein was accelerated and during the next 15 days it was limited and elimination was delayed. A repeated exposure six days later produced more significant changes. During daily exposures for eight days the reaction level, regardless of its pattern, became stabilized at an increase during the postacceleration period. The changes persisted for over a month after the exposure. Author

N71-19062# Joint Publications Research Service, Washington, D.C.

RELATIVE BIOLOGICAL EFFECTIVENESS OF MULTICHARGED IONS DURING SINGLE IRRADIATION OF CHLORELLA

L. K. Vekshina et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 58–62 refs (See N71-19051 08-04)
Avail: NTIS

The dose dependence of relative biological effectiveness of accelerated C-6 and C-12 ions was determined. An increase in the inactivation cross section with an increase in linear energy transfer of ionizing radiation was demonstrated. A dose-dependent change in Chlorella mutability was observed. Author

N71-19063# Joint Publications Research Service, Washington, D.C.

EFFECT OF IONIZING RADIATION ON FOOD PRODUCTS

V. P. Bychkov et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 63–68 refs (See N71-19051 08-04)
Avail: NTIS

Experimental data are presented on the effect of gamma irradiation, in doses of 35,000 and 70,000 rad, on the physicochemical and organoleptic properties of casein, sunflower seed oil, yeast, and oil concentrates of vitamins A and D. A single irradiation reduced some essential amino acids, destroyed significant quantities of water-soluble and small quantities of fat-soluble vitamins in foods, and increased the concentration of peroxides in sunflower seed oil. Author

N71-19064# Joint Publications Research Service, Washington, D.C.

HUMAN BODY IMMUNOLOGICAL REACTIVITY DURING A 120 DAY DIET WITH DEHYDRATED FOODS

V. P. Bychkov et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 69–76 refs (See N71-19051 08-04)
Avail: NTIS

Data collected during a 180-day experiment are presented. Six volunteers 25 to 31 and weighing 68 to 91 kg were tested. During December and May, the subjects were given baseline diets of natural foods providing 3,100 calories per day. Over a 120-day period (January through April), they were given test diets similar in composition to the baseline diets, but dehydrated components were consumed. During the first two months, lysozymic activity decreased in the saliva and blood serum, dysbacteriosis developed in the oral cavity and pharynx, and the ratio of the protein fractions in the blood serum changed. During the third month, these parameters returned to a normal level and by the end of the experiment the phagocytic activity of leukocytes had increased. Author

N71-19065# Joint Publications Research Service, Washington, D.C.

STUDY OF STREPTOCOCCAL FLORA OF THE HUMAN ORAL CAVITY DURING PROLONGED CHAMBER CONFINEMENT

V. I. Drozdova et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 77–83 refs (See N71-19051 08-04)
Avail: NTIS

Results of studies of human oral cavity streptococcal flora during year-long chamber confinement of human subjects are presented. It was found that long-term confinement of human subjects in an isolated environment results in transfer of streptococci from subject to subject; this is accompanied by an increase in the total number of streptococci and the number of hemolytic microbes. Author

N71-19066# Joint Publications Research Service, Washington, D.C.

RENAL OSMOREGULATION FUNCTION OF SOYUZ-4 AND SOYUZ-5 CREW MEMBERS

A. I. Grigoryev et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 84–90 refs (See N71-19051 08-04)
Avail: NTIS

Crew members were examined for the renal osmoregulation function before and after flight. On the second day after the flight they were given a 2 percent water load. The osmolar concentration, Na and K blood concentration, the corresponding concentration in the daily urine and every urine discharge, were determined after the load. Glomerular filtration was also measured using endogenous creatinine. The water load indicated an increased activity of the osmoregulation system. After the load all cosmonauts excreted 1.3 to 2.8 times less fluid. The osmolar concentration and index of the most diluted urine portion increased and the clearance of osmotically free water was reduced; the osmolar and Na concentrations in the blood plasma increased. The glomerular filtration rate changed insignificantly. No differences were detected in the postflight response of command pilots and those who emerged into space. Author

N71-19067# Joint Publications Research Service, Washington, D.C.

PRINCIPAL CHANGES IN THE HEALTHY HUMAN BODY AFTER A 120 DAY BED CONFINEMENT

V. V. Parin et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 91-98 refs (See N71-19051 08-04)
Avail: NTIS

Subjects were given pituitrin, deoxycorticosterone acetate, and nerobol to prevent possible disturbances in mineral and protein metabolism. Examinations made once every 10 to 15 days revealed polymorphic changes in almost all systems in the human body. Clinical, physiological and metabolic changes increased with the experimental time, forming distinct clinical symptoms and syndromes by the end of the second month. The following syndromes were most clearly expressed: autonomic-vascular dysfunction, asthenization, allergy, hemocoagulation disturbance, occasionally accompanied by prethrombotic abnormalities, muscular atrophy, aggravated by muscular atony and disordered bioelectric activity. Mineral metabolism was disturbed, diuresis was negative, and weight losses progressively increased until the third month of the hypokinetic condition, after which a tendency to return to the baseline values was noted. The most distinct changes were observed in Ca metabolism. Nerobol gave a good therapeutic effect, but pituitrin and DOCA were ineffective. Author

N71-19068# Joint Publications Research Service, Washington, D.C.

STATE OF NERVOUS AND MUSCULAR SYSTEMS IN SOYUZ-4 AND SOYUZ-5 CREW MEMBERS

L. I. Kakurin et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 99-104 refs (See N71-19051 08-04)
Avail: NTIS

Reflex excitability of the nervous and muscular systems of four cosmonauts was studied by provocative testing before and after flight. Cosmonauts with high reflex excitability exhibited a decrease in the biopotentials generated by the patellar reflex in response to light and heavy physical loads. After the flight, their reflex excitability fell below the preflight level. Cosmonauts with low reflex excitability exhibited insignificant changes in their response to physical loads both before and after the flight. All cosmonauts exhibited higher levels of tendon reflexes at rest after the flight in comparison with the preflight levels. The more pronouced decrease in the muscle biopotentials accompanying the patellar reflex during physical loads after the flight indicates some deterioration of the functional state of the nervous and muscular systems in these cosmonauts. Author

N71-19069# Joint Publications Research Service, Washington, D.C.

MATHEMATICAL ANALYSIS OF DIURNAL CORRELATIONS BETWEEN THE INDICES OF CEREBRAL AND SYSTEMIC CIRCULATION

V. V. Skryabin et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 105-109 refs (See N71-19051 08-04)
Avail: NTIS

Ten healthy test subjects were kept under moderate bed rest conditions. Rheoencephalograms, transverse rheograms of the body, arterial pressure, and pulse rate were simultaneously registered. The data were processed by computer. Diurnal variations in pulse blood filling of the brain were observed; they increased during the daytime and decreased at night. Linear regression equations were derived for determining the ohmic amplitude of rheoencephalograms using several systemic circulation baseline indices. Author

N71-19070# Joint Publications Research Service, Washington, D.C.

CONDITIONS FOR THE GROWTH AND COMPRESSION OF GAS BUBBLES IN BODY PHYSICAL SYSTEMS AND TISSUES

V. P. Nikolayev *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 110-118 refs (See N71-19051 08-04)
Avail: NTIS

Peculiarities of gas bubbles in physical systems and living tissues are described with emphasis on the problem of bubble statics. Absolute stability of a single bubble in a supersaturated solution of small volume is demonstrated theoretically. The effect of bubbles formed in the tissue during decompression on the elimination of inert gas from the tissue is qualitatively evaluated. The change in the initial distribution of inert gas in the body brought about by bubble transfer is discussed. It is concluded that the resorption of wandering bubbles settling in poorly perfused tissue can be accelerated only by means of body recompression to a pressure exceeding the initial level. Author

N71-19071# Joint Publications Research Service, Washington, D.C.

OTOLITHIC REACTIONS IN ANIMALS ACCOMPANYING INTRAVENOUS INJECTION OF SODIUM BICARBONATE

G. I. Gorgiladze et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 119-121 refs (See N71-19051 08-04)
Avail: NTIS

Four experiments are discussed in which six rabbits and two cats were intravenously injected with sodium bicarbonate in an 8% solution in a dose of 10ml. Prior data on otolithic reactions served as a test control. Results show that neither single nor multiple injections provided changes in any way different from the control otoliths. Author

N71-19072# Joint Publications Research Service, Washington, D.C.

EFFECT OF BREATHING 96 PERCENT OXYGEN ON THE SELF-STIMULATION AND AVOIDANCE REACTIONS IN RABBITS

N. A. Agadzhanyan et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 122-123 refs (See N71-19051 08-04)
Avail: NTIS

Results are presented of a study of the behavioristic and emotional reaction in rabbits when breathing virtually pure oxygen (96 percent) at a pressure of 760 mm. The self-stimulation and avoidance method with electric stimulation of the hypothalamus was used. Author

N71-19073# Joint Publications Research Service, Washington, D.C.

MORPHOLOGY OF THE LIVER AND SKELETAL MUSCLES DURING HYPOKINESIA AND A PROTEIN DEFICIT

G. P. Bykov et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 124-126 refs (See N71-19051 08-04)
Avail: NTIS

Partial results are presented of a many-sided study in alimentary protein inadequacy caused by a reduction of the total protein in the diet of experimental animals kept under hypokinetic conditions to 3 percent. Hypokinesia was induced by placing the animals in tight individual cages. Histologic and histochemical investigations were made of the tissues from the liver and skeletal muscles (gastrocnemius and quadriceps femoris muscles) in 44 nonlinear white male rats. Author

N71-19074# Joint Publications Research Service, Washington, D.C.
STRAIN GAUGE SENSING ELEMENT FOR REGISTERING ISOMETRIC CONTRACTIONS OF SKELETAL MUSCLES
Yu. M. Bazzhin et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 127–128 (See N71-19051 08-04)
Avail: NTIS

A strain gauge sensing element is described fabricated for in vivo registry of individual and tetanic responses of the skeletal muscles in rats (extensor digitorum, soleus, plantaris) when working in an isometric regime. The gauge can also be used for working with the muscles of other animals, provided that the maximum force which they develop does not exceed 400 g. Author

N71-19075# Joint Publications Research Service, Washington, D.C.
PROBLEMS IN HUMAN LIFE SUPPORT IN SPACE
I. I. Gitelzon *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 129–132 Presented at 20th Congr. of the Intern. Astronaut. Federation, Mar Del Plata, Argentina, 5–10 Oct. 1969 (See N71-19051 08-04)
Avail: NTIS

Observations are given on the conference proceedings with emphasis on those papers concerning life support systems in space. E.C.

N71-19076# Joint Publications Research Service, Washington, D.C.
FORTY-FIRST ANNUAL CONGRESS OF THE AMERICAN AEROSPACE MEDICAL ASSOCIATION
I. B. Krasnov *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 133–134 (See N71-19051 08-04)
Avail: NTIS

The organization and themes of the annual congress meeting on aviation and space medicine are mentioned. A listing of the 29 congress sections is included. E.C.

N71-19077# Joint Publications Research Service, Washington, D.C.
WORK OF THE AEROSPACE MEDICINE SECTION OF THE MOSCOW PHYSIOLOGICAL SOCIETY IN 1969
I. Khazen et al *In its* Space Biol. and Med., Vol. 4, No. 5, 1970 7 Jan. 1971 p 135–137 (See N71-19051 08-04)
Avail: NTIS

Results of several aviation and space medicine investigations are cited. Mention is also made of the content of research papers presented at various conferences and meetings during the year. E.C.

N71-19094# Joint Publications Research Service, Washington, D.C.
THE BIOELECTRIC ACTIVITY OF VARIOUS STRUCTURES OF THE RABBIT BRAIN UNDER THE COMBINED ACTION OF RADIOACCELERATION AND IRRADIATION
S. A. Akopyan et al 26 Feb. 1971 13 p refs Transl. into ENGLISH from Biol. Zh. Arm. (Erevan), v. 23, no. 10, 1970 p 3–12
(JPRS-52488) Avail: NTIS

The changes in the bioelectric potentials in various zones of the cortex, the reticular formation and hypothalamus, the threshold and duration of the spasmodic activity, and the change in certain vegetative functions were studied under the combined action of acceleration and irradiation. The animals were subjected to an acceleration of 3 to 5 g on a centrifuge, and to an X-ray dose of 700 to 800 R. Among the findings are the following: Adequate stimulation of the vestibular apparatus by rotation induces a generalized activation of the cortex and subcortex with a decrease in the threshold of electroconvulsive responses. After irradiation there was an increase in amplitude of the slow waves in the EEG, especially pronounced in the cortex. The electrical changes observed in the first hours after irradiation are not the result of profound damages to the nerve elements, since recovery occurs comparatively rapidly. A decrease in the resistance of the organism to acceleration after irradiation was established. N.E.N.

N71-19110# Joint Publications Research Service, Washington, D.C.
LIFE IN SPACE
O. G. Gazenko 2 Mar. 1971 7 p Transl. into ENGLISH from Priroda (Moscow), 1970, no. 10 p 80–82
(JPRS-52514) Avail: NTIS

A question and answer session with O. G. Gazenko, corresponding member of U.S.S.R. Academy of Sciences, is presented on human life maintainance during space flight. Viability of microflora, life on Mars and Venus, psychological effects of prolonged space flight, and life support systems are briefly discussed. J.A.M.

N71-19123# Joint Publications Research Service, Washington, D.C.
DOLPHINS IN THE SERVICE OF MAN
16 Feb. 1971 8 p Transl. into ENGLISH from Morsk. Sb. (Moscow), no. 11, 1970 p 74–76
(JPRS-52395) Avail: NTIS

A generalized account of the intelligence, speed, and conversational ability of the dolphin is presented. It is concluded that the dolphin's attachment to man and its amazing natural abilities make it useful for oceanographic exploration. F.O.S.

N71-19124# Joint Publications Research Service, Washington, D.C.
CLARIFICATION OF THOUGHT PROCESSES DURING PROBLEM SOLVING
V. P. Savelyev 16 Feb. 1971 9 p refs Transl. into ENGLISH from Filosofska Dumka (Kiev), no. 5, 1970 p 84–89
(JPRS-52397) Avail: NTIS

The effects of the awareness of thought processes in the recreation of past experiences was studied using exercises in the Russian language with 5th graders. The results show that simulation through questions, and creation of problem situations conductive to deeper awareness of self-activity help to recreate past experiences more fully and quickly. It is concluded that grammar should be repetitive and presented in various problematic situations. F.O.S.

N71-19125*# Stanford Univ., Calif. Information Systems Lab.
THE DYNAMIC CHARACTERISTICS OF HUMAN SKELETAL MUSCLE MODELED FROM SURFACE STIMULATION
Jean A. Tennant Washington NASA Feb. 1971 113 p refs
(Grant NGR-05-020-007)
(NASA-CR-1691; SU-TR-6303-1) Avail: NTIS CSCL 06P

A mathematical model for the behavior of the muscle group comprised by the biceps and the brachialis was sought taking into account the changes in muscle tension due to the inertia of the moving masses. Isotonic and isometric experiments were formulated

to allow the explicit characterization of the equations for the postulated mechanism. These experiments involved the artificial stimulation of the muscles via a surface electrode, located at the motor point of the muscle group. In the isotonic experiments, external loads were simultaneously applied to the forearm by means of an electric torque motor. The electric motor was controlled not only as a torque producing device, but also as a regulator to compensate for developing inertial loads during accelerated motions, as well as for the changing geometry of the arm/muscle system. The stimulus waveforms were provided digitally. Author

N71-19313*# Chicago Univ., Ill. Dept. of Biophysics.
CELL FINE STRUCTURE AND FUNCTION: PAST AND PRESENT
Humberto Fernandez-Moran *In its* Electron Microscopy in Microbiol. and Lunar Rock Analysis Dec. 1970 12 p refs Repr. from Exptl. Cell Res., v. 62, 1970 p 90-101 (See N71-19311 08-14)
Avail: NTIS CSCL 06C

Problems of nerve membrane ultrastructure which are particularly suitable for correlated electron microscopic investigations are discussed. The organization of cell membranes and of associated multi-enzyme and macromolecular components which carry out energy and information transduction functions is studied. The association of nucleic acids and the protein synthetic machinery with cell membranes is investigated to gain a better understanding of membrane biosynthesis. This includes (1) a study of DNA and RNA conformations associated with membranes in chloroplasts, mitochondria and nerve cells; and (2) study of RNA polymerase and its participation in the differential RNA transcription upon DNA templates. Author

N71-19314*# Chicago Univ., Ill. Dept. of Biophysics.
HIGH RESOLUTION ELECTRON MICROSCOPY OF CELL MEMBRANES AND DERIVATIVES
Humberto Fernandez-Moran, Mitsuo Ohtsuki, and C. Hough *In its* Electron Microscopy in Microbiol. and Lunar Rock Analysis Dec. 1970 1 p Presented at the 7th Intern. Congr. on Electron Microscopy, Grenoble, France, 30 Aug.-5 Sep. 1970 (See N71-19311 08-14)
Avail: NTIS CSCL 06C

The most promising areas suitable for investigation with the high resolution, high voltage, and low temperature electron microscope and diffraction techniques are identified. These include studies of bacteria, algae, mitochondria, multi-enzyme complexes, and microspecimens of lunar rock. Computerized image enhancement and cryo-electron microscope development are also mentioned. N.E.N.

N71-19347# American Micromation Industries, Inc., Philadelphia, Pa.
EXPERIMENTAL BASIS FOR MAXIMUM ALLOWABLE LOAD (MAL) OF Pu 239 IN THE HUMAN ORGANISM, AND MAXIMUM ALLOWABLE CONCENTRATION (MAC) OF Pu 239 IN AIR AT WORK LOCATIONS [K EKSPERIMENTAL'NOMU OBOSNOVANIYU PREDEL'NO DOPUSTIMOI NAGRUZKI (PDN) PLUTONIYA-239 V ORGANIZME CHELOVEKA I PREDEL'NO DOPUSTIMOI KONTSENTRATSII (PDN) PLUTONIYA-239 V VOZDUKHE RABOCHIKH POMESHCHENII]
L. A. Buldakov et al Nov. 1970 32 p refs Transl. into ENGLISH from a Russian report Sponsored by AEC Prepared for ANL (ANL-Trans-864) Avail: NTIS

Experimental data regarding the biological effect of plutonium-239 with various routes and rhythms of accumulation in the organism, as well as information regarding the behavior of the emitter in the organism and its microdistribution in the lungs, raises the question of the need for reexamining existing norms for MAL and MAC. The following recommendations are made: decrease the MAL of plutonium-239 in the organism for professional irradiation (soluble compounds) from 0.04 micro-Ci to 0.01 micro-Ci; decrease the MAL of plutonium-239 in the lungs from 0.016 micro-Ci to 0.0016 micro-Ci; decrease the MAC of plutonium-239 in the air at work locations from 2.10 to the -15th power Ci/1 to 5.10 to the -16th power Ci/1; establish a norm for maximum allowable accumulation of plutonium-239 in the human organism through the respiratory route at a value of 1.25 nCi/year or .3 nCi/quarter. Author (NSA)

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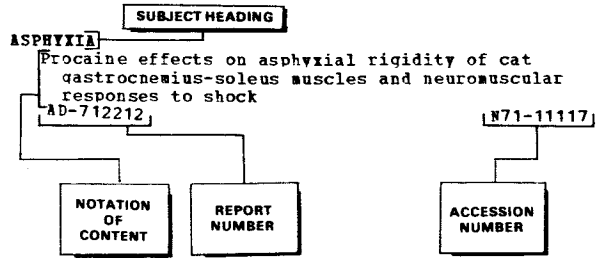

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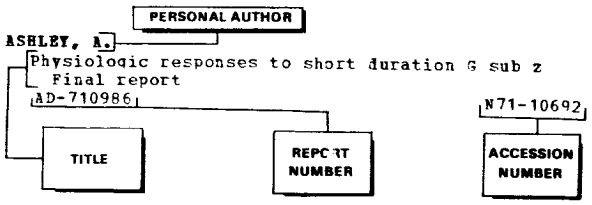

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