AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

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NASA SP-7011 (23)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during March 1966

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. APRIL 1966

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INTRODUCTION

Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics (AIAA), and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

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 will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

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c. LC entries identified by a number in the A66-80000 series.

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a continuing bibliography APRIL 1966

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N66-14340*# School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.
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James E. Dunn, II and Richard W. Bancroft Jun. 1965 27 p refs Presented at the Aerospace Med. Assoc. Meeting, Miami Beach, Fla., 12 May 1964
(NASA Order DPR T-16758-G)
(NASA-CR-68987; SAM-TR-65-48) CFSTI: HC $2.00/MF $0.50 CSCL06C

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1. EXPERIMENTAL ANIMAL DECOMPRESSIONS TO A NEAR-VACUUM ENVIRONMENT R. W. Bancroft and J. E. Dunn, II 11 p refs (See N66-14341 05-04)

2. EXPERIMENTAL ANIMAL DECOMPRESSIONS TO LESS THAN 2 MM. HG ABSOLUTE (PATHOLOGIC EFFECTS) J. E. Dunn, II, R. W. Bancroft, W. Haymaker, and J. W. Foft 14 p refs (See N66-14342 05-04)

N66-14341* School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.
EXPERIMENTAL ANIMAL DECOMPRESSIONS TO A NEAR-VACUUM ENVIRONMENT
Richard W. Bancroft and James E. Dunn, II *In its* Exptl. Animal Decompressions to a Near-Vaccum Environment Jun. 1965 11 p refs (See N66-14340 05-04) CFSTI: HC $2.00/MF $0.50

To estimate the times of consciousness, collapse, and survival of animals exposed to near-vacuum environments, 126 conscious dogs were rapidly decompressed in either 1 or 0.2 second from 35,000 feet, while breathing oxygen, to a pressure less than 2 mm. Hg absolute. Groups of 6 dogs each were exposed to this low pressure for periods of time ranging from 5 to 180 seconds, with and without prior denitrogenation, and then recompressed to 35,000 feet with oxygen in either 5 or 30 seconds. The dogs collapsed within 9 to 10 seconds after decompression, as determined from motion picture films. Simultaneously, the effects of anoxia, water vapor, and other evolved gases were apparent, resulting in a generalized muscle spasticity, a few gasps, momentary convulsive seizures, apnea, and gross swelling of the body and extremities. All dogs exposed for less than 120 seconds survived, despite evidence of lung involvement. Respiration recommenced spontaneously either during recompression or at ground level, providing the heart was beating; otherwise, death was inevitable. Exposures of 120 to 180 seconds resulted in approximately 15% to more than 80% fatalities, respectively. Denitrogenated dogs tended to show a slightly better survival rate. Author

N66-14342* School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.
EXPERIMENTAL ANIMAL DECOMPRESSIONS TO LESS THAN 2 MM. HG ABSOLUTE (PATHOLOGIC EFFECTS)
James E. Dunn, II, Richard W. Bancroft, Webb Haymaker (NASA. Ames Center), and John W. Foft *In its* Exptl. Animal Decompressions to a Near-Vacuum Environment Jun. 1965 14 p refs (See N66-14340 05-04) CFSTI: HC $2.00/MF $0.50

Pathologic examination of tissues of dogs rapidly decompressed to less than 2 mm. Hg absolute was performed. Of the 126 dogs decompressed, 92 were autopsied at 3 time intervals: within 30 minutes, 2 to 5 days, and 1 to 3 weeks post-decompression. Gross examination of the tissues was performed on all autopsied animals. Lung damage was graded 1+ to 4+ according to the amount of edema, emphysema, atelectasis, and hemorrhage present alone or in combination. Microscopic examination of the tissues was performed on selected dogs from the various groups. The most impressive finding was the absence of major pathologic damage, except in the lungs, unless the exposure time exceeded 120 seconds. By varying time of decompression and time of exposure to less than 2 mm. Hg, it was possible to separate the pathologic effects of anoxia versus time of decompression. For the exposures that were longer than 120 seconds, gross examination of other organs and tissues showed increasing congestion and some hemorrhage. The brains showed engorgement without evidence of hemorrhage. One dog that was paralyzed from the exposure had numerous demyelinated lesions of the spinal cord that seemed to be the result of gas bubble emboli. Author

N66-14343# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
TRAINING FOR GROUP INTERDEPENDENCE
Donald B. Haines Jul. 1965 25 p refs
(AMRL-TR-65-117; AD-623119) CFSTI: HC $2.00/MF $0.50

Small teams and crews working together in intimate coordination are the key to many USAF missions today and effective team performance may depend upon member interdependency within the group. An adequate training program requires understanding of the ways in which men work together in closely-knit groups. Goal and means interdependency in group process has long been a focus of interest for

social psychologists. Current research and theory thus may provide useful guidelines for applications of group interdependency principles to military crew situations (particularly that of the American military advisor working with his foreign counterpart). The concepts of goal and means interdependency are defined, the controversy between current exponents of cognitive and stimulus-response (S-R) theory is examined for its contribution to understanding group interdependency phenomena, the recent adaptation of the theory of games is reviewed, and suggestions are made for the development of experimental training programs which will furnish insights into the nature of group functioning. Author (TAB)

N66-14359# European Atomic Energy Community, Brussels (Belgium).
THE FEASIBILITY OF A NEW PROCEDURE FOR BIOLOGICAL DOSIMETRY
J. F. Whitfield, S. Kellerer, H. Brohee, and T. Youdale 1965 35 p refs
(EUR-2505.e) CFSTI: HC $2.00/MF $0.50

Proportion of rat as well as human lymphocytes with structureless (or pycnotic) nuclei can serve as a sensitive indicator of absorbed radiation dose (following an acute exposure) provided that the irradiated cells are removed from the blood and maintained in a glucose-phosphate medium. At the present stage of development the dosimeter is particularly sensitive to doses between 0 and 100 r. Above 100 r, the slope of the linear dose-effect curve tends to decrease and the dosimeter becomes less sensitive. Author

N66-14363# Strasbourg Univ. (France).
EXPERIMENTAL STUDY OF THE TREATMENT OF RADIATION INJURIES BY PADUTIN (KALLICREINE) [ETUDE EXPERIMENTALE DU TRAITMENT DES RADIOLESIONS PAR LA PADUTINE—DEPOT (KALLICREINE)]
P. Mandel, J. M. Mantz, C. Gary, M. Delemen, P. Michaelidis et al Brussels, EURATOM, 1965 22 p In FRENCH; ENGLISH summary
(EURATOM-054-63-10 BIOF)
(EUR-2477.f, Vol. I) CFSTI: HC $1.00/MF $0.50

Experiments confirm the value of Padutin in the treatment of radiodermatitis and radionecrosis in rats and guinea pigs. Data indicate that Padutin dosage can be stepped up. Comparison of Padutin with AET, another vasodilating agent, reveals positive results for Padutin and contraindication for the use of AET in certain instances. Studies are under way to compare the eventual protective effects of these same drugs following whole body irradiation; and preliminary results are favorable for both drugs. Biochemical studies of Padutin are also in progress. It is also reported that the mitotic index and the collagen determination appear to be valid biological criteria for quantitative appreciation of the cicatrization phenomenon. M.W.R.

N66-14367# Joint Publications Research Service, Washington, D. C.
THE EFFECT ON THE LIVING ORGANISM OF NEW TOXIC SUBSTANCES USED IN INDUSTRY
26 Nov. 1965 30 p refs Transl. into ENGLISH from Gigiyena Truda i Prof. Zabolivaniya (Moscow), no. 6, Jun. 1965 p 19–24, 40–48, 63–64
(JPRS-33038; TT-65-33615) CFSTI: $2.00

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1. DATA ON NEUROHUMORAL SHIFTS OCCURRING UNDER THE EFFECT OF CHLOROPRENE Ye. I. Gasparyan p 1–9 refs

2. DATA SUBSTANTIATING MAXIMUM PERMISSIBLE CONCENTRATIONS OF SOME INSOLUBLE MOLYBDENUM COMPOUNDS O. Ya. Mogilevskaya p 10–17 refs

3. ON THE TOXICITY OF GALLIUM COMPOUNDS V. V. Podosinovskiy p 18–24 refs

4. SOME OBSERVATIONS RELATIVE TO THE ARTICLE "AN INVESTIGATION OF NERVOUS SYSTEM FUNCTIONS IN TOXICOLOGICAL EXPERIMENTS" A. I. Korbakova p 25–27

N66-14383*# National Aeronautics and Space Administration, Washington, D. C.
INFLUENCE OF GRAVITY ON THE BLOOD CIRCULATION; DIAGNOSTICS OF SYNCOPE AND APOPLEXY [INFLUENCE DE LA PESANTEUR SUR LE COURS DU SANG; DIAGNOSTIC DE LA SYNCOPE ET DE L'APOPLEXIE]
Piorry Jan. 1966 5 p Transl. into ENGLISH from Arch. Gen. Med. (Paris), v. 11, 1826 p 292–294
(NASA-TT-F-9844) CFSTI: HC $1.00/MF $0.50 CSCL 06S

A paper on experiments to determine the possible causes of syncopes is abstracted. Human subjects, in true syncope, were revived by changing their erect position to a horizontal position, with the head lower than the trunk, indicating a clear influence of gravity. Bichat's theory that syncope is produced by suspension of cardiac action is disputed, emphasizing that interruption of blood flow to the brain is the primary cause. Author

N66-14400# Lockheed Missiles and Space Co., Sunnyvale, Calif.
WEIGHTLESSNESS SIMULATION USING WATER IMMERSION TECHNIQUES Annotated Bibliography, 1951–Jul. 1965
Helen M. Abbott and John H. Duddy, comp. Jul. 1965 54 p refs
(LMSC-5-24-65-3; SB-65-2; AD-623163) CFSTI: HC $3.00/MF $0.50

The compilation contains 97 selected references pertaining to biomedical and behavioral research involving immersion of human subjects. The references are organized under three principal topics: (1) Physiological Studies, including acceleration, impact protection and physiological responses to weightlessness simulations, (2) Human Engineering Studies, and (3) Techniques and Personal Equipment Requirements for immersion studies. The references are arranged alphabetically by author or title under each separate topic. An Author Index is included as an aid in locating specific investigators and publications. The references cited are considered to be the principal contributions to the literature during the period from 1951 through 1965, including both open and government sources. Author (TAB)

N66-14435# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
APPLICATION OF BEHAVIORAL SCIENCE TO PERFORMANCE AID DEVELOPMENT
Donald A. Topmiller Aug. 1965 17 p refs
(AMRL-TR-65-146; AD-623619) CFSTI: HC $1.00/MF $0.50

Four classes of variables relevant to behavioral research on the development of performance aids (technical orders, maintenance manuals, etc.) are outlined: (a) Legibility and Format Variables; (b) Variables Associated with Processing Printed Numeric Information; (c) Variables Associated with the Physical Configuration of Performance Aids; and, (d) Variables Associated with Troubleshooting Informational Processing and Display Systems. Each of these topics is discussed within a historical framework, with supporting empirical research. Some predictions are made for future trends in performance-aid behavioral studies. Author (TAB)

N66-14443# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
THE EFFECTS OF HIGH AMBIENT TEMPERATURE ON SHORT-TERM MEMORY
John F. Wing and Robert M. Touchstone Sep. 1965 26 p refs
(AMRL-TR-65-103; AD-623683) CFSTI: HC $2.00/MF $0.50

The study was designed to determine whether or not an increase in ambient temperature impaired man's ability to recall aurally-presented messages, and whether impairment was greater for some types of messages than for others. On three separate days, 15 men were exposed for 1 hour in an all-weather chamber to each of three different effective temperatures (ET): 72F, 90F, and 95F. During each day's session they were given five successive recall trials on each of six different messages. The men had to work continuously during each hour-long session. The results showed that average recall dropped significantly as environmental temperature was increased. The recall decrement between 90F and 95F was statistically significant, but the drop in recall between 72F and 90F was not significant. Messages of all types suffered approximately equal decrements under the high temperatures. Author (TAB)

N66-14450# Yale Univ., New Haven, Conn. Dept. of Biology.
SYSTEMS ANALYSIS AND VISUAL ORIENTATION OF ANIMALS
Talbot H. Waterman 1965 48 p refs Submitted for Publication

Current research is reviewed on visual responses in aquatic animals which respond strongly to linear polarization. Some research was done with insects and cephalopods, but crustaceans were primarily used. Three different approaches to the problem were used: electrophysiological study of visual information processing in large decapod crustaceans, study of phototactic responses to linear polarized light, and fine structure analysis of the light receptor and nervous elements involved in the sensing and processing of visual information in an effort to understand the relation between input and output. R.N.A.

N66-14475# Army Aviation Test Activity, Edwards AFB, Calif.
PRELIMINARY PILOT QUALITATIVE EVALUATION OF THE XV-5A RESEARCH AIRCRAFT Letter Report
Karl H. Zornig [1965] 48 p
(AD-623514) CFSTI: HC $2.00/MF $0.50

The primary objective of the tests was to investigate those aircraft characteristics directly influenced by the Lift-Fan concept. The report contains the results of the preliminary pilot evaluation of the XV-5A aircraft during the stability and control portion of the U.S. Army flight test program. TAB

N66-14496# Joint Publications Research Service, Washington, D. C.
SIMULATING CERTAIN PROPERTIEES OF THE MEMORY
E. T. Golovan', A. N. Luk, and V. S. Starinets 13 Dec. 1965 12 p Transl. into ENGLISH from Priroda (Moscow), no. 9, 1965 p 45-60
(JPRS-33298; TT-65-33873) CFSTI: $1.00

Relative to the development of memory address systems, clarification is given to physiological conditions which allow humans to make arbitrary selections of the necessary facts from his memory. The processes by which man reproduces information are discussed, with emphasis placed on the following areas; the role of associations, in particular, value of associations, their structure, and heirarchic organization; the value of logical transformations which are realized in asssociative memory; the role of information coding; the significance of the time axis in organization of the bulk of the memory, making it possible to establish relationships of priority, simultaneity, and sequence; and the role of feedback in the process of information reproduction. C.T.C.

N66-14508# Navy Experimental Diving Unit, Washington, D. C.
CALCULATION OF DECOMPRESSION SCHEDULES FOR NITROGEN-OXYGEN AND HELIUM-OXYGEN DIVES
Robert D. Workman 26 May 1965 40 p refs
(PR-6-65; AD-620879) CFSTI: HC $2.00/MF $0.50

This report presents the theoretical basis for calculation of decompression schedules for nitrogen-oxygen and helium-oxygen mixtures used in diving. It includes definitions, theory of of exponential saturation and desaturation, and theory of limiting values of excess saturation permitted at various ambient pressures with helium and nitrogen. An attempt has been made to simplify the presentation of the calculation procedure to implement the theoretical method. The necessary tables and worksheets used in calculations are presented, together with sample calculations of dive schedules. The discussion describes and appraises other methods of calculation developed in recent years. Author (TAB)

N66-14544# Dunlap and Associates, Inc., Santa Monica, Calif. Western Div.
TIME AND ACCURACY AS MEASURES OF HUMAN PERFORMANCE: A CRITICAL REVIEW OF THE LITERATURE
R. L. Smith Sep. 1965 26 p refs
(Contract Nonr-4314(00))
(AD-623637) CFSTI: HC $1.00/MF $0.50

The paper presents a review of the literature related to the performance of simple sensory and/or sensory-motor activities in terms of two factors: the optimal time to perform such activities, and the degradation in accuracy, if any, under time stress. The purpose of this literature review was to seek findings which (1) could aid in evaluating the validity, utility and generalizability of existing mathematical models intended to derive personnel performance standards from system effectiveness requirements, and (2) would provide the information for: (a) accurately deriving personnel performance standards in terms of time, and (b) evaluating the possible effect on system effectiveness of varying time constraints. Author (TAB)

N66-14556*# Northrop Corp., Hawthorne, Calif. Space Labs.
TECHNOLOGY STUDY OF PASSIVE CONTROL OF HUMIDITY IN SPACE SUITS
Arnold P. Shlosinger, Wilton Woo, Constantino Cafaro, and Emil W. Bentilla Sep. 1965 79 p refs
(Contract NAS2-2102)
(NASA-CR-69098; NSL-65-87-3) CFSTI: HC $3.00/MF $0.75 CSCL 06K

Two basic techniques for passive humidity control are discussed: (1) condensation of water vapor from a stagnant pressurization gas in the space suit on wicks cooled below the required dew point, and retention or transport of the liquid condensate by wicks; and (2) adsorption of the water vapor by desiccants. An analytical study is also presented of molecular diffusion, mass transfer within an adsorption bed, and condensation on a cooled wick. Tests on several wick materials indicated that wicks of glass fiber and Refrasil provide superior

performance for space suit passive humidity control applications; this applies to water transport capability in a horizontal plane (simulated zero G) as well as to vertical water lift capability. Experimental findings confirmed that the applicability of desiccants is limited by high weight penalty and by difficult regeneration procedures. However, desiccants may be useful in specific applications where the advantage of operation at temperatures higher than the required dew point is significant. The feasibility of using heat sinks of organic material with suitable melt point to provide sensible heat control for periods of 30 minutes to one hour was also demonstrated.
M.G.J.

N66-14596# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ANALYSIS OF THE INERTIAL PROPERTIES AND PERFORMANCE OF THE ASTRONAUT MANEUVERING SYSTEM
Julius Anthony Tieber and Robert Walter Lindemuth (M.S. Thesis) Aug. 1965 266 p refs
(GA/PH/65-4; AD-622443) CFSTI: HC $6.00/MF $1.25

To predict the system performance in space, the inertial properties of the Astronaut Maneuvering System (AMS) were determined. An existing mathematical model of the human body was revised and improved on the basis of improved regression equations and additional anthropometric dimensions. A mathematical model of a space suit was designed on the basis of measurements of suited subjects and suit weight regression equations. These models were combined into a model of a suited body. A computer program calculated the inertial properties of this model and compared them with experimental data. Results indicated the following: (1) Horizontal accelerations are more efficient than vertical accelerations; (2) The effects of inertial cross-coupling cause considerable loss of efficiency in roll and yaw maneuvers; (3) System performance is better with smaller astronauts, not just because of inherently higher accelerations, but also higher efficiency factors; (4) Variations in attitude deadband width have no significant effect on performance; (5) Inertial cross-coupling and center of gravity and line-of-thrust misalignment will make attitude control difficult while performing maneuvers in the manual control mode. Author (TAB)

N66-14635*# Naval School of Aviation Medicine, Pensacola, Fla.
CLINICAL PATHOLOGICAL CORRELATIONS IN SQUIRREL MONKEYS AFTER SUPPRESSION OF SEMICIRCULAR CANAL FUNCTION BY STREPTOMYCIN SULFATE
Makoto Igarashi, Michael E. Mc Leod, and Ashton Graybiel 14 Jul. 1965 41 p refs *Its* Rept.-117
(NASA Order R-93)
(NASA-CR-69105; NSAM-940) CFSTI: HC $2.00/MF $0.50 CSCL 06E

Streptomycin sulfate was injected to eight selected squirrel monkeys in sufficient dosage to cause suppression of canal function as indicated by the threshold caloric test, emesis in the slow rotation room, and ataxia. The animals were sacrificed six months after the suppression and slides for light-microscopic investigation were prepared following the standard temporal bone preparation procedure. Pathological findings were confined largely to the cristae and organ of Corti, which were both involved in almost every case. Only very slight changes were observed in the maculae in a few instances; therefore, this drug has a place in vestibular studies requiring selective suppression of canal function. The clinical tests used were not reliable indicators of the pathophysiological state of the cristae but were fairly reliable indicators of normal function of these organs. With regard to emesis in the SRR and ataxia, the essentiality of normal function of the semicircular canals has been demonstrated. No such essentiality was demonstrated for the otolith organs in the present investigation. Author

N66-14638*# Maryland Univ., College Park.
CHLORELLA, PHYSIOLOGY AND TAXONOMY OF FORTY-ONE ISOLATES
Ikuko Shihira and Robert W. Krauss [1965] 106 p refs
(Grant NsG-70)
(NASA-CR-69107) CFSTI: HC $4.00/MF $0.75 CSCL 06C

Forty-one isolates of the genus *Chlorella* were examined to established physiological and morphological characteristics of taxonomic value. The algae were grown free of bacteria, under controlled light and temperature conditions, in liquid shake-cultures. From standardized cultures the algae were photographed in color and described according to their morphology, with special emphasis on the structure of the chromatophore. Comparisons of morphology were made between algae growing on organic and inorganic media. Physiological response tc hexoses, pentoses, mono-, di-, and tri-saccharides, and dextrin were recorded for cultures growing in both light and darkness. Ability to use, and preferences for NO_3, NH_3, amino acids, and proteins were observed. Vitamin requirements were determined. Pigment changes indicated tendencies of the organisms to either heterotrophic or autotrophic growth, and suggested evolutionary patterns within the genus. Two subgenera were differentiated. The physiological characteristics of the species were reviewed in the light of morphological similarities, and schematic diagrams were presented to compare the major types of nutrition to that of idealized heterotrophs and autotrophs. Author

N66-14640# City of Hope Medical Center, Duarte, Calif.
BIOCHEMICAL STUDIES ON ACUTE HYDRAZINE TOXICITY IN MICE Final Research Report
Eugene Roberts and Daisy G. Simonsen 8 Nov. 1965 33p refs
(Contract AF 41(609)-2614)

Two-dimensional paper chromatographic methods were employed to study the changes produced in amino acid distribution in tissues of normal mice, mice treated with hydrazine, and mice pretreated with protective amino acids prior to injection with hydrazine. The data suggest that acute hydrazine toxicity does not coincide with any major effects on carbohydrate or amino acid metabolism of the brain but occurs when significant changes are noted in amino acid distribution in the liver. Particular attention was paid to arginine metabolism. Although arginine injection produced only an increase in ornithine content in the liver, when arginine was followed in 30 minutes by the administration of hydrazine there were marked increases in both ornithine and citrulline levels. In no instance was there any evidence of argininosuccinic acid. The data were tentatively interpreted to indicate that the rate-limiting step in the ornithine cycle of liver may be the carbamylation of ornithine, but that in hydrazine-poisoned animals the condensation reaction of citrulline with aspartic acid to give argininosuccinic acid might become rate-limiting. Lipid analyses of livers of control and hydrazine-treated mice showed that no significant abnormalities occurred in the distributions of the individual constituents as a result of hydrazine injection at a time that marked changes in amino acid content were noted. Author

N66-14651# Library of Congress, Washington, D. C. Aerospace Technology Div.
LIFE SUPPORT SYSTEMS—PHOTOSYNTHESIS Surveys of Soviet Scientific and Technical Literature
Boris Nartsissov 7 Dec. 1965 87 p refs
(ATD-65-107)

A brief comprehensive survey of the literature published in Soviet periodicals during 1964, and an annotated bibliography which supports the survey and is arranged to follow the narrative sequence of the survey is reported. The attention of

the Soviet scientist was focused on the following main points of interest: (1) investigation of closely packed chlorophyll modifications in model systems; (2) light conservation, energy transfer, photoexcitation of triplet states in tetrapyrrol pigments; (3) intermediate reduced and oxidized forms of tetrapyrrol pigments; (4) evolution of oxygen in photosynthesis; (5) investigation of the structure of tetrapyrrol pigments; and (6) summaries of scientific meetings. R.W.H.

N66-14656# Joint Publications Research Service, Washington, D. C.
HYPNOPEDIA, ITS LIMITS AND POSSIBILITIES, TRUTH AND FICTION SURROUNDING IT
29 Dec. 1965 15 p Transl. into ENGLISH from Tekhn.-Molodezhi (Moscow), no 11, Nov. 1965 p 26–28
(JPRS-33531; TT-65-34105) CFSTI: $1.00

The replies of six scientists to a request in a Russian periodical for more information on hypnopedia are presented. The answers give evidence of the intensive research on the subject. The fundamental possibility of man's capability to learn during sleep is accepted, although such contradictory views as the necessity for, and the omission of, hypnosis during hypnopedic sessions are held. Details are given on experiments carried out during natural sleep, under hypnosis, and in the awake state, and on electroencephalographic methods for recording and comparing biocurrent characteristics of the brain when signals are being transmitted to a sleeping person. The need for methodology and regulation of the instruction process is also stressed in conjunction with the problem of removing the fatigue which can occur during hypnopedic sessions. M.G.J.

N66-14658# Joint Publications Research Service, Washington, D. C.
ACCLIMATIZATION OF FISH AND FOOD ORGANISMS IN THE SEAS OF THE USSR
G. L. Shkorbatov 28 Dec. 1965 12 p Transl. into ENGLISH from Zool. Zh. (Moscow), v. 44, no. 10, 1965 p 1585–1588
(JPRS-33497; TT-65-34071) CFSTI: $1.00

A review is presented of a collection of articles on the acclimatization of fish and food organisms in Russian seas. The material shows how research should be conducted during realization of broad plans to reconstruct the flora and fauna on a scale incorporating entire sea basins. Mention is given to particular works which include such areas as hybridization of fish, histological analysis, and salt tolerances of particular fish. C.T.C.

N66-14667# Library of Congress, Washington, D. C. Aerospace Technology Div.
EFFECT OF IONIZING RADIATION ON ANIMALS AND PLANTS Surveys of Soviet Scientific and Technical Literature
Janice L. Smith 8 Dec. 1965 25 p refs Compilation of abstracts
(ATD-65-110)

Presented are 10 articles which include experimental and theoretical studies on ionizing radiation effects of living organisms. Comparative studies of the radiosensitivity of different animal strains and species, determination of the RBE of different types of ionizing radiation, and investigation of the relationship between the age of animals and their radiosensitivity are considered. Newer research areas include protein metabolism in animals under the influence of radiation, changes in the proteolytic activity of blood during irradiation, and the neurohumoral mechanism of the remote radiation effect. R.W.H.

N66-14671# Joint Publications Research Service, Washington, D. C.
MAGNETOBIOLOGY
Yu. A. Kholodov 14 Dec. 1965 26 p Transl. into ENGLISH from Priroda (Moscow), no. 10, Oct. 1965 p 12–21
(JPRS-33321; TT-65-33896)

A general discussion is given of the effect of strong magnetic fields on living organisms. A brief history of the problem is presented, and specific experiments are cited. Field effects are included for such areas as therapeutics; bacteria functions, growth, and development; navigation of migrating animals; and the human nervous system. C.T.C.

N66-14728# School of Aerospace Medicine, Brooks AFB, Tex.
SOME EFFECTS OF WHOLE-BODY 32 MeV PROTON IRRADIATION ON PRIMATES. THE RADIATIONS OF SPACE II, 1 JUNE 1964–1 MARCH 1965
Glenn V. Dalrymple, Ian R. Lindsay, John J. Ghidoni, Harold L. Kundel, Edwin T. Still et al Jun. 1965 38 p refs Prepared in cooperation with Texas Nucl. Corp.
(Contract AF 41(609)-2418)
(SAM-TR-65-43; AD-471676)

Eighty primates (Macaca mulatta) were irradiated with spaced doses of 32 Mev protons (280 to 6,700 rads). The highest doses (5,200 to 6,700 rads) produced severe disease of the central nervous system and convulsions. Intermediate doses (1,400 to 4,200 rads) caused marked infection. Mortality patterns, blood counts, Fe^{59} ferrokinetics, clinical manifestations, and histopathologic studies showed no evidence of either gastrointestinal or hematologic radiation changes. This situation was anticipated since the average transverse diameter of the primate (10 cm.) was considerably larger than the range of the protons (1 cm. in soft tissue). Because of the absence of injury to the bone marrow or gastrointestinal tract, mortality was relatively delayed after irradiation; an $LD_{50/80}$ of 1596 ±101 rads was estimated from the cumulative mortality data. The postirradiation course of animals dying from a cutaneous mechanism was in many ways similar to that found following third-degree, thermal burns. Author (TAB)

N66-14741# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PHYSIOLOGICAL EFFECTS OF GRAVITATION
O. G. Gazenko and A. A. Gurjian 7 Oct. 1965 34 p refs Transl. into ENGLISH of a Russian paper presented at the COSPAR 8th Plenary Session and the 6th Intern. Symp. on Cosmic Sci., Buenos Aires, 10–21 May 1963
(FTD-MT-65-223; AD-622758) CFSTI: HC $2.00/MF $0.50

The physiological effects of prolonged weightlessness are discussed. The circumstance that living organisms in the course of evolution did not encounter prolonged action of modified gravitational and inertial conditions must have put its imprint on the peculiarities of the organism's reactions. It is possible to consider that the organism does not possess prepared, specific mechanisms of adaptation or ready mechanisms of compensation and separation of functions which suffer under conditions of prolonged weightlessless. This premise is considered during the analysis of reactions of the organism to modified gravitational conditions. The biological effect of such dynamic factors of flight as the relatively brief action of accelerations and vibration are not considered in this report. Of special interest is the question of what sort of mutual relationships exist between the effects of heightened and reduced gravitational weightlessness. E.E.B.

N66-14764*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN OPEN CYCLE LIFE SUPPORT SYSTEM FOR MANNED INTERPLANETARY SPACEFLIGHT

J. Reece Roth Washington, NASA, 1965 23 p refs For Presentation at the AIAA and Am. Astronautical Soc. Stepping Stones to Mars Meeting, Baltimore, 28–30 Mar. 1966
(NASA-TM-X-52140) CFSTI: HC $1.00/MF $0.50 CSCL 06K

This paper proposes a solution to the problem of supporting human life during manned interplanetary space missions, in which the life support system is integrated with the propulsion system. It is proposed that the propellant of the propulsion system be stored in the form of food, and utilized by the thrustor in the form of metabolic wastes from the crew. It is shown that this life support system is compatible with anticipated manned interplanetary missions and payloads, if suitable electric propulsion systems are used. Author

N66-14788# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
BODY FLUID VOLUMES AND THE RENAL RESPONSE OF HUMAN SUBJECTS TO WATER IMMERSION Final Report, Oct.–Dec. 1964
Michael Mc Cally Aug. 1965 33 p refs
(AMRL-TR-65-115; AD-623724) CFSTI: HC $2.00/MF $0.50

Immersion of human subjects in water is used to simulate various aspects of the aerospace environment, including weightlessness. However, little is known of the physiological cardiovascular and renal responses to immersion. Such data are necessary before responses to immersion can be related to other environments, such as aerospace. The excretion of water and solute by the kidney is the fundamental mechanism for preserving the constancy of the mammalian extracellular fluid. The mechanisms by which the kidney is notified to retain or excrete water and solute in response to changes in the environment have been defined in considerable detail in recent years. The response of the kidney to water immersion of human subjects, as measured by water and solute excretion, provides a fascinating model for the study of body fluid volume regulation. The Ama divers of Japan and Korea represent specific problems of body fluid volume regulation during immersion as dictated by the depth, duration, temperature and respiratory mechanics of their particular immersion pattern. Author (TAB)

N66-14790# ITT Federal Labs., Nutley, N. J.
HUMAN FACTORS RESEARCH IN 3-D DATA PRESENTATION Final Report, Sep. 1962–May 1965
Raymond C. Bassett, Morton H. Kahn, Moira La May, Joel Levy, and Donald E. Page Bedford, Mass., AFSC, Electron. Systems Div. Jun. 1965 83 p refs
(Contract AF 19(628)-274)
(ESD-TR-65-462; AD-623028) CFSTI: HC $3.00/MF $0.75

A series of experiments was performed to evaluate some of the operating characteristics and potential utility of a volumetric (i.e., real) three-dimensional display produced by projection of a CRT image onto a rotating translucent screen. Some of the variables tested were perceptibility of relative location of point targets in close proximity, perception of location of point targets relative to display boundaries and perception of absolute and relative motion of targets in the volume. Estimation of location and motion were found to be highly accurate and quite rapid. While the results do not point conclusively to specific applications, the utility of volumetric 3-d in making fine position and motion discriminations has been demonstrated. Further study would be required to ascertain utility in practical situations such as air traffic control, space surveillance, etc. Author (TAB)

N66-14793# Electronic Systems Div., Bedford, Mass. Decision Sciences Lab.
INCREMENTAL OR ONE-TRIAL LEARNING OF VERBAL SERIES
William H. Sumby Oct. 1965 26 p refs
(ESD-TR-64-555; AD-623383) CFSTI: HC $1.00/MF $0.50

The purpose of this study was to demonstrate that with judicious selection of stimulus material, evidence can be gathered to support either an incremental learning position or an all-or-none position. It is shown that if the priori response probabilities of words in a series are high, the retrieval of that series from memory will lend support to the all-or-none point of view. If, on the other hand, the a priori probabilities are low, the incremental position will be upheld. It is concluded that learning is incremental, but that high response probability will tend to mack the supporting evidence. Author (TAB)

N66-14818# Missouri Univ., Columbia.
ENERGY METABOLISM OF THE CHIMPANZEE—A COMPARISON OF DIRECT AND INDIRECT CALORIMETRY Final Report, Sep. 1963–Apr. 1965
H. E. Dale, M. D. Shanklin, H. D. Johnson, and W. H. Brown Holloman AFB, N. Mex., 6571st Aeromed. Res. Lab., Sep. 1965 80 p refs *Its* J. Ser.-3004
(Contract AF 29(600)-4126)
(ARL-TR-65-17; AD-622438) CFSTI: HC $5.00/MF $1.00

Energy Metabolism of the chimpanzee was studied using simultaneously the techniques of direct and indirect calorimetry. The principal objective was to relate the magnitude and variability of the basal metabolic rate measured with the two techniques. Heat loss was measured with a thermoelectric, or gradient, partitional calorimeter; heat production was calculated from oxygen consumption measured with a Pauling meter and carbon dioxide production measured by infrared absorption. A total of 827 determinations were made on 14 chimpanzees, 7 males and 7 females. The animals were housed and measurements were made at an environmental temperature of 75° F. All measurements were made in the morning between 8:00 and 12:00 o'clock noon; the subjects were awake, 15 to 18 hours postprandial, and confined to a relatively small cage. From each 40 minute test period a 10 minute low period was delineated to serve as an estimate of the basal metabolic rate. Author (TAB)

N66-14830* National Aeronautics and Space Administration, Washington, D. C.
REPORT OF BIOSCIENCE WORKING GROUP
In its NASA 1965 Summer Conf. on Lunar Exploration and Sci. 1965 p 223–244 (See N66-14826 05-04) GPO: HC $0.50; CFSTI: MF $2.25

With regard to the lunar exploration program, areas of interest in the biosciences are considered in terms of basic and fundamental research endeavors and contamination control activities. Objectives and methods are discussed for both types of studies. The search for viable or nonviable organisms, for existing or past life systems, and for life-associated macromolecules is mentioned along with microbiological tests that could be performed on lunar sample materials. A discussion of contamination control stresses the need for collecting biologically clean lunar samples. Contamination to the moon from the landing module itself, leakage from astronaut clothing, and fuel combustion are considered; and back-contamination to earth from lunar materials is considered in terms of sampling techniques and packaging procedures. Training of astronauts to accomplish these tasks is discussed. M.W.R.

N66-14855# Texas Christian Univ., Fort Worth. Inst. of Behavioral Research.
COLD STRESS: PARAMETERS, EFFECTS, MITIGATION Technical Report, Jan. 1960–Dec. 1964

Nurhan Findikyan and S. B. Sells Ft. Wainwright, Alaska, AAL, Sep. 1965 49 p refs
(Contract AF 41(657)-323)
(AAL-TR-65-5; AD-624044) CFSTI: HC $1.00/MF $0.50

The complex interaction of cold stress with environmental and organismic variables in exercising influence on human performance is a problem that still requires extensive investigation. Some relatively well-known interactions of cold with other stressors are reviewed. A description of the functioning of thermoregulative mechanisms in relation to cold stress and cold injury as a result of exposure in extreme climates is presented. Ways and means of counteracting cold stress to improve task performance are emphasized. The literature relating personnel selection, acclimatization, training, indoctrination, leadership, morale, and physical protection to the mitigation of cold stress and to measures of performance effectiveness is reviewed. Despite the paucity of meaningful data, it is felt that adequate and encouraging progress is being made in the understanding of the psychophysiology of cold stress. Author (TAB)

N66-14863 State Univ. of New York, Stony Brook. Coll. of Engineering.
KINETICS OF PROTEIN SYNTHESIS BY POLYRIBOSOMES
I. Gerst and S. N. Levine [1963] 40 p refs
(Contract Nonr-4006(00); Grant AF-AFOSR-667-64)
(AD-606553) CFSTI: HC $2.00/MF $0.50

The report investigates the kinetics of polyribosome mediated protein synthesis. A fairly general but still tractable deterministic linear model is presented which allows for messenger RNA sources of arbitrary functional form and also takes into account any deterioration of the messenger RNA which may occur during the course of protein synthesis. Author (TAB)

N66-14894# Naval School of Aviation Medicine, Pensacola, Fla.
A STUDY OF THE INTERPERSONAL VALUES REPORTED BY NAVAL AVIATION PRE-FLIGHT STUDENTS
Lawrence K. Waters 9 Jul. 1965 16 p refs
(NSAM-938; AD-622231) CFSTI: HC $1.00/MF $0.50

Changes in reported interpersonal values during pre-flight training and the relationship among surveyed, self-rated, and peer-rated values were determined. Significant changes in mean scale scores occurred after fourteen weeks of training and correlations between corresponding value scales ranged from .53 to .68. Difference in magnitude of the correlations among surveyed, self-, and peer-rated interpersonal values were found and related to variations in rater and reference frame. Author (TAB)

N66-14904*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DESCRIPTION OF LANGLEY LOW-FREQUENCY NOISE FACILITY AND STUDY OF HUMAN RESPONSE TO NOISE FREQUENCIES BELOW 50 CPS
Philip M. Edge, Jr. and William H. Mayes Washington, NASA, Jan. 1966 13 p refs
(NASA-TN-D-3204) CFSTI: HC $1.00/MF $0.50 CSCL 05E

This paper describes a facility designed to provide a research capability for large-scale acoustic tests in the frequency range below 50 cycles per second. The capability exists for sinusoidal-, random-, and impulse-type environmental testing in the test chamber, 24 feet in diameter and 21 feet in length. Initial applications of the facility to extend the knowledge of man's behavior in low-frequency noise are described. These tests included whole-body exposure pressures of two orders of magnitude greater than man's previous experience in laboratory exposure at subaudible frequencies. Results obtained indicate that man can tolerate short-time exposures at spectrum levels in the range from 135 to 150 decibels; however, the subjects experienced some annoyance, discomfort, and fatigue and had a slower task performance rate. Author

N66-14905*# Space-General Corp., El Monte, Calif.
PHOTOSYNTHETIC HALOPHILES FROM OWENS LAKE Final Report
R. W. Tew Washington, NASA, Jan. 1966 71 p refs
(Contract NASw-1037)
(NASA-CR-361) CFSTI: HC $3.00/MF $0.75 CSCL 06M

Studies of growth limitation by water have been accomplished with halophilic, anaerobically photosynthetic bacteria from an halite-thenardite-trona evaporite deposit. A purified isolate has been identified as a member of the group of small *Chromatium* species promoting sulfur formation in the growth medium. The optimum a_w for rapid growth of this organism appears to be .95. In solutions of NaCl or of sodium carbonates at pH 9.5, growth is a function of a_w; in sodium sulfate brines the response is also related to a property of the solute. Generation times were 78 and 13 hours in media having water activities of .76 and .95. Growth has been studied in biphasic systems in which the concentration of more than one solute, water activity, and the composition of the solid phase were predicted by phase rule. Organisms trapped within mirabilite crystals during these experiments survived liquid nitrogen temperatures and subsequent exposure to vacuum. Initial results of a theoretical study of halophilic growth indicated that, in the saturated solutions used, water does not move osmotically, but must be pumped into the cell. Author

N66-14923# Harvard Univ., Cambridge, Mass.
THE RELATION OF POSTTEST PERFORMANCE TO RESPONSE-CONTINGENCIES IN PROGRAMMED INSTRUCTION
Mark A. Sherman Bedford, Mass., AFSC, Electron. Systems Div., Jun. 1965 13 p refs
(Contract AF 19(628)-2404)
(ESD-TR-65-357; AD-623916) CFSTI: HC $1.00/MF $0.50

Two programs, containing fictitious subject matter, were employed in a study designed to compare the teaching effectiveness (as measured by posttest) of textual material presented (1) as contingencies for responses in a program, or (2) as material upon which responses were not contingent. The content of the programs was identical, and they differed only in that material whose reading was necessary for correct responding in one program was not necessary for correct reponding in the other and vice versa. The posttest was the same for all subjects. Half of the posttest related in material which was response-contingent in one of the programs, and the other half related to material which was response-contingent in the other program. Results indicate that response-contingent material leads to higher posttest scores than the same material when it is not necessary for correct responding within the program. The probability of information being acquired from a program is increased when this information is response-contingent. Author (TAB)

N66-15003# Joint Publications Research Service, Washington, D. C.
MATHEMATICAL MODELS OF EXCITATION

Yuriy Gur'yevich Antomonov, Alina Borisovna Kotova, Inna Dmitriyevna Ponomareva, Oksana Gavrilovna Pustovoyt, Leonid Vasil'yevich Reshod'ka et al 29 Dec. 1965 153 p refs Transl. into ENGLISH of the book "Matematicheskiye Modeli Vozbuzhdeniya" Kiev, State Publishing House, 1965 p 1–147
(JPRS-33517; TT-65-34091) CFSTI: $4.00

The excitation of nerve and muscular tissue by electrical stimuli is studied with the use of mathematical models. The mathematical models reflect in a general form the regular patterns of tissue excitation and allow a hypothesis concerning qualitative and quantitative characteristics of the response according to a known electrical input signal. Simple mathematics involving functions and differential equations are used in constructing the models. Included are a full treatment on the excitatory properties of an electrical stimulus, physiological research material on threshold properties of nerve and muscular tissue, excitation patterns with various forms of stimuli acting on tissue, an analysis of one of the possible mathematical models of excitation of nervous tissue, and the modeling of excitation properties of nervous tissues on an analog computer. Also included are models of muscular tissue and of various muscular contractions, details of the apparatus used, and an analysis of the frequency factors of nervous tissue functioning.
R.N.A.

N66-15004# *Joint Publications Research Service, Washington, D. C.*
CYBERNETIC APPLICATIONS IN PSYCHOLOGICAL AND MEDICAL PROBLEMS
13 Oct. 1965 65 p refs Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 4, 1965 p 75–102, 140–150, 157–164
(JPRS-32365; TT-65-32855) CFSTI: $3.00

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5. THEORY AND PRACTICE OF MEASUREMENTS OF THE ELECTROENCEPHALOGRAPHIC SIGN CORRELATION COEFFICIENT Ye. Ya. Voytinskiy and V. A. Pryanishnikov p 53–64 refs (See N66-15009 05-04)

N66-15005 Joint Publications Research Service, Washington, D. C.
ON THE ROLE OF EMOTIONS IN THE ADAPTIVE BEHAVIOR OF LIVING SYSTEMS
P. V. Simonov *In its* Cybernetic Appl. in Psychological and Med. Probl. 13 Oct. 1965 p 1–13 refs (See N66-15004 05-04) CFSTI: $3.00

Emotion is considered as a compensatory mechanism offsetting the shortage of information required to accomplish the goal, or to satisfy the need, of the human being. It is assumed that emotion reflects the physiological nature of the phenomenon, reveals the relationship with the need and action, and proves to be universal in nature. It is within this framework that negative emotions, the adaptive significance of positive emotions, and the avoidance of pain are considered. The theory of dynamic stereotype, which shows which physiological mechanisms underlie the formation of activity programs in higher animals, is considered along with disturbances in the stereotype. Characteristics of emotional reactions are enumerated, and it is concluded that emotions are pertinent only when an information shortage exists. As this shortage is eliminated and the new dynamic stereotype is formed, the advantages of emotions are transformed into disadvantages. The classic "information" disease, or neurosis, arises because of emotions; and it is pointed out that psychotherapy is primarily oriented toward eliminating the so-called information shortage.
M.W.R.

N66-15006 Joint Publications Research Service, Washington, D. C.
MEMORY CAPACITY AND THE AMOUNT OF INFORMATION
P. B. Nevel'skiy *In its* Cybernetic Appl. in Psychological and Med. Probl. 13 Oct. 1965 p 14–31 refs (See N66-15004 05-04) CFSTI: $3.00

Numerous experiments confirm that decreasing the amount of new information to be learned increases memory capacity. The dependence of memory capacity on amount of information is further evidenced by the fact that recognition is more productive than reproduction; and memorization of words is more productive than that of meaningless symbols, which in effect carry more information. Further, it is pointed out that poetry is memorized more easily than prose because the former involves a limited selection of words. Memory capacity is considered as a concept and as a function of the number of symbols memorized. Experiments reviewed deal with abstract concepts, three-digit numbers, and words; and an information theory approach to memory is used in interpreting the findings.
M.W.R.

N66-15007* Joint Publications Research Service, Washington, D. C.
ON THE PROBLEM OF NON-REGULATED ACTIVITY IN CONDITIONS OF PROLONGED ISOLATION WITH SENSORY DEPRIVATION
O. N. Kuznetsov and V. I. Lebedev *In its* Cybernetic Appl. in Psychological and Med. Probl. 13 Oct. 1965 p 32–38 (See N66-15004 05-04) CFSTI: $3.00

Fragments of a story and diary written by two subjects tested in a sound- and light-insulated isolation chamber are presented. Tests to determine neuropsychiatric stability dealt with performance capacity, physiological and mental functioning, sleep, different regimes of work, and relaxation. The fixed program occupied four hours each day; the remaining hours were completely non-regulated for isolation periods of 10 and 15 days. It is noted that at the start of the experiment the subjects prepared themselves for the regulated activity far in advance. As the experiment progressed, they found it difficult to abandon their non-regulated activity and were reluctant to resume the fixed activity part of the program. Free activities mentioned include singing, whistling, writing poetry and fiction, drawing, and wood carving. The subjects even disassembled and replaced parts of the electrophysiological sensors used in the experiment.
M.W.R.

N66-15008 Joint Publications Research Service, Washington, D. C.
STATISTICAL METHODS OF EVALUATING THE EFFECTIVENESS OF A HUMAN OPERATOR'S TRANSFER FUNCTION

G. A. Sergeyev and A. F. Romanenko *In its* Cybernetic Appl. in Psychological and Med. Probl. 13 Oct. 1965 p 39–52 refs (See N66-15004 05-04) CFSTI: $3.00

Variations in productivity of human operators are considered too great for use in average productivity estimates based on the assumption of the steady-state nature of input errors. The human operator is shown to master the stochastic structure of input errors. Calculation of possible relative limits of productivity variation, determined with the aid of the information transfer function, is considered to reflect the self-adjustment function of the human servo system under the action of input signals of the transient type. A statistical approach is used to investigate the errors made by human operators; and in one series of experiments with a homogeneous group of operators, considerable variation is found in the frequency structure of individual errors. Correlation functions are determined in both the frequency and time domains. M.W.R.

N66-15009 Joint Publications Research Service, Washington, D. C.

THEORY AND PRACTICE OF MEASUREMENTS OF THE ELECTROENCEPHALOGRAPHIC SIGN CORRRELATION COEFFICIENT

Ye. Ya. Voytinskiy and V. A. Pryanishnikov *In its* Cybernetic Appl. in Psychological and Med. Probl. 13 Oct. 1965 p 53–64 refs (See N66-15004 05-04) CFSTI: $3.00

A discrete setup is described for the automatic calculation of the sign correlation coefficients of the electroencephalogram signal, and the theory of the sign correlation method is examined. Formulas are derived for error calculations, and it is shown that the measurement error tends to be zero when there are sufficiently long observation intervals. Block and circuit diagrams are included for the sign correlator, which is an electronic setup operating in real time with a high degree of accuracy over a broad range of frequencies. M.W.R.

N66-15038 Joint Publications Research Service, Washington, D. C.

THE DEVELOPMENT OF MICROBIOLOGY

Shu-Ch'un Teng *In its* Transl. on Communist China's Sci. and Tech. 21 Dec. 1965 8 p refs Transl. into ENGLISH from K'O-Hsueh T'ung Pao (Peking), no. 10, Oct. 1965 p 889–891 (See N66-15037 05-34) CFSTI: $2.00

A brief review of the historical development of microbiology as a branch of science is presented. The contributions of Pasteur, Koch, and others are briefly summarized. The development of microbiology was assisted, in varying degrees, by other biological disciplines, chemistry, and physics. In turn, microbiology has enhanced and propagated medicine, other fields of biology, and forestry. The need for collaboration among workers in microbiology, biochemistry, and biophysics is recognized. E.E.B.

N66-15041# Joint Publications Research Service, Washington, D. C.

TECHNOLOGY AND THE BRAIN

G. L. Smolyan 29 Dec. 1965 23 p refs Transl. into ENGLISH from Vopr. Filosofii (Moscow), v. 19, no. 5, 1965 p 83–94 (JPRS-33516; TT-65-34090) CFSTI: $1.00

A brief review of cybernetic processes in relation to biological research is given and the analogy between complex organizations and functions of technical systems and the living organism is outlined. The term "bionics" was applied to principles of living systems that may be utilized in technology, especially the brain structure. A concept of a ramified neuron network was developed as a logical attempt to simulate complex neuron structures with varied functions of the individual neurons and their aggregations. This neuron network transmits signals multidirectionally; the exchange of information occurs simultaneously between many neutron circuits. A neuron circuit model that roughly corresponds to a probability prediction process was described. G.G.

N66-15043 Joint Publications Research Service, Washington, D. C.

RADIATION PROTECTION

In its Transl. on Communist China's Sci. and Technol. 6 Dec. 1965 22 p Transl. into ENGLISH from Yuan-Tzu-Neng Ti Yuan-Li Ho Ying-Yung (Peking), Ch. 10, Jul. 1965 p 294–318 (See N66-15042 05-34) CFSTI: $3.00

A brief outline of acute and long range radiation effects on the human system is given, and a variety of preventive and protective methods against radiation contamination are discussed. Human endurance to radiation varies according to health, age, sex, and state of the nervous system; generally, a dose of 100 to 200 rad causes serious radioactive disease. Radiation effects can be reduced by adequate shielding, increased distance from the radiation source, and a decreased time of exposure. Humans working with or near radioactive materials should carry a device that registers radiation exposure; persons with blood deficiencies, tuberculosis, or some types of mental instability should not work with radioactive materials. A personal radiation monitoring device made of film negatives was found most useful for radiation detection of the 0.02-3 r or 0.5 to 20 r ranges. G.G.

N66-15054# Defence Research Medical Labs., Toronto (Ontario).

ANNUAL REPORT, 1963

[1963] 44 p refs

(AD-453143)

The demands made of military personnel to fly at higher heights, dive to deeper depths, move at greater speeds, penetrate and endure more hostile environments, remain vigilant under more monotonous circumstances, and detect the presence of more mobile and elusive opponents require intimate knowledge of the nature and limitations of human physical stamina and the capabilities and characteristics of human perceptual processes. As a scientific ally of the Canadian Armed Forces, the Defense Research Medical Laboratories is dedicated to adding to such knowledge and assisting in the application of it in the design of military equipment and the formulation of the most effective operational and training procedures. Author (TAB)

N66-15056# Joint Publications Research Service, Washington, D. C.

CHANGES IN RESPIRATION AND REFLEX EXCITABILITY OF THE RESPIRATORY CENTER IN DOGS INHALING OXYGEN

G. A. Vaksleyger and L. F. Yermenko 16 Jun. 1965 14 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR I. M. Sechenova (Leningrad), v. 50, no. 3, Mar. 1964 p 280–287

(JPRS-30637; TT-65-31273) CFSTI: $1.00

Data indicated two phases in the effect of increased oxygen content on respiration. For two to eight minutes after inhalation, respiration became more shallow in 88% of the animals. In 82% of the cases, threshold of reflex excitability remained unchanged. The initial reaction was followed by a delayed response, whereby external respiration approximated its

original form. Characteristic respiratory changes were also observed after the administration of chloral hydrate and aminazin. There was weakening of thoracic respiration while abdominal respiration remained relatively unchanged, suggesting inhibition of cerebral cortex activity. However, it was found that aminazin does not alter excitability of the respiratory or feeding centers. Experimentation was carried out in a closed chamber with temperature and pressure constant but ventilation varied. Reflex excitability of the respiratory center was determined by stimulating the trunk of the vagus nerve drawn out in a skin flap on the neck. Length of stimulation was 4 to 10 sec, each stimulation lasting 3 millisec. Immediately after the threshold was determined by minimum coughing effect, oxygen was supplied, then ventilation was stopped, the chamber sealed and the CO_2 was absorbed by a CaO_2 cartridge. M.W.R.

N66-15058# Joint Publications Research Service, Washington, D. C.
STUDIES ON THE EFFECTS OF HEAT, VIBRATIONS, AND RADIATION ON THE ORGANISM
24 Dec. 1964 43 p refs Transl. into ENGLISH from Fiziol. Zh. Akad. Nauk Ukr. RSR (Kiev), v. 10, no. 5, Sep.–Oct. 1964 (JPRS-27982; TT-64-51997) CFSTI: $2.00

The following studies are presented: "Effect of High-Frequency Electromagnetic Vibrations on the Motor Function of the Human Stomach"; "Effect of Blood Circulation on the Distribution of Heat and the Magnitude of the Thermal Effect During Action of a Superhigh-Frequency Electromagnetic Field on Animals"; "Participation of the Central and Vegetative Nervous System in the Mechanism of Ultrasonic Action on the Absorptive Processes in the Gastrointestinal Tract"; "Effect of X-Ray Irradiation on the Structure of DNA Molecules in Solution"; and "Body Temperature and Heat Generation in White Rats Under the Effect of Radial Acceleration." G.G.

N66-15071*# IIT Research Inst., Chicago, Ill.
LIFE IN EXTRATERRESTRIAL ENVIRONMENTS Quarterly Status Report, 15 Aug.–15 Nov. 1965
Charles A. Hagen [1965] 17 p ref
(Contract NASr-22)
(NASA-CR-69141; IITRI-L6023-3) CFSTI: HC $1.00/MF $0.50 CSCL 06F

Bacillus cereus spores were exposed to either 100° C or 130° C for as long as 30 min and found not remarkably sensitive to a modified Martian environment with diurnal freezing and thawing cycles. Although vegetative cell growth and sporulation were delayed, population densities after 28 days of exposure compared favorably with previous results from nonheated spores. Exposure of B. cereus and B. subtilis spores to a simulated Martian environment with barometric pressures over the 5 mm to 12 mm Hg range indicated that the growth response was unusually delayed or inhibited when compared to the growth response of these organisms in a similar environment but with a pressure of 75 mm Hg. Manometric studies were initiated to determine the extent of adaptation and/or damage that an organism's respiratory system undergoes as a result of prolonged contact with a simulated extraterrestrial environment. Determination of suitable systems were investigated and included phosphate buffer and glucose concentrations, the effect of 1-alanine and manganese sulfate as germinating agents, and different densities of B. cereus and B. subtilis spore suspensions. C.T.C.

N66-15081# Montefiore Hospital, New York.
EFFECT OF COLLIMATOR-SHAPE ON DEPTH DOSE CURVES.
A. Dahler (Norweg. Radium Hosp.) [1964] 9 p Presented at the Symp. of High Energy Electrons, Montreux, Switzerland, Sep. 1964
(Contract AT(30-1)-2607)
(CONF-640918-1) CFSTI: HC $1.00/MF $0.50

A comparison was made of isodose and depth-dose curves for 15-, 25-, and 33-Mev electrons when Cr-plated brass or perspex applicators were used as part of the collimating system. Results indicated that the brass applicators gave a more ideal isodose curve at depths. Design improvements are suggested to increase the performance of collimators used in radiotherapy. NSA

N66-15117 Catholic Univ. of America, Washington, D. C. Dept. of Electrical Engineering.
AUTOCORRELATION TECHNIQUES APPLIED TO THE FETAL HEART SIGNAL
Andrew G. Favret *In its* Elec. Eng. Res. Rev., No. 4 Jun. 1965 p 36–45 refs (See N66-15112 05-34)
(Grant PHS-HE-06268)

The effectiveness of autocorrelation techniques when applied to the fetal heart signal analysis was evaluated. The correlation analysis was performed on a digital computer which permitted considerable flexibility in manipulating the data and adjusting the correlation parameters. In the fetal electrocardiogram, the maternal complex dominates the correlogram and prevents a meaningful interpretation of the fetal contribution. Before correlation analysis, the maternal signal is automatically eliminated in the computer by locating the sharp maternal peaks, shifting each maternal cycle in time so that all peaks are aligned, developing group averages for the maternal complex, and subtracting the appropriate average maternal complex from each maternal cycle in the original data. This technique is shown graphically. Even with the maternal complex removed, autocorrelation analysis does not provide improved detection performance over conventional visual analysis. This is due to the not quite periodic nature of most fetal signals combined with the specific type of waveshape associated with the fetal electrocardiogram. R.N.A.

N66-15118 Catholic Univ. of America, Washington, D. C. Dept. of Electrical Engineering.
MATCHED-FILTER PROCESSING OF FETAL ELECTROCARDIOGRAMS
William A. Welch *In its* Elec. Eng. Res. Rev., No. 4 Jun. 1965 p 46–56 (See N66-15112 05-34)

This paper reports the results of an investigation to improve the probability of detection of fetal signals by using matched filters and applying the concepts of statistical decision theory. Since the signals were recorded on magnetic tape, a digital computer was used to simulate the matched filter and perform the decision theoretical analysis. The study shows that matched filter processing of fetal electrocardiograms is capable of offering significant improvement over simple peak detection. This result was demonstrated for an electrocardiogram with high fetal signal-to-noise ratio, i.e., the positions of the fetal peaks were known in advance. Since the actual purpose of the program is to detect fetal peaks when their positions are not already known, it will be necessary to process electrocardiograms with poor signal-to-noise ratios before the effectiveness of matched filter computer processing can be completely determined. R.N.A.

N66-15129# Joint Publications Research Service, Washington, D. C.
VESTNIK OF THE USSR ACADEMY OF MEDICAL SCIENCES, VOLUME XX, NO. 9, 1965

7 Dec. 1965 195 p refs Transl. into ENGLISH of Vestnik. Akad. Med. Nauk SSSR (Moscow), v. XX, no. 9, 1965 p 1-111 (JPRS-33196; TT-65-33772) CFSTI: $5.00

CONTENTS:

N66-15130 Joint Publications Research Service, Washington, D. C.

PATHOGENESIS OF REMOTE CONSEQUENCES OF RADIATION

S. N. Aleksandrov *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 12-15 (See N66-15129 05-04) CFSTI: $5.00

Results of a study to investigate disturbances which develop in irradiated subjects surviving acute or chronic radiation sickness are presented. Three types of disturbances are singled out and discussed: (1) irreplaceable loss of cellular modification; (2) disorders preserved in irradiated cells, and (3) hereditary changes in somatic cells. These derangements were found to cause variations in body reactivity which limits defensive and adaptive possibilities in the irradiated organism. Such a biological "chain reaction" results in shortening of the life span and represents injury or disease occurring after subsequent exposure of the organism to radiation effects. M.R.W.

N66-15131 Joint Publications Research Service, Washington, D. C.

BIOLOGICAL ANALYSIS OF PRIMARY BIOLOGICAL RADIATION EFFECTS

N. V. Luchnik *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 16-22 refs (See N66-15129 05-04) CFSTI: $5.00

The paper presents a brief essay on the present-day situation with regard to the issue of primary mechanisms underlying the biological action of radiation. New data on the nature of primary chromosome injuries, on occult injuries of the DNA molecules and on the significance of free-radicals mechanisms are cited. The obtained results are discussed from the standpoint of their significance for certain problems of radiobiology and medical radiology. Author

N66-15132 Joint Publications Research Service, Washington, D. C.

MOLECULAR MECHANISMS UNDERLYING RADIATION CYTOGENETIC DISTURBANCES

B. V. Ivannik, N. A. Klipson, T. G. Mamedova, N. I. Ryabchenko, M. V. Sklobovskaya et al *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 23–28 refs (See N66-15129 05-04) CFSTI: $5.00

Results are reported of an experimental study of the damaging effect of different forms of free radicals and of irradiation on the cellular and molecular levels, and also of the nature of various types of local injuries arising in macromolecules of DNA and DNP. The damages appearing in the basic matrix structure of the cellular nucleus, provoked by the effect of ionizing radiation, are demonstrated to be secondary to direct absorption of radiation energy of them. These damages cannot be fully imitated by the action of free radicals, or by ultraviolet radiation. Author

N66-15133 Joint Publications Research Service, Washington, D. C.

ON PROCEDURES FOR RECORDING AND ASSESSING DYNAMICALLY THE FREQUENCY OF DEVELOPMENTAL DEFECTS IN MAN

N. V. Glotov *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 29–33 refs (See N66-15129 05-04) CFSTI: $5.00

The author depicts methodological requirements which have to be taken into consideration in analysing the frequency of developmental defects. Under consideration are the influence exerted by the migration of the population, diagnostic particularities and the actual state of medical statistics on the results subsequent to estimates of the developmental defects frequency. An analysis of some literature data concerning temporal dynamics of developmental defects is given. Note is taken of the ambiguous inferences and the absence of convincing facts speaking in favor of a systematic rise in the frequency of developmental defects. Author

N66-15134 Joint Publications Research Service, Washington, D. C.

A STUDY OF PROCESSES GOVERNING THE REPAIR OF CELLS FROM PRIMARY CYTOGENETIC INJURIES

L. S. Tsarapkin, N. A. Poryadkova, N. G. Labzina, S. I. Alekseyeva, and V. S. Yatenko *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 34–44 refs (See N66-15129 05-04) CFSTI: $5.00

Experimental data are set forth demonstrating the influence exerted by gamma-irradiation on the character of the chromosome formation from the chromatid. A phenomenological classification of effective chemical substances, tested according to a definite pattern and capable of producing a defensive or radiosensitizing effect on the cytogenetic level, is presented. Author

N66-15135 Joint Publications Research Service, Washington, D. C.

ENERGY-PRODUCING PROCESSES AND THE POST-RADIATION REPAIR OF THE CELL

A. F. Mosin, R. P. Ivanova, and E. M. Karabayev *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 57-62 refs (See N66-15129 05-04) CFSTI: $5.00

Restoration of post-radiation damages of cells is closely related to the activity of energy-producing processes (respiration and fermentation). The suppression of these processes tends to inhibit the restoration. In irradiated yeast the respiratory intensity is much higher than in nonirradiated one. As the irradiation dose increases the rate of oxygen consumption goes up too. This, however, is seen to occur only in strains capable of post-radiation restoration. In cells devoid of this ability (haploids) the nature of respiration after irradiation remains unchanged. Under definite conditions (cellular concentration in a suspension not exceeding 5×10^6 cell/ml and the presence of substrate) fermentation provides just as high a level of restoration as does the respiration. In thick suspensions under anaerobic conditions the restoration is strongly inhibited, and this in spite of the presence of a sufficiently large amount of glucose. In these conditions it is alcohol that appears as a factor hindering the process of restoration. Author

N66-15136 Joint Publications Research Service, Washington, D. C.

REACTIONS OF THE NEUROSECRETORY NUCLEI OF THE HYPOTHALAMUS, THYROID GLAND AND ADRENALS IN THE CASE OF IRRADIATION INJURY TO THE BODY

A. A. Voytkevich, A. V. Tkachev, A. S. Chekunov, G. F. Palyga, and G. A. Ovchinnikova *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 63–75 refs (See N66-15129 05-04) CFSTI: $5.00

The authors used histochemical, histological and histoautographic techniques in studying the nature marking distribution and content of typrosine, tryptophan and histidine, the activity of the succino-dehydrogenase, the localization of the polonium-210 alpha-particles, the number of chromosomic aberrations in the liver and also the histostructure of neurosecretory nuclei of the hypothalamus, thyroid gland and adrenals in different functional states and in radiation sickness induced by external gamma-irradiation and introduction of polonium-210. The experiments were staged on rats of the Wistar and August lines, as well as on mongrels. The introduction of hormonal preparations to animals and radiation injury of the organism bring about substantial changes in the endocrine organs, which proves the neuroendocrine system to partake in the response of the organism to various adequate and nonadequate effects. Thus, the neurosecretory hypothalamus nuclei cells, which are a seat for an elective accumulation of Po^{210}, after provisional deposition of neurosecretion, demonstrate an intensive discharge of the latter, followed by cellular destruction. Alterations occurring in the thyroid and adrenals are also of a triphasic nature. After a short period of stimulation comes the stage of functional depression of the above-cited glands. Later on, morphological signs denoting stimulation of the thyroid and adrenals become apparent. Under discussion is the nature of disturbances of the neuroendocrine system regulatory components appearing under the effect of radiation factors. Author

N66-15137 Joint Publications Research Service, Washington, D. C.

TRANSPLANTABLE FIBROSARCOMA IN LINEAGE RATS, INDUCED BY PLASTICIZED RESIN AND Co^{60} GAMMA IRRADIATION

S. P. Podsosov and S. I. Kharlampovich *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 76–81 refs (See N66-15129 05-04) CFSTI: $5.00

By combining the inducing capacity of plastisized resin and carcinogenous effect of a high dose of Co^{60} gamma-irradiation the author obtained a primary tumor (fibrosarcoma). The further transplantation of the tumor (10 generations) was effected simultaneously on two groups of animals:—irradiated and nonirradiated. In groups of irradiated and nonirradiated rats of the "August" line a difference was established in the duration of the latent period, life span, volume, weight and microscopic picture of the growing neoplasm. Author

N66-15138 Joint Publications Research Service, Washington, D. C.

ON THE LOSS OF HYPOTENSIVE ACTIVITY DUE TO DERIVATIVES OF 5-HYDROXY-INDOLE DURING IRRADIATION OF ANIMALS

A. N. Grinev, T. Yu. Il'yuchenok, V. P. Lepekhin, and K. S. Shadurskiy *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 82–86 refs (See N66-15129 05-04) CFSTI: $5.00

Experiments made on rats of the "August line demonstrated that some 5-hydroxy-indole derivatives produce a chronic hypotensive action (from 66 up to 77 days). A preliminary exposure of rats to irradiation in a dose of 300 roentgens results in the reduction of the hypotensive effect, while in a dose of 6000 roentgens no hypotensive action is seen at all (compound ORF-50). It is suggested that irradiation of the animals brings with it "break-up" of biochemical mechanisms, through which 5-hydroxyindoles are involved in the hypotensive effect. Author

N66-15139 Joint Publications Research Service, Washington, D. C.

ACCUMULATION AND EXCRETION KINETICS OF RADIOACTIVE CESIUM (Cs^{137}) UPON ENTRY INTO THE ORGANS OF RESPIRATION

G. K. Korolev *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 87–96 refs (See N66-15129 05-04) CFSTI: $5.00

Distribution of $Cesium^{137}$ in albino rats following its intratracheal introduction was studied. Radiometric investigations demonstrated this radio-isotope to be highly absorbable. In the course of the first 24 hours up to 90% of the activity introduced (0.4 microcuries/g of the animal's body weight) is removed from the lungs. The absorption of the radio element proceeds exponentially. $Cesium^{137}$ penetrating into the organism is deposited predominantly in muscles (about 46% of the activity actually introduced). The isotope is noted to metabolize at a higher rate in the myocardium. It is also deposited in the skeleton, liver and in other organs. Within the limits of 24 hours the concentration of the isotope was highest in the kidneys. Later on, no essential differences were noted in the level of the isotope contained in 1 g of the internal organs. Morphological examinations of the lungs revealed the occurence of massive hemorrhages and the development of degenerative and inflammatory processes. After expiration of 15 days regenerative processes made their appearance, becoming most marked in 2–3 months. Within the period of from 4 to 12 months one could see an increased microcellular infiltration setting in around vessels and proliferation of the connective tissue. Author

N66-15140 Joint Publications Research Service, Washington, D. C.

SOME PROBLEMS OF IMMUNOPATHOLOGY UPON CHRONIC EXPOSURE OF THE BODY TO RADIOACTIVE ZINC (Zn^{65})

P. P. Filatov and Ye. S. Gaydova *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 97–105 refs (See N66-15129 05-04) CFSTI: $5.00

The work deals with a study of the role played by autoimmunological processes in animals exposed chronically to the effect of radioactive zink (Zn^{65}). By using immunological, morphological and biochemical techniques it was shown that under prolonged effect of Zn^{65} the antigenic tissue structure in laboratory animals is subject to alterations, there appear autoantibodies and the fraction composition of the blood serum changes too. There was also evidence of the reticular tissue hyperplasia in hemopoietic organs, the emergence of extramedullary hemopoiesis foci in the spleen and lymphatic nodes and the presence of plasmatic cells, amyloidosis in the spleen and kidneys. The confrontation of the resulting data gives ground to suggest that autoimmunological mechanisms play an important role in the pathogenesis of a chronic radiation injury. Author

N66-15141 Joint Publications Research Service, Washington, D. C.

COAGULATION OF THE BLOOD AND ITS FIBRINOLYTIC ACTIVITY IN ACUTE RADIATION SICKNESS

V. P. Baluda, N. V. Lysogorov, S. S. Khnychev, D. N. Ishmukhametova, Zh. N. Rukazenkova et al *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 106–111 refs (See N66-15129 05-04) CFSTI: $5.00

The work is devoted to clarifying the condition of the coagulation and fibrinolytic systems of the blood in acute radiation sickness induced by gamma-rays. A whole-body irradiation with Co^{60} in a dose of 600 rads at a dosage rate of 100 rad/sec during acute period of acute radiation sickness produces delayed coagulation of the blood, reduced tolerance of plasma to heparin, diminished prothrombin activity of the blood, increased thrombin time and fibrinogen concentration, reduced thermal stability, the emergence of fibrinogen B, reduced fibrinase and fibrinolytic activities, diminished blood platelets count and disturbed retraction of the blood clot. The electron microscopy demonstrated upset structure of the fibrin fibers, rupture of the fibrin threads and their vacuolization. The hemorrhagic syndrome is seen to make its appearance 24 hours after irradiation (occult blood in the feces), with its most marked manifestations emerging at the height of the disease. Disturbances in the properties and structure of the fibrin clot during radiation sickness are primarily due to reduced fibrinase activity. Disordered coagulation of the blood and fibrinolase in radiation sickness may cause functional and morphological alterations in vascular walls and bleeding. Author

N66-15142 Joint Publications Research Service, Washington, D. C.

THERMAL AND ANAPHYLACTOID EDEMA IN ACUTE RADIATION SICKNESS

V. M. Dorofeyev, B. V. Polushkin, and N. I. Tsyran *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 119–127 refs (See N66-15129 05-04) CFSTI: $5.00

The authors investigated in rats of the Wistar line the size of edema on a thermally damaged skin of their paws and following subcutaneous injection of dextran. The part played by serotonin in the development of edema in healthy and gamma-irradiated rats (doses of 750 and 680 rads) was demonstrated. In acute radiation sickness the rats showed inhibition of the thermal and anaphylactoid edema, this being particularly evident on the 4th day after irradiation. By the 8th day the intensity of the edema would return back closely to its normal level, while the blood serotonin experienced a sharp drop. Preliminary administration of iprazide, indopan, 5-oxytryptophan and serotonin inhibits the development of a thermal edema in healthy rats. 5-oxytryptophan tends to raise the serotonin concentration in the blood and does so particularly in the skin of rats with acute radiation sickness. It also depresses the development of a thermal edema. Iprazide stimulates a dextran-induced edema in irradiated rats, but tends to inhibit a thermal one. Author

N66-15143 Joint Publications Research Service, Washington, D. C.

EFFECT OF ZYMOSAN UPON THE MACROPHAGE RESPONSE OF THE LUNGS AND PHAGOCYTOSIS IN ACUTE RADIATION SICKNESS

A. V. Bykhovskiy, G. S. Komovnikov, and B. V. Polushkin *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 128–133 refs (See N66-15129 05-04) CFSTI: $5.00

The modified technique of La Belle and Brieger, which includes cytological examination of the pulmonary wash off permits obtaining readily reproducible results, characterizing accumulation of alveolar macrophages in air passages of the lungs. Intratracheal administration of zymosan to nonirradiated rats causes a considerable increase of alveolar macrophages in the pulmonary wash off (27-fold in 22 hours after introduction of 1500 γg of zymozan). As compared with intratracheal administration of carbon, ornithine and aminoacetic acid-zymozan showed the most marked stimulating effect. With intraperitoneal administration of zymozan no substantial changes in the number of alveolar macrophages is recorded. Intraperitoneal injections of zymozan in irradiated and nonirradiated rats caused stimulation of the bone-marrow function, leukocytosis and increased phagocytic activity of cellular elements in the lungs and blood. The changes occurring in the digestive capacity of cellular elements and the blood are of an undulating nature. Author

N66-15144 Joint Publications Research Service, Washington, D. C.

CHANGES IN THE COMPOSITION OF SERUM PROTEINS IN IRRADIATION INJURIES OF ANIMALS

K. P. Kashkin and S. V. Aleksandrova *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 145–149 refs (See N66-15129 05-04) CFSTI: $5.00

The presented material was derived from immunochemical and biochemical investigations into serum proteins of irradiated animals. As an object of research served nonlineage mice, subjected to roentgen irradiation with a dose of 1000 rads, and also rats of the "August" line and monkeys (Macaca-rhesus), exposed to the effect of Co^{60} gamma-rays in doses of 630–750 and 550–630 roentgens respectively. Highly sensitive rabbit antisera were used in analysis. The radiation injury was demonstrated to lead to qualitative and quantitative alterations in the composition of individual serum protein fractions, which are due to varying sensitivity to irradiation of the cells participating in their synthesis. Evidence was also obtained showing that following radiation injury some tissue antigens gain access into the blood of irradiated animals, which are absent in the serum of intact animals. Author

N66-15145 Joint Publications Research Service, Washington, D. C.

A CIRCULATORY RADIOCARDIOGRAPHIC METHOD FOR COMPLEX ANALYSIS OF CENTRAL AND PERIPHERAL HEMODYNAMICS

B. Ye. Votchal and F. F. Vysovskiy *In its* Vestn. of the USSR Acad. of Med. Sci. 7 Dec. 1965 p 150–163 refs (See N66-15129 05-04) CFSTI: $5.00

Inhalation radiocardiography with radioactive krypton (Kr^{35}) was taken as a basis for establishing a technique for the study of the central and peripheral hemodynamics constants. Under examination came healthy persons, patients with predominant sinistro-ventricular and dextroventricular insufficiency and with liver cirrhosis. The analysis of the obtained data indicates the presence of a fine differentiation of the indices covering the central hemodynamics of the arterial and venous circulation, as well as the liver circulation in healthy persons and in patients demonstrating different pathological conditions.

Author

N66-15150# National Defense Research Organization T.N.O., The Hague (Netherlands). Medical Biological Lab.

THE CULTURE COLLECTION OF THE DEPARTMENT FOR MICROBIAL GENETICS. II: THERMOSENSITIVE MUTANTS OF *ESCHERICHIA COLI*

A. Rörsch, P. van de Putte, I. M. Dijkmans, J. van Dillewijn, and A. M. Schepman Sep. 1965 39 p refs (MBL/1965/25) CFSTI: HC $2.00/MF $0.50

Thermosensitive microbial mutants were isolated by various techniques, and some of the properties of the mutants are listed. The growth curves for all the 350 mutants isolated, are presented, and the conditions of growth measurement are given. The properties of the various types of mutants isolated are summarized in a model growth curve. According to their growth pattern at 42° C, the mutants were classified in the following four categories: a) strains blocked in cell division forming long filaments (fts strains), b) strains that do not grow at all at elevated temperature (gts strains), c) strains that lyse at 42° C (lts strains), and d) strains of which the nature of the thermosensitive mutation is unknown as yet (uts strains).

L.S.

N66-15152 Joint Publications Research Service, Washington, D. C.

THE DEVELOPMENT OF MOLECULAR BIOLOGY

T'ien-Ch'in Ts'ao and Te-Pao Wang *In its* Transl. on Communist China's Sci. and Technol., No. 274 5 Jan. 1966 p 1–12 (See N66-15151 05-34) CFSTI: $3.00

History, status, and practical significance of molecular biology are reviewed in general terms. Discussed are two biological milestones: (1) clarification of protein structure and synthesis and (2) transmission of genetic information. Included are stereo structure models of whale myoglobin and horse hemoglobin, the double helical structure of deoxyribonucleic acid, and a diagram of protein biosynthesis. Contributions of molecular biology to other scientific disciplines are mentioned.

M.W.R.

N66-15156 Joint Publications Research Service, Washington, D. C.

ENTOMOPHILIC MICROORGANISMS AND THEIR USES

Hsing Tseng *In its* Transl. on Communist China's Sci. and Technol., No. 274 5 Jan. 1966 p 31–41 refs (See N66-15151 05-34) CFSTI: $3.00

Utilization of bacteria, fungi, viruses, and protozoans for insect control is considered for agricultural production programs. In China, a bacillus-containing powder has been found effective against pine, cabbage, and tea moths as well as fruit tree borers. Certain fungi have been used in soybean fields and in silk production. Further studies are required to determine the location and season for spraying fungi-preventive powder, and unified production methods must be developed for the various powders. Virus-containing powders have not been developed, but studies have been made of viruses in the silkworm and attempts have been made to isolate certain viruses. M.W.R.

N66-15158 Joint Publications Research Service, Washington, D. C.

EFFECT OF IMMUNIZATION SERUM ON PHAGOCYTES, BACTERICIDINS, AND CELL METABOLISM

Ting Fang, Hui-Fen Wang, and Mei-K'un Su *In its* Transl. on Communist China's Sci. and Technol., No. 274 5 Jan. 1966 p 58–63 refs (See N66-15151 05-34) CFSTI: $3.00

Under normal conditions, phagocytic ability of the polynuclear cells of immunized domestic chinchilla rabbits is very weak in the presence of poisonous typhoid bacillus of mice. Under special conditions the phagocytes may become active and counteract the bacilli. Experiments indicate a relationship between increase in phagocytic and bactericidal action, oxygen consumption of the phagocytic cells, and increased accumulation of lactic acid. Tables summarize data on the effect of immunization serum on phagocytic percentage of polynuclear cells, lactic production in these cells, relationship between lactic acid production of control and immunized cells, oxygen consumption, and bactericidal activity. It is concluded that when phagocytic activity increases, metabolism takes place at a higher energy level. M.W.R.

N66-15182# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
SELF-CONFRONTATION FOR COMPLEX SKILL TRAINING. REVIEW AND ANALYSIS Final Report, Apr.–Dec. 1964
Herbert T. Eachus Sep. 1965 22 p refs
(AMRL-TR-65-118; AD-624062) CFSTI: HC $1.00/MF $0.50

A review of the literature on self-confrontation and related phenomena was conducted to investigate the feasibility of their use as training techniques. The phenomenon of self-confrontation is the feedback of an individual's performance in a given situation through the use of videotape or sound motion picture film. This technique provides complete feedback of information and generates a situation in which subjects are quite amenable to modifications of their behavior, both verbal and nonverbal, with respect to given standards. The body of technical literature dealing with self-confrontation is small but complete enough to provide a basis for discussion of the phenomenon as a training technique. The analysis of the literature resulted in the recommendation for a research program to explore self-confrontation as a training technique for complex human skills. Author (TAB)

N66-15184# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
A REVIEW OF THE EFFECTS OF HIGH AMBIENT TEMPERATURE ON MENTAL PERFORMANCE
John F. Wing Sep. 1965 44 p refs
(AMRL-TR-65-102; AD-624144) CFSTI: HC $2.00/MF $0.50

Fifteen experiments done in various laboratories have assessed the effects of high thermal stress on mental performance. These experiments represent different combinations of exposure time and effective temperature. These studies were reviewed, and the upper thermal limit for unimpaired mental performance was found to vary systematically with exposure duration. Specifically, the lowest test temperatures yielding statistically reliable decrements in mental performance decline exponentially as exposure durations are increased up to 4 hours. When this temperature duration curve for mental performance is compared with physiological tolerance curves, it is found to lie well below them at every point in time.
Author (TAB)

N66-15197# Joint Publications Research Service, Washington, D. C.
CYBERNETICS IN CLINICAL MEDICINE
A. S. Cheyshvili 27 Dec. 1965 93 p refs Transl. into ENGLISH of the book "Kibernetika v Klinicheskoy Meditsine" USSR, Sabchota Sakartvelo, 1964 p 1–92
(JPRS-33477; TT-65-34051) CFSTI: $3.00

The work examines from the standpoint of biological cybernetics the processes of control over the functional activity of the organism as well as the intrasystemic mechanisms in the interaction between the organism and environmental factors in health and disease. The following problems are considered: the significance of control processes and interconnections with respect to the methodological foundations of the science of cybernetics which is of practical importance to medicine; the problem of adaptation of the organism; the principles of automatism and self-regulation of functional activity over the closed circuits through which the impulses travel and processing of information through them. The working activity of the organism is illustrated with the aid of original block diagrams clarifying the dynamics of the processes. The concluding part presents the applications of the cybernetic method to the problems of practical medicine, with certain typical pathological states being examined. Author

N66-15204# Cornell Univ., Ithaca, N. Y. Dept. of Zoology.
TEMPERATURE REGULATION IN THE VAMPIRE BAT *DESMODUS ROTUNDUS* Interim Report, Sep. 1963–Jun. 1964
Charles P. Lyman and William A. Wimsatt Ft. Wainwright, Alaska, Arctic Aeromed. Lab., Sep. 1965 19 p refs
(Contract AF 41(609)-2296; Grant NSF G-2403)
(AAL-TR-64-36; AD-624043) CFSTI: HC $1.00/MF $0.50

Body temperature and oxygen consumption were measured at various environmental temperatures in a series of captive and wild caught vampire bats, Desmodus rotundus. The response to changes in ambient temperatures was unpredictable and could not be correlated with the age or sex of the animals, their nutritional condition, or the length of their captivity. Body temperature varied greatly, but generally did not fall below 30° C when the ambient temperature was above 25° C. At lower ambient temperatures, some bats increased their metabolism and maintained a high body temperature for varying periods, while others showed little or no increase in metabolic rate, and their body temperatures declined. Below about 20° C body temperature, bats were unable to rewarm themselves without exogenous heat. Calculations indicate that vampires did not drink sufficient blood to maintain a homeothermic condition at the temperatures of temperate zone hibernacula. Bats could tolerate ambient temperatures of 33° C or more for only short periods. It is suggested that Desmodus is limited from spreading northward because of its inferior temperature regulation.
Author (TAB)

N66-15205# Duke Univ., Durham, N. C. Dept. of Anatomy.
HISTOLOGIC STUDY OF THE EFFECTS OF PROFOUND HYPOTHERMIA ON SPINAL CORD OF THE DOG Interim Report, Jun. 1963–Sep. 1964
Charlene M. Nelson, Talmage L. Peele, Maurice A. Lesage et al Ft. Wainwright, Alaska, Arctic Aeromed. Lab., Aug. 1965 38 p refs
(Contract AF 33(637)-9629)
(AAL-TR-64-35; AD-624042) CFSTI: HC $2.00/MF $0.50

A study was made of the microscopic effects of profound hypothermia on spinal cord of the dog. Samples of cervical, thoracic, lumbar and sacral cord levels of three normal and eight experimental dogs were examined. In the experimental sections the axons and myelin were apparently unaltered, and the number of anterior horn cells was within normal limits. Changes in the experimental sections included the appearance of slight to moderate chromatolysis, hyperchromic, pyknotic neurons, and most commonly, gliosis, which was more evident in the lumbar and sacral cord levels. The findings of the present study were in agreement with the results other authors have reported in studies on ischemia by vascular occlusion. Although

the alterations found in the spinal cords of the experimental dogs were not extensive, it is believed that these animals had been subjected to a condition of mild ischemia. Author (TAB)

N66-15221# Harvard Univ., Boston, Mass. Dept. of Dermatology.
MOLECULAR STRUCTURE AND DIFFUSIONAL PROCESSES ACROSS INTACT EPIDERMIS Final Comprehensive Summary Report, Jul. 1964–Jul. 1965
Robert J. Scheuplein [1965] 70 p refs
(Contract DA-18-108-AMC-148(A))
(AD-621078) CFSTI: HC $3.00/MF $0.75

The penetration rate for small molecular weight alcohols is approximately given by the expression: $Js = Kp\ Km\ dCs$, where $Kp = 0.001\text{-}3$ cm/hr. is essentially the permeability constant for water in the membrane. Km is the membrane-water partition coefficient for the alcohol and dCs is the concentration difference across the membrane. The activation energy for the penetration water and the polar alcohols, through hydrated stratum corneum is approximately 15 Kcal/mole. Extensive immersion in water effects the 'barrier' function of stratum corneum only slightly; principally by opening 'pores' which contribute to the diffusion a parallel flux which is relatively small above room temperature. Penetration through the stratum corneum is not primarily intercellular or appendageal. The hydrated stratum corneum seems to be best described as a dense, effectively homogeneous phase into which small molecular weight polar non-electrolytes dissolve with strong chemical interaction and through which diffusion occurs remarkably slowly. Author (TAB)

N66-15226*# Israel Program for Scientific Translations, Ltd., Jerusalem.
FUNDAMENTALS OF ENGINEERING CYBERNETICS
E. A. Yakubaitis 1965 263 p refs Transl. into ENGLISH of the book "Osnovy Tekhnicheskoi Kibernetiki" Riga, Izd., Akad. Nauk Latv. SSR, 1962 p 1–242 Publ. for NASA and NSF
(NASA-TT-F-290; TT-65-50116) CFSTI: HC $6.00/MF $2.00 CSCL 06D

Trends in engineering cybernetics and theoretical problems in automatic control systems are considered in a textbook intended for college students as well as for engineers concerned with automation in industry, transport, and agriculture. Chapters are devoted to types of signals and their conversion, electronic logical elements, statistical methods for the analysis of automatic control systems, and adaptive control systems. There is an introduction to the theory of probability and consideration of elements of information theory. Principles of the theory of nonlinear automatic control systems are also discussed. Learning and the imitation of the learning process are related to automatic control systems. M.W.R.

N66-15239*# Miami Univ., Coral Gables, Fla.
EXPERIMENTS SUGGESTING EVOLUTION TO PROTEIN
Sidney W. Fox (Florida State Univ.) [1964] 20 p refs
(Grant NsG-689)
(NASA-CR-59829) CFSTI: HC $1.00/MF $0.50 CSCL 06A

Studies of the organismic evolution of proteins began with application of sequential and terminal residue methods to trace the evolution of the primary structure of protein particles. Among the evolved concepts were a Darwinian explanation of microheterogeneity of protein preparation and evidence of genealogical relations of proteins. The latter led to experiments to test the effect of sufficient proportions of glutamic acid, glutamine, aspartic acid, and asparagine on the anhydrocopolymerization of amino acids. It was found that clean polymers could be produced by dry heating mixtures of eighteen amino acids common to protein. These protenoids are compared with contemporary proteins by reference to numerous research studies which demonstrate the similarity of poly-α-amino acid to protein, and experiments can approach the viable contemporary cell. It is considered that the dilemma concerning the evolutionary pathway to the first protein, and to a precellular form, has been solved in principle. M.W.R.

N66-15240*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE IONIZING RADIATIONS IN SUPERSONIC TRANSPORT FLIGHTS
Trutz Foelsche [1964] 23 p refs Presented at the 2d Symp. on Protect. against Radiation in Space, Gatlinburg, Tenn., 12–14 Oct. 1964
(NASA-TM-X-56135) CFSTI: HC $1.00/MF $0.50 CSCL 06R

Commercial supersonic transport planes are envisioned to cruise at altitudes up to 23 km or 75,000 feet. The exposure to crew and passengers from Galactic and Solar Cosmic Rays at these altitudes on polar routes is estimated and compared with the maximum permissible dose rates (MPD) cited in the guide lines of the Federal Radiation Council or the International Commission for Radiation Protection. The dose equivalent in rem from Galactic Cosmic Radiation at cruise altitudes on polar routes is estimated as ≤ 2 mrem/hr. This implies that the crew should experience ≤ 20 percent of the MPD for radiation workers (5 rem/year), at 20 hours/week flight duty or 10 hours in 23 km altitude, if evasive measures during intense and energetic solar flare events are taken. The above dose rate from Galactic Cosmic Rays is considered as an upper limit because the fast neutron flux and the buildup factors of secondaries in the airplane are assumed conservatively high. Author

N66-15245*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INCORPORATION OF PROTEIN AND NUCLEIC ACID PRECURSORS INTO FROG NERVOUS TISSUE IN VITRO
Jacob Shapira, Peter C. F. Castellani, and Johnnie O. Coleman [1964] 14 p refs Submitted for Publication
(NASA-TM-X-54943) CFSTI: HC $1.00/MF $0.50 CSCL 06A

In vitro observations were made of the effects of 1,1,3-tricyano-2-aminopropene (TCAP) on the incorporation of protein and nucleic acid precursors into central and peripheral nervous tissue of the frog. It was found that TCAP inhibited C^{14}-valine incorporation into the protein fraction of both types of tissue; whereas H^3-uridine incorporation into RNA was inhibited only in the brain tissue. Changes in nucleic acid metabolism of frog ganglia were quite similar to those produced by DNP and azide. Initial experiments, to determine whether tissues were able to incorporate significant amounts of radioactivity during an 18-hour incubation period, showed that H^3-uridine, H^3-cytidine, C^{14}-adenine, C^{14}-guanine, and C^{14}-valine were incorporated in easily determinable amounts; while H^3-thymidine was not since the tissues were not engaged in the formation of new DNA. Only a negligible amount of radioactivity from the other precursors was incorporated into the DNA. Dual labeling experiments with H^3- and C^{14}-precursors were also undertaken. It was necessary to phosphorylate the precursors before they could be incorporated into RNA; and there is some evidence that TCAP has an effect on oxidative phosphorylation and the formation of ATP. M.W.R.

N66-15260 Joint Publications Research Service, Washington, D. C.
HELIOTHERAPY DEVICE USING COMBINED ACTION OF TOTAL AND DIFFUSE SOLAR RADIATION
V. S. Svarichevskiy *In its* Heliotechnology 21 Dec. 1965 p 45–49 refs (See N66-15251 06-03) CFSTI: $3.00

Several louvered and pierced sun screens designed to eliminate the harmful effects of overexposure to the sun while making the fullest use of bright sunlight are described. These devices, used in heliotherapy, are discussed in terms of their advantages and disadvantages. R.N.A.

N66-15272 Joint Publications Research Service, Washington, D. C.
CYBERNETICS IN PLANT-GROWING
N. Bolgarov *In its* News of Soviet Cybernetics 29 Dec. 1965 p 6–8 (See N66-15270 06-34) CFSTI: $1.00

The use of cybernetic systems for the control of physiological factors in plant growing are discussed. An experiment in which a plant was forced to establish during artificial illumination the duration of "day" and "night" is reported. The plant, interacting with automatic machines, switched on and off the light itself when necessary. The sum of hours of light and darkness turned out to be close to the duration of the solar day. Experiments of automatic watering on commands of the plant are also reported. M.R.W.

N66-15334# Human Engineering Labs., Aberdeen Proving Ground, Md.
CHECK-READING ACCURACY AS A FUNCTION OF DIAL ALIGNMENT IN AN EXTENDED-POINTER DIAL DISPLAY
Lynn C. Oatman Feb. 1965 19 p refs
(TM-2-65; AD-616881) CFSTI: HC $1.00/MF $0.50

Two simulated dial displays were compared in a check-reading task. The pointers were aligned at 12 o'clock in one display and at 9 o'clock in the other. The dial displays were presented to 39 subjects who were asked to indicate whether the display contained a deviant pointer and, if so, to locate it. The data indicate that subjects performed about equally well with the two pointer alignments. Locations of the deviant dials within the displays were an important determinant of the number of deviant pointers detected. Author (TAB)

N66-15349*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
WASTE MANAGEMENT AND PERSONAL HYGIENE FOR EXTENDED SPACECRAFT MISSIONS
Norman Belasco and Donald M. Perry [1964] 43 p refs Presented at the Am. Ind. Hyg. Conf., Philadelphia, 26–30 Apr. 1964
(NASA-TM-X-57096) CFSTI: HC $2.00/MF $0.50 CSCL 06K

Spacecraft missions of extended time duration require waste management and personal hygiene facilities that will be reliable, sanitary, psychologically acceptable, have man–vehicle–system compatibility, and have use procedures duplicating earthbound modes. This paper contains a discussion of the specific nature of the major problems relative to waste management and personal hygiene on long term multiman missions. Equipment requirements, design concepts, and status of equipment development are discussed sequentially. More specifically, for waste management, the major considerations of collection, transport, storage, treatment, and rejection of excreta are reviewed. For personal hygiene, shaving, showering, superficial body cleansing, oral hygiene, and cleaning of clothes and equipment are considered. Author

N66-15381*# Public Health Service, Washington, D. C. Div. of Environmental Engineering and Food Protection.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Second Quarterly [Progress] Report, Jul. 1–Sep. 30, 1965
Robert Angelotti, Herbert E. Hall, James H. Maryanski, Ronald G. Crawford, Ralston B. Read et al Oct. 1965 23 p refs
(NASA Order R-36)
(NASA-CR-69345) CFSTI: HC $1.00/MF $0.50 CSCL 06F

Data are presented indicating that *Bacillus globigii* spores are recoverable from experimentally contaminated blocks of balsa wood by maceration in a Waring Blendor. A technique has been developed whereby spores introduced into aceton soluble plastics may be recovered quantitatively by means of dissolution and entrapment in Seitz filter pads. In connection with the development of a satisfactory model system for insoluble components, a method has been developed which provides quantitative information on the toxicity of plastics. This technique utilizes the concept of the direct surface agar plate which has found wide application in the field of surface contamination. Author

N66-15394*# Institute for Behavioral Research, Inc., Silver Spring, Md.
EXPERIMENTAL STUDIES OF PERCEPTUAL PROCESSES, SECTION TWO Progress Report, Jan. 1–Sep. 30, 1965
Charles B. Ferster, John Randolph, and Clifford Hammer Sep. 1965 54 p refs
(Grant NsG-450)
(NASA-CR-69356) CFSTI: HC $3.00/MF $0.50 CSCL 05J

The development of special environmental and concomitant behavioral techniques necessary for experiments on complex repertoires and the kinds of complex cognitive repertoires developed were previously presented. The complex performances developed over the past three years were used as tools for the evaluation of schedules and kinds of reinforcement and special contingencies to control error rates and the overall rate of responding. The most complex matching-to-sample task developed was one in which the chimp matched binary numbers to a stimulus consisting of a display of geometric figures varying in form and spatial distribution. The chimp selected one of two binary numbers which corresponded to the number of items in the sample. New kinds of stimulus control were developed in other experiments in which the animal actually produced the binary stimulus. Complex discrimination behavior in chimpanzees, fixed ratio reinforcement of large units of behavior, and deferred reinforcement are the three major subjects presented. E.E.B.

N66-15395*# Institute for Behavioral Research, Inc., Silver Spring, Md.
EXPERIMENTAL STUDIES OF PERCEPTUAL PROCESSES, SECTION THREE Progress Report, Jan. 1–Sep. 30, 1965
Israel Goldiamond, John Thomas, Stanley Pliskoff, Albert Miller, John Quagliano et al Sep. 1965 87 p refs
(Grant NsG-450)
(NASA-CR-69357) CFSTI: HC $3.00/MF $0.75 CSCL 05J

A series of experiments which are part of a program in which procedures derived from operant research are extended to relevant problems in signal detection research and in which procedures derived from signal detection research are extended to the design of experiments in relevant operant areas are reported. Operant research has developed refined procedures relating reinforcing and aversive consequences to behavior. Such procedures have been built into the cells of the decision

matrices of signal detection research. Procedures for establishing and maintaining complex behaviors have also been included. Signal detection research programs its systematic relation of pay-offs to behavior in a manner which differs from the systematic relation obtaining in operant research. Some operant experiments were designed in terms of the refined decision framework of signal detection. Signal detection psychophysical research, application of the theory of signal detection to the design and analysis of operant conditioning experiments, and experiments in visual phenomena are included. E.E.B.

N66-15396*# Institute for Behavioral Research, Inc., Silver Spring, Md.

EXPERIMENTAL STUDIES OF PERCEPTUAL PROCESSES, SECTION FOUR **Progress Report, Jan. 1–Nov. 30, 1965**

Robert G. Grenell, John Thomas, Alan Stubbs, and Israel Goldiamond Sep. 1965 47 p refs

(Grant NsG-450)

(NASA-CR-69358) CFSTI: HC $2.00/MF $0.50 CSCL 06A

Progress is reported on the neurobiological program concerned with a specification of particular neurochemical correlates of such behavioral phenomena as learning and memory. The behavioral aspects of the neurobiological program and the neurochemical aspects of the program are summarized. A current series of research has involved the use of rats that have been maintained on a chronic injection program for extended time periods. The rats were injected chronically with TRIAP, a substance known to alter RNA in neurons and glia. The rats were trained on several different behavioral baselines and their terminal performances were compared to normal subjects on the same baselines. The determination of nucleic acid content and base composition by biochemical method was performed on specific cellular structures isolated by microdissection. The nucleic acids are extracted from these structures and analyzed under defined physicochemical conditions. Microelectrophoresis was employed for the determination of nucleic acid base composition. E.E.B.

N66-15431# Massachusetts General Hospital, Boston. Stanley Cobb Labs. for Psychiatric Research.

RESEARCH ON INFORMATION PROCESSING IN THE CENTRAL NERVOUS SYSTEM **Scientific Report No. 1**

Frank R. Ervin 23 Jul. 1965 26 p refs

(Contract AF 19(628)-408)

(AFCRL-65-580; AD-621277) CFSTI: HC $2.00/MF $0.50

A system of automatic receptive field mapping for visual cortical neurons by a digital computer. It consists of (1) stimulus display by a digital CRT, simultaneous data sampling and on-line data processing into a post-stimulus time histogram and an averaged evoked potential, and (2) offline readout of numerical values and tabulation. Several problems lying between the neurophysiological or statistical nature of the response and data processing techniques are also described and discussed. Author (TAB)

N66-15435*# Naval School of Aviation Medicine, Pensacola, Fla.

THE EFFECTS OF VISUAL DEPRIVATION ON ADAPTATION TO A ROTATING ENVIRONMENT

Robert S. Kennedy, Gilbert C. Tolhurst, and Ashton Graybiel 18 Mar. 1965 43 p refs *Its* Rept.-106

(NASA Order R-93)

(NASA-CR-69359; NSAM-918) CFSTI: HC $2.00/MF $0.50 CSCL 06S

Visual factors play a significant role in adapting to a rotating environment. The lack of visual information appears to minimize the symptomatology of vestibular sickness. In addition, performance during rotation, on tests of postural equilibrium, is at least as good and improvement is probably more rapid in an individual who is visually deprived. Reduction in the magnitude of the Coriolis illusion as a function of time under rotation occurs whether vision is permitted or denied, but is more variable in the latter condition. In addition, the post-adaptation Coriolis illusion was absent following the no-vision rotation condition. It was evident, however, when visual information was available during rotation; and this might indicate that adaptation which occurred with vision was "deeper." Contiguous (four days or less) duration exposures show evidence that adaptation is more easily attained on the second exposure, thus indicating a transfer of training. Little, if any, transfer appears when exposures are 30 days apart. Author

N66-15456 Joint Publications Research Service, Washington, D. C.

AGROMETEOROLOGICAL INDICES OF FLAX-FIBER GROWTH

L. V. Andrianova *In its* Soviet Studies in Meteorol. and Hydrol. 21 Dec. 1965 p 47–54 refs (See N66-15451 06-13) CFSTI: $3.00

The biological characteristics of flax fiber are summarized, and the influence of such meteorological factors as temperature, soil, and air moisture on the yield and quality of the fiber is discussed. Tabulated data show the difference in the development of the morphological indices of the stem as a function of different agrometeorological conditions during the critical period. Details are also given on various field experiments. Findings indicate (1) the importance of moisture reserves in the soil; (2) the relationship between the duration of the sprouting–flowering period and meteorological conditions; and (3) the dependence of plant height on moisture supply in the tilled soil layer. M.G.J.

N66-15465# Joint Publications Research Service, Washington, D. C.

A BIOLOGY OF ACTIVITY: THE ROLE OF CYBERNETICS IN BIOLOGY

N. A. Bernshteyn 29 Dec. 1965 30 p refs Transl. into ENGLISH from Vopr. Filosofii (Moscow), no. 10, 1965 p 65–78

(JPRS-33518; TT-65-34092) CFSTI: $2.00

The rapidly changing viewpoints and the many developments in the area of the biological sciences are discussed in conjunction with the need to reexamine and reinterpret older methodologies and concepts. The classical reflex theory is reviewed, and the relationships of the whole and part in the development and behavior of the organism is considered. The research problems directly connected with the study and mathematical modeling of the basic categories of physiological variables, and their participation and interaction in the control of vital activities, are analyzed. The conclusion was drawn that in mathematizing the biological sciences, acclimatization or addition of mathematics to biology should not be superimposed from the outside; rather, new biological methods of mathematics should be cultivated from the inside, based on the problems posed by the sciences dealing with life. M.G.J.

N66-15472# Defence Research Medical Labs., Toronto (Ontario).

A TABLE OF d' FOR A MODEL OF THE UNFORCED CHOICE EXPERIMENT

M. M. Taylor and W. C. G. Fraser Jun. 1965 32 p refs

(DRML-534) CFSTI: HC $2.00/MF $0.50

A table of d' is presented for a model of an intermediate condition, in which the observer must decide if a signal was actually presented in one of two intervals. Three responses are available: interval 1, interval 2, and no decision. Two different models of observer behavior appropriate to the unforced choice experiment are described, and the derivation of the likelihood ratio distributions in each detection theory is summarized. The values of d' are given for the unbiased model in terms of the proportions of all correct and wrong responses to intervals in which a signal is presented. Only positive decisions that the signal was in the first or second interval are counted as correct or wrong. No decision responses are included in the total from which the proportions are derived, but are not counted as either correct or wrong. The numerical computations and the use of the table are described. Also included are a 7090 Fortran program for computing d' and criterion levels for arbitrary values of P (wrong) and P (no decision), and for arbitrary values of the standard deviations in the two dimensions; and a subroutine for computing a table of d' with constant values of the standard deviations and arbitrary constant steps in probability. M.G.J.

N66-15474# Joint Publications Research Service, Washington, D. C.
REGULATIONS ON RADIATION SAFETY DURING GAMMA RAY DEFECTOSCOPY
28 Dec. 1965 29 p Transl. into ENGLISH from Durzhaven Vestn. (Sofia), no. 95, 3 Dec. 1965 p 1-7
(JPRS-33502; TT-65-34076) CFSTI: $1.00

The regulations governing the design, production, and use of all types of gamma defectoscopes in Bulgaria are defined. These cover the requirements for (1) the design of new laboratories, and the rebuilding of existing ones; (2) the location of the laboratory, and the construction of the rooms; (3) mobile defectoscope operations in open areas, general shops, etc., where the work areas must be protected; (4) protection against gamma radiation in the laboratory; including recommendations for safety norms and dosimetric control; (5) general requirements and basic regulations for safety techniques during operation; (6) medical control of personnel; and (6) administrative responsibilities and penalties. Data are also included on radioactive isotopes used in gamma defectoscopy, and on the distances at which the dose power drops down to 0.1 m/hr when the beam is directed vertically downwards. M.G.J.

N66-15509# BioTechnology, Inc., Arlington, Va.
THE TRANSLATION OF VISUAL INFORMATION INTO VEHICULAR CONTROL ACTIONS
Raymond E. Reilly, Robert R. Gilbert, Richard F. Dillon, and James F. Parker, Jr. Oct. 1965 64 p refs Sponsored by Va. Dept. of Highways
(BTI-65-2)

The use of visual information from a land vehicle taillight system is studied in relation to specific vehicular control actions by the driver. Particular attention is given to the angular velocity cue provided by the increase in vehicle visual angle provided by the two tail lights as the driver approaches the rear of a vehicle. It appears that a driver uses both the angular velocity cue as well as the speed of his own vehicle in making the decision to stop. Other cues appear to give important perceptual information, although individuals operate within the entirety of the visual environment rather than from separate cues. It is concluded that all the visual information available to a driver is used in a highly systematic manner to effect control actions. Specific characteristics of tail-light systems were found to have a significant effect on braking behavior, and a system with large, bright lights separated by 60 inches consistently produces better braking responses from drivers. M.W.R.

N66-15512# Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg (West Germany). Institut für Flugmedizin.
PAPERS OF DVL-INSTITUTE FOR AEROMEDICINE AT VIth INTERNATIONAL AND XIIth EUROPEAN CONGRESS OF AVIATION AND SPACE MEDICINE IN ROME 1963 AND XIIth INTERNATIONAL CONGRESS OF AVIATION AND SPACE MEDICINE IN DUBLIN 1964 [VORTRAGE AUS DEM INSTITUT FUR FLUGMEDIZIN GEHALTEN AUF DEM VI. INTERNATIONALEN UND XII. EUROPPAISCHEN KONGRESS FUR LUFT- UND RAUMFAHRT MEDIZIN IN ROM 1963 UND DEM XIII. INTERNATIONALEN KONGRESS FUR LUFT- UND RAUMFAHRTMEDIZIN IN DUBLIN 1964]
W. Briegleb Sep. 1965 48 p refs In GERMAN; ENGLISH and FRENCH Summaries
(DLR-FB-65-40; DVL-431) CFSTI: HC $2.00/MF $0.50

This report includes 7 papers presented by members of the DVL-Institute for Aeromedicine at the VIth International and XIIth European Congress of Aviation and Space Medicine 1963 in Rome and at the XIIIth International Congress of Aviation and Space Medicine 1964 in Dublin. The different subjects of the papers are: therapy against decompression sickness, adaptation to an "unspecific stress", the mechanism of the serous stress reaction, the biochemical primary effects in radiation damage, clinical picture of the shifted diurnal rhythm during jet flights, explosion and decompression injuries, and the influence of weightlessness on cell function. Author

N66-15552# Manitoba Univ., Winnipeg. Dept. of Psychology.
BIBLIOGRAPHY OF STUDIES ON SENSORY DEPRIVATION AND RELATED CONDITIONS
John P. Zubek, Doris Dobbs, and Louis Bayer [1965] 31 p refs
(Grant NIH G-MH-08748-01) CFSTI: HC $2.00/MF $0.50

A bibliography is presented on studies on sensory deprivation and related conditions. References are included on perceptual deprivation, sensory isolation, sensory invariance, stimulus deprivation, patterned stimulation, confinement, social isolation, monotony, effects of early experiences in humans and animals, and brainwashing. R.N.A.

N66-15579*# Baylor Univ., Houston, Tex. College of Medicine.
AUDITORY MASKING: A STUDY OF ITS PHYSIOLOGICAL MECHANISM AND OF CORRELATIONS BETWEEN PHYSIOLOGICAL AND PSYCHOLOGICAL OBSERVATIONS
First Quarterly Progress Report, Period Ending 30 Jun. 1965
Peter Kellaway and A. C. Coats [1965] 20 p
(Grant NsG-390)
(NASA-CR-69426) CFSTI: HC $1.00/MF $0.50 CSCL 05J

Psychological data in the following areas was accumulated: the time course of recovery of masked click threshold following cutoff of the masking stimulus, the effect of masking duration, and the effect of masking intensity. Results in these areas and the observed similarities and differences with comparable physiological observations are discussed. Also, control experiments to determine the effect of a warning flash on the recovery click threshold are discussed. Further physiological studies include masked and unmasked click input-output curves and the effect of masking intensity utilizing white noise instead of pure tones. Author

N66-15580*# Naval School of Aviation Medicine, Pensacola, Fla.
VISUAL LOCALIZATION OF THE HORIZONTAL AS A FUNCTION OF BODY TILT UP TO ±90° FROM GRAVITATIONAL VERTICAL

Earl F. Miller, II, Alfred R. Fregly, Gert van den Brink, and Ashton Graybiel 3 Aug. 1965 25 p refs *Its* Rept.-118 (NASA Order R-47)
(NASA-CR-69927) CFSTI: HC $2.00/MF $0.75 CSCL 06S

The visual horizontal was determined for three sophisticated subjects tilted laterally in 10° intervals within ±90° from gravitational vertical. The task had adequate intratest reliability, but there were considerable intertest and intrasubject quantitative variations. Visual localization as a function of body tilt, however, was qualitatively similar among all subjects and among the thirteen test sessions of each subject. Around upright there was a range (totaling 20°–40° on the average) of body positions in which the deviation was not significant from that of upright. Inclinations beyond this range caused the E-phenomenon to appear and increase bilaterally up to a maximum of about the 40°–50° position; with further inclination the deviation reversed direction and passed through the position (60°–80°) of zero deviation to grow as the A-phenomenon. Responses were bilaterally symmetrical in certain respects for each of the subjects. The variable error among all subjects followed a similar (curvilinear) function of body attitude. Repetition of the test without immediate knowledge of results did not as a rule end in reduction of errors. Author

N66-15635*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE HUMAN PARAMETER IN SPACE FLIGHT A State-of-the-Art Review
Mitchell R. Sharpe, Jr. 19 Jul. 1963 67 p refs
(NASA-TM-X-57119; MTP-M-MS-IS-63-1) CFSTI: HC $3.00/MF $0.75 CSCL 06S

The role of man as an integral part of a spacecraft is discussed from the viewpoint of his physiology and the ambient space environment. The deleterious effects of this environment upon him and the measures necessary to keep him alive in it are also reviewed. The known as well as the unknown hazards are treated briefly. An appendix summarizes the cyborg concept, which is often proposed as an alternative to human space travel. Author

N66-15655# Aerojet-General Corp., Dayton, Ohio. Life Support Systems Div.
TOXIC HAZARDS RESEARCH UNIT—DESIGN AND CONSTRUCTION PHASE
J. D. MacEwen Wright-Patterson AFB, Ohio, AMRL, Sep. 1965 111 p *Its* Rept.-3024
(Contract AF 33(657)-11305)
(AMRL-TR-65-125; AD-624473) CFSTI: HC $4.00/MF $0.75

A facility was designed and constructed at Wright-Patterson Air Force Base for the specific purpose of conducting inhalation toxicology research. This facility is unique in that it has considerable functional variability and may be used for the study of space cabin toxicity under altitude and 100% oxygen conditions. Additionally, the laboratory was designed for use as a standard inhalation toxicology laboratory for the study of Air Force materials which may constitute a hazard to ground support personnel. This report describes the design and functional capability of the toxic hazards research unit laboratory which became operational in September of 1964. Toxicology research of the nature described has been initiated and will be reported upon as individual experiments are completed. Author (TAB)

N66-15668# Technological Lab. RVO-TNO, Rijswijk (Netherlands).
TYPE K GASMASK FOR USE WITH GLASSES [INZETMONTUUR VOOR GASMASKER K]
E. W. Lindeijer 6 Sept. 1965 20 p In DUTCH
(TL/1965/18; TDCK-43436) CFSTI: HC $1.00/MF $0.50

Details are given on a glass frame attachment for use with the type K gas mask. The device was developed to facilitate the use of gas masks by persons who wear glasses, and to prevent steaming of the glasses while wearing the mask. The optical requirements are outlined, and the structural changes involving the ring attachment, the rim, and the closures are described. Schematics show the design. Among the advantages cited are the ease with which the frames can be put on, and the elimination of the steaming problem through use of a specially treated ultra-clear material. Transl. by J.O.

N66-15672# Brussels Univ. (Belgium).
RESEARCH INTO NEW MEANS OF DIAGNOSIS AND TREATMENT BY METHODS DERIVED FROM NUCLEAR TECHNIQUES [RECHERCHE DE NOUVEAUX MOYENS DE DIAGNOSTIC ET DE TRAITEMENT A L'AIDE DE METHODES DERIVEES DE TECHNIQUES NUCLEAIRES] Annual Report
1965 53 p refs In FRENCH and ITALIAN; ENGLISH summary Prepared jointly with Pisa Univ.
(EURATOM-026-63-4 BIAC)
(EUR-2414.f,i) CFSTI: HC $3.00/MF $0.50

The first results obtained from this research include the planning and final work on: (1) analog models of the metabolism of phospholipides and proteins; (2) a clinical absorption test on I^{125} and I^{131} labelled fats; (3) external measuring renal excretion with I^{125} hippurane; (4) measurement of coronary flow using external and internal counting (Rb_{85}, Kr_{87}); (5) Measuring cerebral circulation (Kr_{85}); (6) detection of cancers and cancerous metastases by external counting (I^{131} fibrinogen); (7) measuring *in vitro* glucosated catabolism (C_{14} glucose); (8) methods for dosing erythropoietin, insulin and thyreotropic hormone; (9) double labelling with I^{125} and I^{131} and isotopic equilibrium in the diagnosis of thyroid disorders; and (10) neutron activation dosing of urinary, plasmatic, and thyroidal iodine and tissue ions in muscular biopsies. Author

N66-15718# MSA Research Corp., Callery, Pa.
POTASSIUM SUPEROXIDE ATMOSPHERE CONTROL UNIT Final Report, Mar.–Dec. 1964
M. J. Mc Goff Wright-Patterson AFB, Ohio, AMRL, Sep. 1965 54 p
(Contract AF 33(615)-1518)
(MSAR-64-123; AMRL-TR-65-44; AD-624556) CFSTI: HC $3.00/MF $0.50

Superoxides were used in a new approach to atmosphere control systems for aerospace flight. This approach offers the control of dynamic systems and the low power requirement of passive systems. This technique can be adapted to unusual geometries with low weight and volume requirements. Potassium superoxide discs comprise the bulk of this new unit serving as a structural self-support and yet offering adequate carbon dioxide absorption and oxygen evolution. The discs are 3.77 in. in diameter × 3/16 in. thick and have a 7/8 in. diameter center hole. They are placed in a cylindrical aluminum housing with a 0.080 in. clearance between the shell and discs. The discs are separated from each other by integrally molded 1/16 in. protrusions. A one-man version of the unit for 24 hour service weighs 12 pounds, requires 17 watts power continuously, is 32 in. long × 4 in. in diameter and contains 110 discs. The disc configuration permits both radial and axial circulation at a throughput of 9 CFM and 1.6 in. of water. Tests with a one-man simulator in a 130 cu ft compartment showed adequate oxygen delivery and control at less than 1% carbon dioxide. Author (TAB)

N66-15734# National Defense Research Organization T.N.O., The Hague (Netherlands). Medical Biological Lab.
CONTINUED IMMUNOLOGICAL TOLERANCE IN MICE, INDEPENDENT OF ANTIGEN EXCESS
O. B. Zaalberg and V. A. van der Meul 1965 40 p refs Sponsored by EURATOM
(MBL/1965/24; TDCK-43736) CFSTI: HC $2.00/MF $0.50

The specific immunological tolerance of donor cells towards the host tissue antigens in allogeneic mouse irradiation chimeras was investigated. It has been shown that transfer of bone marrow cells from these chimeras into irradiated mice of the original bone marrow-donor strain results in a loss of tolerance. However, transfer of spleen cells or bone marrow cells together with lymph node cells results in a prolonged state of tolerance towards the tissue antigens of the first host, as could be demonstrated with skin-grafts. These transfer experiments make it probable that for the maintenance of the tolerance within the lymphatic cell population no antigens are necessary. Mice inoculated with a tolerant lymphatic cell population sometimes lose tolerance, which is ascribed to a gradual replacement of the tolerant population by nontolerant cells originating from the transferred bone marrow. Thymectomy was therefore used as a method of preventing the transferred bone marrow from replacing the transferred tolerant population of lymphatic cells. Thymocytes were only effective to maintain the tolerant state when they were transplanted into thymectomized hosts. Author

N66-15739# Joint Publications Research Service, Washington, D. C.
STUDIES IN REACTIVITY OF THE CARDIOVASCULAR SYSTEM
S. V. Andreyev and Yu S. Chechulin 13 Jan. 1966 26 p Transl. into ENGLISH from the book "Ocherki po Reaktivnosty Serdechnososudistoy sistemy" Moscow, Publishing House "Meditsina", 1965 p 329-346 370-372
(JPRS-33717; TT-66-30161) CFSTI: $1.00

The factors affecting cardiovascular reactivity are discussed, based on data obtained from experiments and from a literature review of the subject. Particular attention is given to the phylo- and ontogenetic characteristics, and the influence of such factors as climate, pharmacological agents, body temperature, infectious processes, endocarditis, hypertension, and pathological conditions. Vascular reactivity in atherosclerosis, angina pectoris, and myocardial infraction are also considered. From the factual material surveyed, cardiovascular reactivity was tentatively defined as the main biological property of the cardiovascular system, consisting essentially of prompt and adequate change in cardiac activity, vasomoter activity, and vascular tone in response to influences from the social and biological environment. It was also pointed out that cardiovascular reactivity differs from variability and individual characteristics including hereditary ones. The recommendation was made that experimental investigations consider inadequate, distorted, and paradoxical reactions of the myocardium and blood vessels when using drugs and other therapeutic measures. M.G.J.

N66-15743# Joint Publications Research Service, Washington, D. C.
ON THE PREREQUISITES AND PARTICULAR FEATURES OF CONSCIOUSNESS
F. I. Georgiyev and G. F. Khrustov 6 Jan. 1966 16 p refs Transl. into ENGLISH from Vopr. Filosofii (Moscow), no. 10, 1965 p 14-21
(JPRS-33630; TT-66-30074) CFSTI: $1.00

The functional prerequisites for the development of consciousness are discussed, in relation to the factual material and the hypotheses offered as a result of experimental research. Data are given on several experiments conducted with chimpanzees to determine the development of higher forms of implement activity. It was concluded that this process led to the formation and retention in the psyche of the anthropoid of an object-information complex, or generalized and retained reflection of the basic parameters of the required implement. The difference between the object-information complex and the result of labor is discussed, and the fundamental distinction between the object-information complex and human expediency is delineated. Several theories on the anticipating function of consciousness are also examined, and a qualitative distinction between the intellectual activity of an animal and a man is made. M.G.J.

N66-15744# Joint Publications Research Service, Washington, D. C.
COMPLEX THERAPY OF ACUTE RADIATION SICKNESS
Ye. Ye. Chebotarev 30 Dec. 1965 101 p Transl. into ENGLISH of selected articles from the book "Kompleksnoye Lecheniye Ostroy Luchevoy Bolezni" Kiev Publishing House "Naukova Dumka", 1965 205 p
(JPRS-33552; TT-65-34126) CFSTI: $3.00

The effect of various therapeutic substances on the course and outcome of radiation sickness was studied, and details are given on the treatment complexes compiled to alleviate the seriousness of radiation injuries and thereby increase the survival rate of the experimental animals. Investigations centered mainly on the therapeutic properties of BK-8 blood substitute, bicillin-3, vitamin B-12, hemopoiesis stimulators such as batyl alcohol, penicillin, streptomycin, ascorbic acid, and vicasol. Results indicate that the most effective complex of therapeutic measures includes substances with a wide range of biological action and which are also less traumatizing to the irradiated organism. A complex consisting of the BK-8 blood substitute, vitamin B-12, batyl alcohol, and bicillin-3 met these requirements; experiments showed that over 50 percent of irradiated animals survived, and that their regenerative processes developed at an earlier stage. Investigations also showed the expediency of combining the suggested complex therapy with a chemical protection of the organism. M.G.J.

N66-15746# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).
REVIEW OF LITERATURE ON MILITARY MEDICINE [LITERATUUROVERZICHT, MILITAIRE GENEESKUNDE]
17 Jul. 1965 41 p In DUTCH and ENGLISH *Its* Vol. II, No. G-122
CFSTI: HC $2.00/MF $0.50

Abstracts on a wide variety of subjects are presented in a literature survey of military medicine. Subjects of the reviews include radiation exposure, dermatology, psychology and psychiatry, aviation medicine, internal medicine, surgery, pharmacology and toxicology, and new trends and devices. M.W.R.

N66-15750# Southwest Research Inst., San Antonio, Tex.
RESEARCH ON ANALYSIS OF AMINO ACIDS BY GAS CHROMATOGRAPHY
D. E. Johnson and T. Goodson Wright-Patterson AFB, Ohio, Sep. 1965 35 p refs
(Contract AF 33(615)-1823)
(AMRL-TR-65-148; AD-624469) CFSTI: HC $3.00/MF $0.50

A gas-liquid chromatographic procedure was developed for the analysis of the essential amino acids for man using the N-trifluoroacetyl methyl ester derivative. The procedure requires 2-1/2 hours for preparation of the sample and gas chromatographic resolution of all the common protein amino acids. The method was applied to the analysis of standard mixtures of amino acids, a protein hydrolyzate of ribonuclease and the free amino acids in human blood plasma. Author (TAB)

N66-15752# Naval Training Device Center, Port Washington, N. Y. Communications Div.
DETECTION IN A HOMOGENEOUS VISUAL FIELD UNDER A CONDITION OF INFINITE DEPTH
John F. Catalano and Milton S. Katz 19 Aug. 1965 15 p refs (NAVTRADEVCEN-IH-33; AD-624531) CFSTI: HC $1.00/MF $0.50

It has been proposed by Whiteside that in a homogeneous visual environment involuntary accommodation results in a myopic condition which impairs target detection. A means of overcoming this myopia by approximating a condition of infinite depth of focus with the use of an artificial pupil was studied. No improvement of target detection resulted from this procedure. Author (TAB)

N66-15760* System Research, Ltd., Richmond (England).
A STUDY OF GROUP DECISION MAKING AND COMMUNICATION PATTERNS UNDER CONDITIONS OF STRESS AND OVERLOAD, WHEN THE PARTICIPANTS ARE PERMITTED TO FUNCTION AS A SELF-ORGANISING SYSTEM Quarterly Technical Status Report, 1 Apr.–30 Jun. 1965
[1965] 5 p
(Contract DA-91-591-EUC-3607)
(QTSR-2; AD-624597) CFSTI: HC $1.00/MF $0.50

Individual adaptive subsystems (as assigned to each of two participants) were provided to maintain optimum performance conditions for the participants concerned. An overall control system was provided to adjust the parameters of each of the subsystems to optimize group performance. The participants are continuously engaged in the conjoint skill of detecting and intercepting one of eight different trajectories. Experimental work is summarized. TAB

N66-15776*# Aeronutronic, Newport Beach, Calif.
EXPERIMENTAL STUDIES FOR THE DETECTION OF PROTEIN IN TRACE AMOUNTS Final Report
E. R. Walwick and B. R. Zalite 28 Jan. 1966 90 p refs
(Contract NASw-770)
(NASA-CR-69551; U-3427) CFSTI: HC $3.00/MF $0.75 CSCL 06A

Further research is presented on a program to demonstrate the utility of the dye, 4,5,4',5'-dibenzo-3,3'-diethyl-9-methylthiacarbocyanine, for the detection of biological macromolecules. Analysis of stoichiometry studies on the reaction of the dye with various macromolecules were carried out and they indicate that for optimal reaction a one to one ratio of dye to anion site on the polymer is generally required to form the various complex states. These states correspond roughly with spectral band maxima at 570, 535, 510, 650 and 470 mμ. Titration of materials giving a J-band (650 mμ peak) indicated that this state arises through reaction of individual dye molecules with particular sites as a function of dye configuration and conformation to the site rather than being due to dye-dye interaction in a very large aggregate of dye molecules as previously supposed. Results from reaction of the dye with soil extracts are presented. Inorganic ions and aluminosilicate minerals which might interfere with the dye reaction were investigated and procedures were developed to circumvent interference. This involved the testing and selection of a soil processing procedure which permitted removal of the inorganic materials from, and retention of the humic acid by, the soil extract. Reaction of the dye with humic acid from soil was investigated by titration of the humic acid with the dye, and determination of functional groups by titration and chemical modification. Author

N66-15782# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
TWO-COMPONENT RADIATION EFFECT ON STRONTIUM^{85} ABSORPTION BY THE RAT ILEUM IN SITU [DE ABSORPTIE VAN STRONTIUM-85 NA BESTRALING DOOR RATTE ILEUM IN SITU]
C. Silber Marcus and O. Vos Oct. 1965 15 p refs
(MBL/1965/26; TDCK-43752) CFSTI: HC $1.00/MF $0.50

Male Wistar rats (150–180 grams) were exposed to 0, 695, 926, and 1158 r whole body X-irradiation and tested for changes in Sr^{85} absorption 1, 2, 3 and 4 days after irradiation by injecting a Sr^{85} solution into ligated ileal sacs *in situ* and recovering the unabsorbed dose 3 hours later. A two-component radiation effect was described. Two days after 695 r, the rats showed a significant decrease in absorption followed by a return to the control level within 2 more days. Three days after 926 r, there was a significant increase in Sr^{85} absorption; those that survived to 4 days showed a trend back to the control level. Three days after 1158 r there was a highly significant increase in absorption; no rats survived beyond 3 days. Y^{91}, which is not at all absorbed by the normal intestine, is also not absorbed by 695 r rats 2 days after irradiation or 1158 r rats 3 days after irradiation. Author

N66-15810*# Naval School of Aviation Medicine, Pensacola, Fla.
FACTORS CONTRIBUTING TO THE DELAY IN THE PERCEPTION OF THE OCULOGRAVIC ILLUSION
Brant Clark and Ashton Graybiel 13 Aug. 1965 23 p refs *Its* Rept.-120
(NASA Order R-93)
(NASA-CR-69562; NSAM-944) CFSTI: HC $1.00/MF $0.50 CSCL 05E

Five normal and eight labyrinthine defective men were studied in a Slow Rotation Room to observe the effects of factors which contribute to delay in change in perception of the horizontal following a change in direction of resultant force acting on a subject. Results showed very small effects of pre-exposure conditions prior to change in direction of resultant force. Delays in presentation of a luminous target following a change in resultant force and before settings to the visual horizontal occurred, however, produced major, systematic effects on the perception of the visual horizontal. Results are discussed in terms of the interaction of visual and gravitational cues in producing the lag effect. Author

N66-15827*# National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY Bibliography
Jan. 1966 96 p refs
(NASA-SP-7011(19)) CFSTI: HC $1.00/MF $0.75 CSCL 06E

Abstracts 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 are presented. References describing similar effects on biological organisms of lower order are also included. Related subjects such as sanitary problems, pharmacology, toxicology, safety, survival, life support systems, exobiology, and personnel factors receive appropriate attention. The abstracts were prepared by three contributing organizations, NASA, AIAA, and LC. E.E.B.

N66-15833# Educational Testing Service, Princeton, N. J.
THE ROLE OF COGNITIVE FACTORS IN THE RECOGNITION OF AMBIGUOUS VISUAL STIMULI

John R. Frederiksen Jul. 1965 52 p refs
(Contract NONR-1858(15); Grant NSF G-22889)
(RB-65-23; AD-473580)

The effect of five cognitive abilities on the recognition of out-of-focus pictures was investigated using a factor extension procedure which is sensitive to differences among the slides in the abilities they require for recognition. In addition to recognition point measures, the subjects received scores reflecting their rate of hypothesis formation during the early stages of blur. The results indicated that the pictures did not all require the same cognitive abilities for their recognition. Nevertheless, some general effects of the cognitive abilities on slide recognition, which were independent of the particular picture, were also noticed. It was found that the ability to visualize (to transform the image of a spatial pattern into other visual arrangements) was negatively associated with early slide recognition, while Speed of Closure (the ability to unify an apparently disparate perceptual field into a single percept) was positively related to early recognition. It was also observed that visualizers tended to make fewer guesses about the blurred pictures than did nonvisualizers, while people who were high in Speed of Closure produced many initial hypotheses. It was found that the chances of recognizing early were greater for subjects who had few initial ideas. Author (TAB)

N66-15857# Naval Research Lab., Washington, D. C.
HUMAN VS FILTER AS DATA EXTRAPOLATOR IN A TWO-COORDINATE, SAMPLED-DATA TRACKING SYSTEM
C. L. Tipton 14 Oct. 1965 12 p refs
(NRL-6323; AD-624494) CFSTI: HC $1.00/MF $0.50

The performance of human operators was compared with that of a singly augmented filter in the continuous determination of the present position of a constant rate target moving in two coordinates. Target position was indicated intermittently in low, medium, or high noise levels and at low, medium, or high data rates. In addition, the target was subjected to a 10, 20, or 60 degrees course change in each trial. The filter evidenced less average tracking error in 23 of the 27 combinations of conditions of data rate, noise level, and course change. In twelve of these instances the filter was significantly superior at p = .02 level. Also, the results indicated increased error in human and filter performance as a function of increasing noise levels and decreasing data rates. Relative to the further enhancement of data extrapolation, several avenues of investigation recommend themselves. An immediate possibility is the employment of filter networks as an aid to the human operator. A second avenue of investigation is the study of more sophisticated filter designs. This experiment employed a filter of fixed time constant and fixed augmentation. An optimum filter would be of an 'adaptive' type, automatically adjusting its time constant and augmentation as a function of noise and data rate. Author (TAB)

N66-15858# North American Aviation, Inc., Columbus, Ohio.
TIME, UNCERTAINTY, AND INCENTIVE VARIABLES IN COMPOSITE TASK PERFORMANCE
John B. Feallock, Harry P. Bahrick, and George N. Ornstein 30 Sep. 1965 42 p refs
(Contract Nonr-4480(00))
(NA65H-913; AD-624830) CFSTI: HC $2.00/MF $0.50

Within complex man–machine systems, individual operators are commonly required to perform two or more functions concurrently. This report describes two empirical evaluations of the effects of variables common to complex systems upon the performance of a composite task comprised of two serial tasks. The first study investigated the effects of signal rate, signal duration and signal onset predictability upon performance accuracy and latency. Accuracy scores were reliably decreased by increased signal rate and increased onset predictability, although signal duration produced no reliable differences. Latency scores were insensitive to all three independent variables. In the second study, two variables were evaluated for their effects upon the accuracy of performance on the individual channels. One variable was the redundancy of signals on the second channel; the other was the ratio of incentive pay for the first and second channels. Performance improved reliably with signal redundancy for only the channel whose signal redundancy was increased. Different ratios of incentive pay did not produce reliable differences in performance for either channel, although certain trends were noted. Author (TAB)

N66-15859# Frost Engineering Development Corp., Englewood, Colo.
PERSONNEL RESTRAINT AND SUPPORT SYSTEM DYNAMICS
Peter R. Payne Wright-Patterson AFB, Ohio, AMRL Oct. 1965 112 p refs
(Contract AF 33(657)-9514)
(AMRL-TR-65-127; AD-624487) CFSTI: HC $4.00/MF $0.75

Like any other complex dynamic system the human body responds in a complex way to acceleration inputs which vary rapidly with time. The need to avoid stresses large enough to cause injury to the body usually imposes limits on the permissible input acceleration. The restraint system interposed between a vehicle and its occupant can modify the physiological effects of a vehicle's acceleration–time history. This modification should be made as favorable as possible by minimizing the stresses generated in the vehicle's occupant. To determine optimum dynamic characteristics for the restraint system, its important characteristics, and those of the human body, need to be represented in terms of a mathematical or 'dynamic' model. Through suitable analysis, either mathematical or by means of a computer, those dynamic characteristics of the restraint system can be determined which will minimize the peak stresses developed in its human occupant. A general theory of suitable dynamic models is developed for this type of problem. Closed form solutions for a number of simple cases are presented. In addition a method is shown which permits development of simple dynamic models for the human body utilizing existing experimental data. Author (TAB)

N66-15865# Bell Helicopter Co., Fort Worth, Tex.
CONTACT ANALOG SIMULATOR EVALUATIONS: THE INFLUENCE OF SCREEN SIZE AND IMAGE FIELD OF VIEW
J. H. Emery and D. J. Dougherty Apr. 1965 33 p refs
(Contract Nonr-1670(00))
(D228-421-021; AD-624579) CFSTI: HC $2.00/MF $0.50

Measurement was made of the ability of four groups of pilots to perform a simulated rotary wing approach task under four display conditions of screen size and image field of view on the JANAIR contact analog vertical display. Two screen sizes tested were 6 inch square and 12 inch square. Measures of glideslope altitude, lateral track and airspeed control were recorded during the descent of the approach task. Flare overshoot, impact 'G' and final touchdown position were measured during the landing. Results indicate that image field of view did not differentially affect any of the six performance measures. Approach airspeed control was significantly better with the 12 inch square screen. Final touchdown position control was superior on the 6 inch square screen. None of the remaining performance measures were differentially affected by screen size. It was concluded that pilot subjects with no previous training on the contact analog

could adapt to the display condition that each was assigned, but it is recommended that a 1:1 relationship with the real world be used if intermittent VFR-IFR flight were in force or if it were desirable to superposition other information such as television or radar on the contact analog. Author (TAB)

N66-15893# Human Engineering Labs., Aberdeen Proving Ground, Md.
HUMAN FACTORS ENGINEERING DESIGN STANDARD FOR MISSILE SYSTEMS AND RELATED EQUIPMENT
Robert F. Chaillet Sep. 1965 254 p
(HEL-S-3-65; AD-623731) CFSTI: HC $6.00/MF $1.25

The purpose of the Standard is to provide human factors engineering design principles and detailed criteria. The design principles are expressed as general rules applicable during missile system research and development programs, or as essential items to be considered during design, to insure the incorporation of sound human factors engineering practices. The detailed criteria consist of dimensions, ranges, tolerances and other specific data. The range of acceptable dimensions and other factors may be rather large in some cases. TAB

N66-15914# United Kingdom Atomic Energy Authority, Harwell (England). Health Physics and Medical Div.
THE SLOW NEUTRON CALIBRATION OF FILM AND OTHER GAMMA DOSIMETERS
S. J. Boot and J. A. Dennis Aug. 1965 21 p refs
(AERE-R-4960) HMSO: 3s

The slow neutron calibration of a film dosimeter was determined for exposures in free air and on the surface of a tissue equivalent chest phantom. The slow neutron and gamma flux determinations associated with the film measurements are described in detail. Equations are derived from which neutron and gamma doses may be found from film densities and the errors involved are given. Slow neutron and gamma flux reflection caused by the phantom is discussed with reference to results of depth dose calculations. Author

N66-15995# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex. Biodynamics Branch.
MAXIMUM VOLUNTARY VENTILATION AFTER $+G_x$ INPACT IN HUMANS Interim Report, Feb. 1965
Peter G. Hanson Nov. 1965 18 p refs
(ARL-TR-65-22; AD-624626) CFSTI: HC $1.00/MF $0.50

Eighteen volunteer male subjects were exposed to $20+G_x$ impact on the Daisy Decelerator. Measurements of maximum voluntary ventilation (MVV) obtained 10 minutes prior to, immediately after, and 20 minutes after impact were compared with previously determined baseline MVV values. The results indicate that MVV performance is elevated immediately after impact. It is suggested that this response is related to subject anxiety with accompanying sympathicotonia. Author (TAB)

N66-15975*# Naval School of Aviation Medicine, Pensacola, Fla. Aerospace Medical Inst.
PRACTICAL AND THEORETICAL IMPLICATIONS BASED ON LONG-TERM FOLLOW-UP OF MENIERE'S PATIENTS TREATED WITH STREPTOMYCIN SULFATE
Ashton Graybiel, Harold F. Schuknecht, Alfred R. Fregly, Earl F. Miller, II, and Michael E. Mc Leod 25 Oct. 1965 30 p refs
Prepared in Cooperation with Mass. Gen. Hospital
(NASA Order R-93)
(NASA-CR-69658; NAMI-948) CFSTI: HC $2.00/MF $0.50
CSCL 06E

Four patients who had received streptomycin sulfate in the treatment of Ménière's disease were evaluated in terms of the long-range effects of therapy and utilized as experimental subjects. The findings are reported in terms of a lack of return of their symptoms, and the effect of the drug on hearing, the semicircular canals, otolith organs, ataxia, and the Coriolis aculogyral illusion. An attempt was made to interpret the findings in terms of the etiology of idiopathic Ménière's disease, and the suggestion is made that it might represent a disturbance attributable to the secretary cells of the crista. Author

N66-15983*# Naval School of Aviation Medicine, Pensacola, Fla.
THE DIAL TEST: A STANDARDIZED PROCEDURE FOR THE EXPERIMENTAL PRODUCTION OF CANAL SICKNESS SYMPTOMATOLOGY IN A ROTATING ENVIRONMENT
Robert S. Kennedy and Ashton Graybiel 10 Jun. 1965 33 p refs
(NASA Order R-93)
(NASA-CR-69664; NSAM-930) CFSTI: HC $2.00/MF $0.50
CSCL 06S

Part 1 describes a developmental study to identify an optimum dial test procedure and the results of using the procedure on three groups with differing aviation experience. The problem was to determine that combination of rotational velocity of a slow rotation room, time between dial settings, and number of sequences to be performed which would yield the best measure of susceptibility to motion sickness. Parts 2 and 3 report the correlations between dial test scores and the modified Romberg and the coriolis illusion, and with scores from a motion sickness questionnaire. Modified Romberg scores had a small but significant relationship with dial test scores for the incoming flight student group, and this relationship was almost significant for the proficiency billet aviator group. Coriolis illusion scores were not significantly related to dial test scores but were in the predicted direction. Statistically significant relationships were obtained between dial test score and scores from two keys to the motion sickness questionnaire; these need cross-validation, however. Author

N66-16015# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
THE ELECTRORETINOGRAPHIC RESPONSE TO WEAK STIMULI OF LARGE SUBTENSE
N. M. J. Schweitzer and A. Troelstra [1965] 22 p
(IZF-1965-15; TDCK-43437) CFSTI: HC $1.00/MF $0.50

If a stimulus of large subtense and low intensity, e.g. 100 times above the absolute visual threshold, is presented to the dark adapted eye, the resulting ERG-response shows several fast positive components, followed by a slow negative deflection. The number of the positive components depends mainly on the duration of the flash. The first component is hardly affected by changes in the intensity of the flash; the second and following ones show, within the intensity range studied, a linear dependency and the latter therefore determine the amplitude and shape of what is called the normal scotopic b-wave. This linearity also accounts for the excellent responses one can obtain at intensity levels very near the differential visual threshold. Apart from the way light adaptation affects the several components we have also devoted attention to the response on a dark flash and to the influence exerted by dark adaptation and the subtense of the stimulus field. Author

N66-16016# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
DIGITAL COMPUTATIONS OF TEMPERATURE IN RETINAL BURN PROBLEMS

J. J. Vos [1963] 24 p refs
(Grant NIH FR-00016-02)
(IZF-1965-16; TDCK-43438) CFSTI: HC $1.00/MF $0.50

A simple method is described to compute intraretinal temperatures during and after irradiation with light. Some data obtained are presented in graphical form. The data are meant to be used as a quantitative basis to analyze and understand results obtained in retinal burn studies. Author

N66-16020*# Stanford Univ., Calif. Instrumentation Research Lab.

FLUORMETRIC ASSAY FOR NUCLEASE ACTIVITY

Vincent L. Stevens 26 Jul. 1965 15 p refs
(Grant NsG-81-60)
(NASA-CR-69662; IRL-1029) CFSTI: HC $1.00/MF $0.50 CSCL 06A

Consideration is given to the preparation of substrates for deoxyribon-nuclease (DNASE) assay, which permits the use of sensitive fluorescent techniques. The proposed procedure is to label the heterocyclic portion of DNA (the preferred substrate of DNASE) with a fluorescent species. As a result of enzyme action low molecular weight fluorescent products are formed. These can be made to pass through a semipermeable membrane and are then readily detected by fluorometry. Because of its high quantum yield of fluorescence, derivatives of fluorescein and related compounds were used as reagents to label DNA; in particular, fluorescein isothiocyanate was used for the preparation of fluorescent protein derivatives. Preliminary experiments with this compound showed that the amino and hydroxyl groups of DNA are hard to label with this reagent and yields were found to be extremely low. Sulfonyl chlorides do, however, react with weakly basic amino groups to form sulfonamides, and relative to this model condensations of napthalene-sulphonyl chloride with adenine were carried out, and yields were shown to be excellent. C.T.C.

N66-16028# Naval School of Aviation Medicine, Pensacola, Fla.

A STUDY OF SOME DETERMINERS OF PSYCHOLOGICAL STRESS

Robert J. Wherry, Jr. and Patrick M. Curran Jul. 1965 43 p refs
(NSAM-941; AD-624450) CFSTI: HC $2.00/MF $0.50

The study utilizes a four-choice discrimination task and various levels of electric shock to investigate possible determiners of anticipatory stress, and individual differences in performance decrements resulting from such stress. In general, disruption increases as the threatening event comes closer, as the perceived probability of its occurrence becomes greater, and as the perceived degree of unpleasantness is increased. Whether or not the anticipated unpleasant event really occurred in previous exposures influences behavior in subsequent exposures. There are several indications that anticipatory physical threat stress has a curvilinear relationship to performance, with low amounts of threat enhancing performance. There were wide individual differences in susceptibility to performance disruption by threat. Author (TAB)

N66-16037# Joint Publications Research Service, Washington, D. C.

NOMOGRAMS FOR DETERMINING THE HEIGHT-WEIGHT-CIRCUMFERENCE RELATION IN HUMAN SUBJECTS

D. A. Zhdanov 11 Jan. 1966 19 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. i Embriol. (Leningrad), no. 10, Oct. 1965 p 33–42
(JPRS-33694; TT-66-30138) CFSTI: $1.00

The dimensions of body weight, standing weight, chest circumference, and the distance from the suprasternal point to the pubic point were measured in over two thousand male and female subjects for the purpose of preparing nomograms for determining body weight on the basis of body length and chest circumference. The nomograms are shown. The subjects were either manual or office workers, and ranged in age from 21 to 65. The data were processed by the variational–statistical method, and the form of equations used for computing the statistical parameters is specified. The results of the measurements were grouped on the basis of 5-year age categories, and the number of observations for each age interval was not less than 100. Observations on the relationship of body weight changes with age to the occurrence of health problems (such as heart damage) are noted; and recommendations on the use of the nomographs and accompanying tables by a general physician are made. Several case history examples are discussed. L.S.

N66-16046*# Beckman Instruments, Inc., Fullerton, Calif. Space Engineering Dept.

STUDY PROGRAM FOR BIOCHEMICAL MONITORING BY PAROTID SECRETION Final Report

[1964] 101 p refs
(Contract NAS2-2594)
(NASA-CR-69691) CFSTI: HC $4.00/MF $0.75 CSCL 06A

An investigation was conducted on monitoring biochemical changes in body fluids under varying conditions by parotid secretion. More than two thousand analyses were made on body fluid samples from 102 subjects of three distinct groups: normal, or general population; hospitalized patients; and a select group of marine pilots. The homogenous third group was subjected to a series of body function tests, with sampling of this group for the various chemical components done during exercise and post-exercise periods. It was found that simple body function tests rapidly elicited distinct changes in concentration of parotid components greatly in excess of those evidenced in other monitored body fluids. The potential use of parotid secretion as an indicator of physiological changes is clearly documented. A statistical comparison of mean concentrations of several components in parotid showed the marine control group to be separate from the normal and hospitalized populations. C.T.C.

N66-16065# Grumman Aircraft Engineering Corp., Bethpage, N. Y. Research Dept.

A STUDY OF THE MECHANICS OF HUMAN BALANCING FOR POTENTIAL APPLICATION TO THE CONTROL OF VEHICLES. PART I: INITIAL INVESTIGATION OF VERTICAL BALANCING IN EARTH GRAVITY

T. Keller, J. O'Hagan, and R. Weston Oct. 1965 30 p ref
(RM-299)

This is a report of progress in a continuing program of basic research into the mechanics of human balancing viewed as a closed loop dynamic process. The program is being conducted in conjunction with a NASA sponsored study of vehicular control using the human balancing reflex. Its ultimate objective is a general mathematical model of the balancing process. Initial work has been concerned with natural, fore-and-aft balancing on a simulated force-vector supported platform under conditions of earth gravity. Several kinds of experimentation and analysis procedures have been tried and a number of hypotheses concerning such items as the relative roles of vision and proprioception in the balancing process, the effect of body flexibility, and the response to disturbing inputs have been qualitatively tested, but only a small amount of data suitable for mathematical analysis has so far been collected. The following, tentative conclusions about the balancing process have been

drawn: (1) it is completely subconscious and varies little between people; (2) it is not significantly affected by body flexibility; (3) it has a short period and a long period component, essentially uncoupled and operating through different sensing mechanisms; and (4) its short period response is essentially a simple, damped sine wave. Author (TAB)

N66-16100# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
HUMAN PERFORMANCE DURING VIBRATION
Charles S. Harris and Richard W. Shoenberger Nov 1965 28 p refs Presented at Autonetics and ONR Joint Symp. on Visual and Display Problems of High Speed Low Altitude Flight, Anaheim, Calif., 3–5 Mar. 1964
(AMRL-Memo-P-73; AMRL-TR-65-204; AD-624196) CFSTI: HC $2.00/MF $0.50 CSCL 06B

The report discusses the experimental approaches to the study of human performance during vibration. In addition, the characteristics of mechanical bodily responses to vibration at different frequencies are discussed, and human performance studies of the effects of vibration are compared with recommended long time tolerance curves. Author (TAB)

N66-16106*# Naval School of Aviation Medicine, Pensacola, Fla.
THE ROLE OF THE VESTIBULAR ORGANS IN THE EXPLORATION OF SPACE
Washington, NASA, 1965 376 p refs Symp. held in Pensacola, Fla., 20–22 Jan. 1965 Sponsored by NASA
(NASA-SP-77) GPO: HC $2.25; CFSTI: MF $2.00 CSCL 06S

Symposium papers on the role of the vestibular organs, the semicircular canals, and otolith apparatus in space exploration are presented. For individual titles see N66-16107–N66-16137.

N66-16107* Zurich Univ. (Switzerland).
ULTRASTRUCTURAL STUDIES OF THE LABYRINTH IN SQUIRREL MONKEYS
Heinrich H. Spoendlin *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 7–22 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

The relationship of the vestibular sensory epithelia to the functional behavior of sensory receptors is investigated in squirrel monkeys. Direction specificity and asymmetric mode of action of the receptors is considered, and the polarization of the vestibular sensory hairs of the entire surface of the cristae and maculae in certain mammals is studied via phase contact microscopy. The reversed function pattern of horizontal and vertical cristae is related to a reversed morphological polarization of the sensory hairs. A direct relation between the arrangement of the kinocilia and sensory cell functions indicates the kinocilium to be an important structure for sensory cell stimulation. In the maculae the sensory hairs, although shorter, have the same structure; and the kinocilia are also uniformly polarized over wide areas. The enormous variety and large number of synaptic structures in the vestibular sensory epithelia of the squirrel monkey might be related to the functional importance of the gravity receptors for these animals for whom acrobatic skill is so important for survival. In some sensory cells, however, no synaptic structures are found, suggesting these structures are not of a permanent nature. M.W.R.

N66-16108* Naval School of Aviation Medicine, Pensacola, Fla.
FORM AND INNERVATION OF THE VESTIBULAR EPITHELIA
Harlow W. Ades and Hans Engström (Göteborg Univ.) *In its* The Role of the Vestibular Organs in the Exploration of Space 1965 p 23–41 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

The present study has shown that the vestibular sensory cells are of two basic types; however, cells are also found which are intermediate in form. These presumably represent stages of partial differentiation from the more primitive type II cell toward the type I. It has been clearly established that sensory cells of both types may be innervated by the same nerve fiber. It is apparent also that the pattern of innervation of vestibular sensory cells is much more complicated than has been believed hitherto. Finally, this study has shown that well defined "synaptic regions" can be found between the nerve calyx and the base of the type I sensory cell, and that these are very much like the supposed synaptic regions which are seen between the sparsely granulated type of nerve ending and the type II Sensory cells. Author

N66-16109* Naval School of Aviation Medicine, Pensacola, Fla.
AN EXPERIMENTAL APPROACH TO THE DYNAMICS OF THE VESTIBULAR MECHANISMS
Jorma I. Niven, W. Carroll Hixson, and Manning J. Correia *In its* The Role of the Vestibular Organs in the Exploration of Space 1965 p 43–56 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Prediction of vestibular response to nonphysiological static and dynamic acceleration stimuli of the space environment is based on the use of sinusoidal angular stimulus of variable frequency and magnitude and expressing the nystagmus transition response in electrical degrees. A mathematical formulation is given for the basic stimulus–response relationship between steady-state nystagmic eye velocity and periodic angular accelerations. Investigations are made of the performance characteristics of the semicircular canals in their transduction of angular accelerations, as well as linear accelerations and otolith organs. It is found that a strong highly systematic stimulus-bound horizontal nystagmus is produced by the periodic linear acceleration stimuli whether the subject's head is lightly constrained or rigidly fixed during linear oscillations. The precise responding mechanisms, whether otoliths or canals, cannot be identified. M.W.R.

N66-16110* Goodyear Aerospace Corp., Litchfield Park, Ariz.
THE "MATCH" OF THE SEMICIRCULAR CANALS TO THE DYNAMIC REQUIREMENTS OF VARIOUS SPECIES
Robert Mayne *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 57–67 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Concepts of frequency response and elementary information theory are used to match the semicircular canals to dynamic requirements of various species. It is suggested that five adjustable parameters be considered: the internal diameter of the canal, radius of its curvature, volume of the ampulla, stiffness of the cupula, and possibly the number of sensory cells in the cristae. The behavior of the semicircular canals is considered in terms of the upper and lower ranges of tha frequency band and the resolution possessed by physiological sensors. It is pointed out that the large canals of fish, as compared to mammals is one of the best illustrations of the match of these sensors to biological systems and efficient design and economy in configurations of nature. M.W.R.

N66-16111* National Aeromedical Center, Soesterberg (Netherlands).

THE MODULATING INFLUENCE OF THE OTOLITH ORGANS ON SEMICIRCULAR CANAL FUNCTIONS

Martin P. Lansberg *In* NSAM The role of the Vestibular Organs in the Exploration of Space 1965 p 69–75 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Experiments on a slow rotation platform reveal that magnitude and direction of nystagmus varies with the subject's heading in cases where orientation of the canal system relative to the plane of rotation remains unchanged. When the subject is heading forward, nystagmus is strong and a long duration; when heading backward, nystagmus does not reach the anticipated magnitude, lasts for a shorter period than expected, and gradually changes plane and direction. This implies that the otoliths can modulate an ampullar signal and perhaps have both a nystagmuss modifying and generating power. M.W.R.

N66-16112* State Univ. of Iowa, Iowa City. College of Medicine.

INFLUENCE OF THE OTOLITHS ON THE DURATION OF POST-CALORIC NYSTAGMUS

Bosko Milojevic *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 77–84 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

The otolith system of 22 adult cats, with normal response on caloric stimulation, was stimulated on the fronto–occipital axis at 45 and 135° angles. Since nystagmus duration increases when the otoliths provoke stronger stimuli on the otolith membrane, it is suggested that the otolith system has a controlling regulatory mechanism over post-caloric duration of nystagmus through central parkways. A table and graphs summarize nystagmus duration and maximum slow and fast phase velocities for both ears in 11 cats. M.W.R.

N66-16113* Army Medical Research Lab., Fort Knox, Ky.

RESPONSE OF SINGLE CELLS IN CAT BRAIN STEM TO ANGULAR ACCELERATION IN THE HORIZONTAL PLANE

George H. Crampton *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 85–96 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Single units within the brain stem of deeply anesthetized cats were observed for long periods during which the animal was repeatedly subjected to long duration angular accelerations. The head was centered over the vertical axis of rotation and the horizontal stereotaxic plane of the head was parallel to the plane of rotation. Observations were made of adaptation, habituation, and forms of response discharge. Electrode tip locations were confirmed histologically. No regular evidence for a reduction in discharge rate could be found (1) during the application of a long angular acceleration or (2) from acceleration to acceleration. There are indications of changes in patterning of the discharge with repeated stimulation which may reflect habituation. A new form of response is described which appears to act as a binary switch, in that it holds a discharge rate for long periods after a stimulation, and is turned on and off by alternating negative and positive angular accelerations. Author

N66-16114* Naval School of Aviation Medicine, Pensacola, Fla.

A NEW QUANTITATIVE ATAXIA TEST BATTERY

Ashton Graybiel and Alfred R. Fregly *In its* The Role of the Vestibular Organs in the Exploration of Space 1965 p 99–119 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

A new multidimensional quantitative ataxia test battery employing the "rail method" of testing was developed to assess more precisely than heretofore postural equilibrium–disequilibrium under unusual conditions and stresses such as rotating environments. High reliability, including test-retest reliability, was demonstrated for each of two versions: a long version employing six rails of varying widths, and a short version employing two of these rails. Normative standards covering a wide age range; and age, height, and weight influences upon performance; tentative sex differences in performance, practice effects; and test battery relationships with several clinical-type ataxia tests were determined. Validity of the standardized test procedures in the laboratory, in the field and in clinical situations was demonstrated, present and future uses of the test battery in normals and auricular-involved individuals in vestibular research as well as in related research-clinical areas were outlined, and several methodological limitations were indicated. Author

N66-16115* Naval School of Aviation Medicine, Pensacola, Fla.

OTOLITH FUNCTION AS MEASURED BY OCULAR COUNTERROLLING

Earl F. Miller, II and Ashton Graybiel *In its* The Role of the Vestibular Organs in the Exploration of Space 1965 p 121–131 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

This report summarizes the results of several studies in which the effect upon otolith activity of change in magnitude or direction of the gravitoinertial force was determined in man by measuring the particular vestibulo-ocular reflex of counterrolling. In these studies hypergravic forces were generated by means of centrifugation while periods of partial or complete weightlessness were produced by ballistic flights in specially equipped aircraft. Since the available periods of reduced gravity were relatively short, the rapid adjustment in counterrolling position in response to the acting gravitational stimulus made this index of otolith activity particularly well-suited for study. A photographic method developed for quantitatively studying counterrolling movement in normal and labyrinthine-defective subjects provided the accuracy required for measuring the extremely small response changes found under reduced G loading. The average data of several normal subjects indicated that the relationship between otolith activity and gravitational force expressed in $\log_{10}$ units was linear, i.e., obeyed Fechner's law, from approximately 0.6 G up to at least 1.0 G and probably beyond. Below 0.6 G the otolithic response began to deviate from linearity and asymptotically approached its zero level at some infinitely small G value. The possible application of these findings to manned space flights was outlined. Author

N66-16116* Rochester Univ., N. Y. Dept. of Psychology.

THE NATURE OF ADAPTATION TO OSCILLATORY ROTATION

G. Richard Wendt *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 133–139 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Experimental evidence is offered for a theory, proposed to explain habituation to rotation, which says that nystagmus was lost because it was replaced by a competing wandering-type eye movement system. Both electric and photographic recordings of eye movements are used; and the stimulation device is a horizontally rotating platform with the subjects seated at the center of rotation. Use of sinusoidal oscillation through 20° of the arc at 18 cycles/minute keeps the labyrinths under continuous stimulation to permit a continuous record of adaptation. The alternation of rotation direction shows that the habituation process results in compensatory opposite reaction.

During habituation the fast phases increase in frequency; the onset and cessation of each fast phase is exactly synchronous in both eyes, and eventually becomes a wandering movement. It is speculated that as the subject is repeatedly exposed to the same pattern of oscillation or turning, a kind of learning takes place. During periods when no vestibular or visual stimuli are present in the relaxed subject, the eyes wander irregularly and no longer have a fixed position. M.W.R.

N66-16117* Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.

REPEATED CALORIC STIMULATION OF THE HUMAN LABYRINTH AND THE QUESTION OF VESTIBULAR HABITUATION

William E. Collins *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 141–150 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Forty unilateral caloric irrigations were administered in a habituation series to each of two groups of subjects. One group was tested in total darkness. The second group was stimulated in illumination and actively attempted to control and suppress their eye movements by means of visual fixation. Pre- and post-tests were administered (always in total darkness) in which both directions of response were elicited. In all cases, tasks were assigned to subjects to maintain alertness. The nystagmic reaction was altered as a result of the habituation series, but the change was different for the two groups. After one month of rest, there was no apparent recovery of the response toward the pretest level for either group. Subjective reactions declined in intensity for the two groups, but showed recovery after a 1-month rest period. Author

N66-16118* San Jose State Coll. Foundation, Calif.

SOME FACTORS CONTRIBUTING TO THE DELAY IN THE PERCEPTION OF THE OCULOGRAVIC ILLUSION

Brant Clark and Ashton Graybiel (NSAM) *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 151–162 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

The purpose of the five experiments reported here was to study some variables which influence the lag in the perception of the oculogravic illusion following a change in the direction and magnitude of resultant force acting on the subject. All the observations were made with the subject facing the direction of rotation while he observed a collimated, luminous line. Five normal and nine labyrinthine defective men acted as subjects. The subjects' task was to set the luminous line to the apparent horizontal following different conditions of pre-exposure to a visual framwork, of different exposure to the luminous line, and for different periods of constant rotation of the room. The inertial-lag effect was found to occur in both normals and labyrinthine defective subjects, but the oculogravic illusion was significantly greater in the normal subjects for short periods of observation. Change in the perception of the horizontal continued systematically for the labyrinthine defective subjects for about 1 hour, at the end of each time the magnitude of the oculogravic illusion was not significantly different for the two groups. Pre-exposure to a visual field was found to be of little importance in producing the lag effect, but setting the line to horizontal during rotation does reduce the lag effect. The results are discussed in terms of Adaptation Level Theory. Author

N66-16119* McGill Univ., Montreal (Quebec). Aviation Medical Research.

THE VESTIBULAR CONTRIBUTION TO STABILIZATION OF THE RETINAL IMAGE

G. Melvill Jones *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 163–172 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

The vestibulo-ocular reflex system is examined in the context of an essential backup to the visual fixation reflex. The vestibular stimulus is seen as the output from an angular velocity transducing hydrodynamic system, feeding the central nervous system with angular velocity modulated information, provided the mechanical stimulus is confined within a specified frequency range. This general interpretation appears to apply over a wide range of different animal species. The central nervous angular velocity signal is envisaged as driving an angular velocity control system through the physiology of the oculo-motor system. It appears that the dynamic response of the vestibulo-ocular system improves as that of the visual tracking system fails, to the extent that the former operates with a gain of 1 at frequencies associated with failure of the latter. The overall system is apparently superimposed by a pattern of response which insures that compensating eye muscles are stretched on an average by an amount directly related to the compensatory eye angular velocity required for image stabilization at every instant. In addition, the system response is substantially dependent upon the axis of rotation referred to the head, in the sense that the rate of intrusion of errors attributable to cupular restoration is greater in the vertical than in the horizontal planes. Moreover, in the roll plane there appears to be relatively poor visual tracking, and this permits the virtually unopposed operation of the vestibulo-ocular reflex when the latter is at variance with the real event. Author

N66-16120* California Univ., Berkeley. Donner Lab.

RADIOSENSITIVITY OF THE VESTIBULAR APPARATUS OF THE RABBIT

Larry W. Mc Donald, Gerald A. King, and Cornelius A. Tobias *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 175–182 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

A method of radiating the inner ear of the rabbit with an alpha particle beam without significant exposure of the brain has been devised. Long lasting changes in semicircular canal function of the rabbit have been demonstrated with doses of 500 rads. The approaches to determine the threshold of radiosensitivity of the semicircular canal function and the radiosensitivity of the macula utriculi are described. Structural changes are discussed which may account for the functional alterations observed. Work being undertaken to study the structural changes is described. Author

N66-16121* Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

PRELIMINARY STUDIES OF VESTIBULAR DAMAGE IN GUINEA PIGS FOLLOWING HIGH ACCELERATION

Donald E. Parker, Henning E. von Gierke, and Walter P. Covell (Washington Univ., St. Louis, Mo.) *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 183–194 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Guinea pigs were exposed to high impact deceleration on a sled and short-duration acceleration on a centrifuge. Behavioral examination of swimming ability and the righting reflex revealed evidence of vestibular damage following exposure to peak acceleration in the range of 200 to 400 g for periods of 14–20 sec. Histological examination of the temporal bones demonstrated extensive structural damage for the same animals which exhibited behavioral deficiency. No evidence of behavioral damage has been observed following exposure to impact deceleration. Also, histological evidence of damage is considerably less following impact deceleration than short-duration centrifugation. Author

N66-16122* Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
DYNAMIC COUNTERROLLING OF THE EYE IN NORMAL SUBJECTS AND IN PERSONS WITH BILATERAL LABYRINTHINE DEFECTS
Robert S. Kellogg *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 195–202 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Measurements were made on both normal and bilaterally labyrinthine defective (L-D) subjects, at rotation rates from static to 15 rpm in both clockwise and counterclockwise directions. A modified F-104 ejection seat was bolted to the rear axle and differential assembly of a 2.5 ton truck; the seat was equipped with lap belt, shoulder harness, and various straps. A bite bar is held securely in the subject's mouth. Counterrolling responses were not exhibited by L-D subjects in either the static or dynamic condition. Amplitude of the curves is found to be inversely related to the rotation rates, and may be explained in terms of zero G tumbling effect which would tend toward less stimulation of the otolith as rotation increases. There is a lag time in otolith response. M.W.R.

N66-16123* Baylor Univ., Houston, Tex. Coll. of Medicine.
CLINICAL PROBLEMS ASSOCIATED WITH PROLONGED EXPOSURE TO WEIGHTLESSNESS
William S. Fields *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 203–207 (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

It is emphasized that weightlessness alone does not necessarily produce any disorientation or clinical disorder of vestibular function following exposure for a period of 24 hours; no information is available regarding effects of prolonged periods of weightlessness of more than two weeks. Vestibular sickness after a space flight may be somewhat analogous to the post-rotation effects observed in subjects who come out of the slow rotation room. Both severity of stress and length of exposure are important factors. Vestibular disorders are considered unlikely during prolonged space flight but possible problems in a manned space station. High intensity sound levels may damage the cochlea and produce serious effects on the vestibular apparatus. At the moment, it is not possible to predict the scope of such problems that will be encountered in space. It is emphasized that the equilibrium disorder suffered by John Glenn following his fall is in no way related to his participation in the Mercury Program. M.W.R.

N66-16124* Douglas Aircraft Co., Inc., Santa Monica, Calif.
SPACE-BASED CENTRIFUGE
William J. White *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 209–213 (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Engineering and biomedical studies are in progress to define the research, therapeutic and training potential of a space-based centrifuge. A brief review of these studies indicates: (a) the short-radius centrifuge is the only practical method of producing a valid acceleration in space; (b) that a steep head-to-foot acceleration gradient neither precludes the measurement of tolerance to positive acceleration nor do the high rates of rotation produce motion sickness problems for the well-trained individual; (c) cardiovascular deterioration produced by recumbency is largely prevented by periodic centrifugation. Author

N66-16125* Defence Research Medical Labs., Toronto (Ontario).
SOME VESTIBULAR RESPONSES PERTAINING TO SPACE TRAVEL
Walter H. Johnson, Kenneth E. Money, and Ashton Graybiel (NSAM) *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 215–219 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Experiments are described which attempt to determine the importance of the labyrinth in spatial orientation during parabolic flights. Studies with both monkeys and humans confirm that weightlessness alone is unlikely to cause motion sickness. Evidence indicates that semicircular canal stimulation is of prime importance in causing motion sickness. When the canals of squirrel monkeys are inactivated, no signs of motion sickness are exhibited. Although normal otolith function is retained, normally functioning labyrinths should be of value in providing spatial orientation to the space traveler. M.W.R

N66-16126* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
SPONTANEOUS FIRING AND RESPONSES TO LINEAR ACCELERATION OF SINGLE OTOLITH UNITS OF THE FROG DURING SHORT PERIODS OF WEIGHTLESSNESS DURING PARABOLIC FLIGHT
Torquato Gualtierotti and Siegfried J. Gerathewohl (NASA, Washington) *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 221–229 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Quantitative information on the effect of zero gravity on the vestibular responses is obtained by comparison of records from a single vestibular unit yielding spontaneous and evoked activity on weightlessness and at one G. A tungsten micro-electrode provides recordings from the same nerve fiber over a long period of time and under anticipated flight conditions. To select the desired fiber in the vestibular nerve, a frog is tested on a tilt table and then completely immersed in an aluminum container. During the flight, the frog is placed so that the otolith unit can respond to acceleration in the direction of the stimulus. During parabolic flight, main changes observed in the single otolith unit activity are: (1) a sudden increase of spontaneous firing at the beginning of weightlessness preceded by a high G period; (2) an initial larger response to acceleration; (3) a sudden suppression of response, restored to normal by returning to one G; and (4) a large increase in overall spontaneous activity of the nerve after a number of short-interval parabolas. It is doubtful if these changes are due solely to weightlessness. Further, parabolic flight does not give complete information on the effect of weightlessness on the vestibular organ. M.W.R.

N66-16127* General Electric Co., Houston, Tex.
PHYSIOLOGICAL DESIGN CRITERIA FOR ARTIFICIAL GRAVITY ENVIRONMENTS IN MANNED SPACE SYSTEMS
Allen B. Thompson *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 233–241 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Indications of undesirable environmental adaptations during conditions of weightlessness have led to experiments to find practical means for exercising the affected systems to prevent atrophy. For example, the cardiovascular system can be exercised by applying interconnected tourniquets to the four extremities, connected to an air source, and compressed and released at short intervals. In six-hour tests in a water immersion facility, orthostatic tolerance as determined by tilt table was normal or better than the one G controls. The encumbrances and the power required for such exercise are considered undesirable. A systematic calisthenic program and a carefully controlled diet are basics to prevent muscular atrophy and reduce decalcification of the skeleton. A practical method to achieve artificial gravity is described. Drawbacks are (1) the generation of coriolis acceleration and (2) gyroscopic torque stimulation of semicircular canals when angular motion is attempted outside the plane of rotation. M.W.R.

N66-16128* Naval School of Aviation Medicine, Pensacola, Fla.

COMPARISON OF VESTIBULAR EFFECTS IN SEVERAL ROTATING ENVIRONMENTS

Fred E. Guedry, Jr. *In its* The Role of the Vestibular Organs in the Exploration of Space 1965 p 243-255 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

It is necessary to consider the basic differences in vestibular stimulation in different rotating environments in order to anticipate conditions in a rotating space environment. Since the particular pattern of canal stimulation is controlled by the position of the head relative to the plane of rotation, a comparison is made of all subjects in four different head positions for which the direction and magnitude of gravity in the rotating room changes with the plane of rotation. Results indicate that when a man is oriented gradually as he will be in a space station, the same head movement relative to the body may result in a variety of reactions, which are dependent on orientation in terms of the rotation direction of the vehicle. Some studies indicate that actual space conditions will present more drastic results and that adaptation to the space station may be somewhat different than that in a rotating room. It is noted, however, that there are indications that habituation to complex vestibular stimulation in one kind of rotation environment may have a carry-over in reducing undesirable effects in another rotation environment. Results are presented for nystagmus responses to head movements after various periods before and after rotation; and predicted and obtained nystagmus for 12 subjects are illustrated for various head positions. M.W.R.

N66-16129* Defence Research Medical Labs., Toronto (Ontario).

VESTIBULAR PROBLEMS IN ROTATING SPACECRAFT

Kenneth E. Money *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 257-262 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

From the point of view of vestibular physiology, particularly motion sickness, zero gravity is acceptable for long-term space flights, whereas rotation rates of 3 to 5 rpm create hazardous conditions. Motion sickness has been reported in experiments in rotating rooms at these rates, which are probably less variable and of less intensity than can be expected in a rotating spacecraft. To prevent vestibular problems during spacecraft flight, the rotation speed of the spacecraft must be maintained at a low enough level, probably in the order of 1 rpm. At the present time, however, it is impossible to estimate with any accuracy the likelihood of an astronaut becoming motion sick in a spacecraft rotating at 4 rpm; and at the current level of knowledge it is considered unwise to place men who must move into a rotating spacecraft. Before rotation of a spacecraft is adopted in order to solve the cardiovascular problems of weightlessness, it should be shown that such problems at zero g are a greater danger to the mission than the vestibular problems created by rotation. M.W.R.

N66-16130* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SOME OBSERVATIONS ON THE STIMULATION OF THE VESTIBULAR SYSTEM OF MAN IN A ROTATING ENVIRONMENT

Ralph W. Stone, Jr. and William Letko *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 263-278 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Experimental results indicate that the effects experienced in a rotating spacecraft are best simulated by orienting a subject with his long body axis perpendicular to the axis of rotation of the vehicle. Considerable variation in semicircular canal stimulation is indicated for persons with normal vestibular functions, although most subjects can tolerate 10 rpm. Performance and tolerance to rotation do not appear to be effected by the radius of rotation. In the body position used in this experiment, tilting back the head caused some subjects to be less tolerant to motion. Experiments were made in a simple rotating-vehicle simulator with the centrifugal force taken on the soles of the feet as it would occur in a rotating space vehicle. Twenty-nine subjects were used for head turning experiments, nine participated in nodding experiments, and 10 were used to study combined motions. Tolerance, response times, and rates are plotted for various parts of the experiment. M.W.R.

N66-16131* General Dynamics/Astronautics, San Diego, Calif.

OBSERVATIONS ON SUBJECTS EXPOSED TO PROLONGED ROTATION IN A SPACE STATION SIMULATOR

Bernard D. Newsom and James F. Brady *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 279-292 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Rotating space vehicle design and task analysis require biofunctional guidelines based upon the integrated information of all levels of vestibular physiologic research, with final criteria determined by the measure of crew performance as a function of controlled environmental changes in a realistic space vehicle simulator. The Manned Revolving Space Station Simulator (MRSSS) at GD/Convair is the result of this concept and allows adjustments in radius, angular velocity, force field and stability. As a baseline study for projected investigations of the stability requirements of a rotogravic system, four subjects performed a comprehensive array of psychologic and physiologic tests during five days of continuous rotation at 6 rpm in the MRSSS. Subjects adjusted completely to the environment, required little post-spin readaptation and showed minor performance decrement. Paper discusses importance of stability as a design parameter and the five-day test program and results. Author

N66-16132* Naval School of Aviation Medicine, Pensacola, Fla.

THE EFFECTS OF EXPOSURE TO A ROTATING ENVIRONMENT (10 rpm) ON FOUR AVIATORS FOR A PERIOD OF 12 DAYS

Ashton Graybiel, Robert S. Kennedy, Fred E. Guedry, Jr., Michael E. Mc Leod, Edward C. Knoblock (WRAIR, Washington) et al. *In its* The Role of the Vestibular Organs in the Exploration of Space 1965 p 295-337 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Countermeasures in addition to adaptation are shown to be necessary if rotational velocities of 10 rpm are required by spacecraft. Rotating room experiments show that when the subject is asleep or his head is fixed, conditions are not too different than those with the room stationary. Movements of the head out of the horizontal plane of the rotating room cause semicircular canal disturbance; whole body movements, which generate Coriolis forces, affect neuromuscular coordination. Two distinct prerotation periods are found. At first subjects restrict head movements and physical activity to prevent nausea; when nausea symptoms disappear, restrictions on head movements are lifted, which in turn increase the stimulus to the semicircular canals. This latter period is characterized by a rising level of physical activity. The first of 12 days rotation made the greatest overall impact on the four aviators who were exposed to the 10 rpm environment. All of the subjects concluded that they were, at one time or another during the exposure period, unfit to carry out the tasks required for an orbital flight; and objective results confirmed this conclusion. M.W.R.

N66-16133* Umea Univ. (Sweden). Medical School.
STEPWISE ADAPTATION TO A VELOCITY OF 10 RPM IN THE PENSACOLA SLOW ROTATION ROOM
Martin Bergstedt *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 339–345 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

As a result of three experiments conducted in a slow rotation room (SRR), a stepwise procedure appears to be desirable for adapting to a velocity of 10 rpm. Steps of 2 to 3 rpm are recommended, and it is found difficult to reach or adapt to 10 rpm in less than five days. Even with stepwise adaptation, the 10 rpm level is considered difficult and stressing. The rotating chair, mounted in the SSR, permitted oculogyral illusion testing and Coriolis nystagmus recording, and could be used to estimate adaptation to each of the velocity levels. Profiles of the three experiments are illustrated. M.W.R.

N66-16134* Walter Reed Army Inst. of Research, Washington, D.C.
BIOCHEMICAL RESPONSES TO VESTIBULAR STIMULATION
Edward C. Knoblock *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 347–355 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

A series of biochemical parameters was measured in an attempt to focus critical areas of biochemical responses to motion sickness attending prolonged exposure to a moving room environment. The most striking finding in the study is the demonstration of an increased glucose utilization by normal subjects in comparison with labyrinth-defective volunteers. These findings are consistent with a hypothesis drawn from a previous study (pilots, 1962) that changes in glucose tolerance may be caused by increased muscle tonus in normal subjects. The increase in tonus may be a direct result of labyrinth stimulation. This hypothesis is supported by determination of pH which showed a decrease, by an increased pCO_2, and by a steady or slightly decreased pO_2 value for normal subjects. The LDH value was also increased in the pilot group only. These are the types of responses that would be expected. The L-D groups should not show such a response. With a possible exception to an unexplained response in pO_2 in the pilot 1964 group, this hypothesis is borne out. Author

N66-16135* Naval School of Aviation Medicine, Pensacola, Fla.
STRESS MEASUREMENTS IN NORMAL AND LABYRINTHINE DEFECTIVE SUBJECTS IN UNUSUAL FORCE ENVIRONMENTS
James K. Colehour *In its* The Role of the Vestibular Organs in the Exploration of Space 1965 p 357–371 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Stress hormone excretion rates were measured in both normal and labyrinthine defective subjects exposed to unusual and different force backgrounds in a series of three different experiments. The effects of the systemic and neurogenic stress were measured as increased levels of 17-hydroxy corticosteroids and catechol amine in urine excretion. Uropepsin assays and leukocyte counts of blood samples were also made. In the first experiment, both subject groups were exposed to an intensive set of acrobatic flight maneuvers lasting about 30 mins in which four G pullout maneuvers (a very stressful incident for the uninitiated subjects) were made. In the second experiment, the subjects were subjected to Coriolis acceleration during zero gravity flight; and in the third experiment eight subjects from each group were tested in a relatively small ship at sea in which the pitch and roll of the ship was the motion variant. The data for the experiments are tabulated, and are also depicted by bar graphs. L.S.

N66-16136* Arkansas Univ., Little Rock. Medical School.
ANTIMOTION SICKNESS DRUGS FOR AEROSPACE
Charles D. Wood *In* NSAM The Role of the Vestibular Organs in the Exploration of Space 1965 p 365–371 refs (See N66-16106 06-04) GPO: HC $2.25; CFSTI: MF $2.00

Anti-motion-sickness drugs were orally administered to naval personnel subjects for studying the relative effectiveness and side effects of the drugs. A total of 112 separate experiments were performed on the subjects using eight different drugs. The drugs and the doses used are tabulated. The subjects were given questionnaires to record the side effects produced by the drugs, and medical surveillance was maintained for 8 hrs following administration of the drugs. Blood pressures and pulse rates were recorded periodically. Head movement studies of the subjects in slow rotation rooms were conducted, as a method of comparing the drugs. The effectiveness of each of the drugs is graphically portrayed in terms of tolerated head movements in experimental and control groups. The anti-motion-sickness study was repeated a second time, using increased dosages of the same drugs. The therapeutic effect was enhanced by the increased dose with only two of the drug preparations used, d-amphetamine (20 mg) and a combination of d-amphetamine (20 mg) and hyoscine (1.2 mg). The results of the questionnaire on side effects are tabulated, and a discussion of the significance of the various test results is given. L.S.

N66-16137* Naval School of Aviation Medicine, Pensacola, Fla.
TEMPORARY SUPPRESSION OF SEMICIRCULAR CANAL FUNCTION IN SQUIRREL MONKEYS AFTER STREPTOMYCIN SULFATE
Makoto Igarashi *In its* The Role of the Vestibular Organs in the Exploration of Space 1965 p 373–384 refs (See N66-16106 06-04) GPO: HC $2.25 CFSTI: MF $2.00

Streptomycin sulfate was administrered to eight squirrel monkeys by injection over a period of three weeks for studying the compound's effect on the temporary suppression of the semicircular canal function of the ear, without damaging the hearing end organs. The total dosage for each monkey was different, increasing from 1100 mgr to 4600 mgr. The suppression was repeatedly measured by the threshold caloric test and susceptibility to vomiting in a slow rotation room. Six months after the suppression, pathological studies were carried out. All animals were sacrificed, and bone samples of the ear were examined by light microscopy. All functional test results and the pathological findings of both vestibule and cochlea are summarized in a table. Results indicate that neither a normal caloric threshold nor susceptibility to vomiting in a slow rotation room is a reliable indicator of morphological normality of the canal criteria. Other significant conclusions from the findings are summarized. Generally, it was shown that the administration of streptomycin sulfate is a useful method of selectively suppressing the semicircular canal function. L.S.

IAA ENTRIES

A66-14616
RECENT PSYCHOLOGICAL RESEARCH RELEVANT TO THE HUMAN FACTORS ENGINEERING OF MAN-MACHINE SYSTEMS.
Richard W. Pew (Michigan, University, Dept. of Psychology, Ann Arbor, Mich.).
IN: NATIONAL ELECTRONICS CONFERENCE, CHICAGO, ILL., OCTOBER 25-27, 1965, PROCEEDINGS. VOLUME 21.
[A66-14553 05-09]
Conference sponsored by the Illinois Institute of Technology, the Institute of Electrical and Electronics Engineers, Northwestern University, the University of Illinois, Argonne National Laboratory, Electronic Representatives Association, Scientific Apparatus Makers Association, the Society of Motion Picture and Television Engineers, Iowa State University, Marquette University, Michigan State University, the University of Minnesota, Purdue University, the University of Michigan, the University of Notre Dame, Ohio State University, and the University of Wisconsin.
Chicago, National Electronics Conference, Inc., 1965, p. 678-682. 14 refs.
Contracts No. AF 49(638)-1235; No. AF 33(615)-1817.

Review of recent psychological studies of human performance capabilities which are of interest in the design of man/machine interfaces. The human information-processing system is discussed, and the rates of information handling in the central human decision-making subsystem are examined for different classes of information-processing tasks. Methods for incorporating the results of these studies into man/machine system design are discussed.
P. K.

A66-14617 #
A "PREDICTOR" DISPLAY FOR ON-BOARD RENDEZVOUS OPTIMIZATION.
George G. Frost (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Human Engineering Div., Wright-Patterson AFB, Ohio) and William K. McCoy, Jr. (Ritchie and Associates, Inc., Dayton, Ohio).
IN: NATIONAL ELECTRONICS CONFERENCE, CHICAGO, ILL., OCTOBER 25-27, 1965, PROCEEDINGS. VOLUME 21.
[A66-14553 05-09]
Conference sponsored by the Illinois Institute of Technology, the Institute of Electrical and Electronics Engineers, Northwestern University, the University of Illinois, Argonne National Laboratory, Electronic Representatives Association, Scientific Apparatus Makers Association, the Society of Motion Picture and Television Engineers, Iowa State University, Marquette University, Michigan State University, the University of Minnesota, Purdue University, the University of Michigan, the University of Notre Dame, Ohio State University, and the University of Wisconsin.
Chicago, National Electronics Conference, Inc., 1965, p. 683-688. 7 refs.
Contract No. AF 33(615)-2353.

Description of a fast-time modeling technique for generating the display needed to simulate orbital rendezvous maneuvers. The display is driven by a fast-time repetitive computer which shows the pilot his predicted trajectory relative to the target. Using this "predictor" pilots can be rapidly trained to fly successful rendezvous maneuvers. By the addition of two simple off-line or trial controls, pilots can determine a near-optimum trajectory and implement that trajectory for near-minimum fuel consumption.
P. K.

A66-14635
THE RELEVANT PRACTICE TECHNIQUES FOR MAINTAINING PSYCHOMOTOR SKILLS.
David W. Stubbs, Albert J. Macek (Honeywell, Inc., Aeronautical Div., Minneapolis, Minn.), and Martin Debrovner (NASA, Manned Spacecraft Center, Houston, Tex.).
IN: NATIONAL ELECTRONICS CONFERENCE, CHICAGO, ILL., OCTOBER 25-27, 1965, PROCEEDINGS. VOLUME 21.
[A66-14553 05-09]
Conference sponsored by the Illinois Institute of Technology, the Institute of Electrical and Electronics Engineers, Northwestern University, the University of Illinois, Argonne National Laboratory, Electronic Representatives Association, Scientific Apparatus Makers Association, the Society of Motion Picture and Television Engineers, Iowa State University, Marquette University, Michigan State University, the University of Minnesota, Purdue University, the University of Michigan, the University of Notre Dame, Ohio State University, and the University of Wisconsin.
Chicago, National Electronics Conference, Inc., 1965, p. 905-909.

Study of the possibility that an astronaut might be able to maintain his performance skills by performing practice tasks with lightweight, inexpensive devices. Two tasks similar to those expected on the Apollo mission are performed to determine whether a significant loss of skill results if an extended period of time elapse between the performances of a complex task. The possibility that a rehearsal or warmup with a practice device can reduce this loss is examined, and the requirements for such a practice device are discussed.
P. K.

A66-14642
A COLORIMETRIC METHOD FOR THE DETERMINATION OF HYDRAZINE AND MONOMETHYLHYDRAZINE IN BLOOD.
Barbara A. Reynolds and Anthony A. Thomas (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
American Industrial Hygiene Association Journal, vol. 26, Sept.-Oct. 1965, p. 527-531. 5 refs.

A simple procedure is described for measuring microgram amounts of hydrazine in the blood serum of rats. The procedure, with a minor modification, can be used for measuring microgram amounts of monomethylhydrazine. Calibration ranges of 0.5 to 5.0 μg of hydrazine and 0.5 to 10.0 μg of monomethylhydrazine per milliliter are presented. Data are presented on the dose-blood-level relationship of hydrazine and monomethylhydrazine in rats after intraperitoneal injection. Minimum detectable dose levels were 0.6 mg of hydrazine and 3.0 mg of monomethylhydrazine per kilogram.
(Author)

A66-14749 #
INPUT POWER DETERMINED FROM TEMPERATURES IN SIMULATED SKIN PROTECTED AGAINST THERMAL RADIATION.
J. M. Davies (U.S. Army, Natick Laboratories, Pioneering Research Div., Natick, Mass.).
American Society of Mechanical Engineers and American Institute of Chemical Engineers, Heat Transfer Conference and Exhibit, Los Angeles, Calif., Aug. 8-11, 1965, Paper 65-HT-33. 6 p. 15 refs. Members, $0.50; nonmembers, $1.00.

With thermal protective systems, the power transferred from an opaque layer to the skin or a skin simulant determines the temperature of the skin and in turn the degree of burn. The power input was calculated from the measured temperature of the simulant by expressing the power as a series of functions, with unknown constants, whose Laplace transforms were of the proper form for comparison with the measured temperatures and thus determine the constants. The lag of temperature behind the power causes some uncertainty in the latter, but practically adequate precision is attainable.
(Author)

A66-15000 #
MEDICAL EVALUATION OF AIRMEN EXPOSED TO SUPERSONIC TRANSPORT ALTITUDES.
Charles I. Barron (Lockheed Aircraft Corp., Lockheed-California Co., Burbank, Calif.).
Aircraft Engineering, vol. 37, Nov. 1965, p. 350, 351.

Description of an investigation into the ability of man to withstand the environmental stresses existing at the high altitudes associated with supersonic flight. The medical histories of a group of pilots who had been exposed for extended periods to altitudes in excess of 50,000 ft were compared with those of a control group whose flying had been confined to normal altitudes. The total exposure time of the test group was estimated to be in excess of

35,000 hr. Evaluation of the findings is considered to show that the state of development in human engineering and life-support systems has progressed to the degree that air crews may be exposed to extreme altitudes for long periods without fear of injury or illness. It is commented that the radiation hazard that exists is safely tolerated. F. R. L.

A66-15013 #
ENHANCEMENT OF SPACE POWERPLANT RELIABILITY BY CREW ACTION.
P. Duchon and L. K. Petersen (Aerojet-General Corp., von Kármán Center, Azusa, Calif.).
Society of Automotive Engineers, National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 4-8, 1965, Paper 650810. 18 p.
Members, $0.75; nonmembers, $1.00.

Discussion and the man-powerplant reliability interface with emphasis on manned vs automatic sensing and control. The relations that exist or can exist between the space powerplant and man are tabulated. Man can, to a large degree, directly interpret and diagnose while automatic systems require computerized results. A general comparison of human sensing and control with that of the corresponding automatic operations is made. In connection with sensing, representative elements discussed are pressure and temperature sensing, flow, liquid level, bearing performance, vibration, leakage, valve position, and speed. In regard to control, valve positioning, switchover and liquid level, and leakage are studied. The influence of man on the reliability of the redundant systems with automatic controls is considered. M. F.

A66-15117
PROBLEMS IN DOSIMETRY AND RADIATION PROTECTION [VOPROSY DOZIMETRII I ZASHCHITY OT IZLUCHENII].
Edited by L. R. Kimel'.
Moscow, Atomizdat, 1965. 148 p. In Russian.
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SOME RESULTS OF AN EXPERIMENTAL STUDY OF THE PROTECTIVE PROPERTIES OF MATERIALS WITH RESPECT TO HIGH-ENERGY PROTONS [NEKOTORYE REZUL'TATY EKSPERIMENTAL'NOGO ISSLEDOVANIIA ZASHCHITNYKH SVOISTV MATERIALOV PO OTNOSHENIIU K PROTONAM BOL'SHIKH ENERGII]. V. P. Afanas'ev, A. M. Biskupchuk, V. E. Dudkin, E. E. Kovalev, V. G. Kuznetsov, E. G. Litvinova, and L. N. Smirennyi, p. 102-116. 13 refs. [See A66-15118 05-05]

RESPONSE OF AMPLITUDE DISCRIMINATORS IN TRANSISTORS [CHUVSTVITEL'NYI AMPLITUDNYI DISKRIMINATOR NA TRANZISTORAKH]. V. A. Fedorov and G. G. Doroshenko, p. 141, 142. [See A66-15119 05-14]

A66-15118 #
SOME RESULTS OF AN EXPERIMENTAL STUDY OF THE PROTECTIVE PROPERTIES OF MATERIALS WITH RESPECT TO HIGH-ENERGY PROTONS [NEKOTORYE REZUL'TATY EKSPERIMENTAL'NOGO ISSLEDOVANIIA ZASHCHITNYKH SVOISTV MATERIALOV PO OTNOSHENIIU K PROTONAM BOL'SHIKH ENERGII].
V. P. Afanas'ev, A. M. Biskupchuk, V. E. Dudkin, E. E. Kovalev, V. G. Kuznetsov, E. G. Litvinova, and L. N. Smirennyi.
IN: PROBLEMS IN DOSIMETRY AND RADIATION PROTECTION [VOPROSY DOZIMETRII I ZASHCHITY OT IZLUCHENII].
Edited by L. R. Kimel'.
Moscow, Atomizdat, 1965, p. 102-116. 13 refs. In Russian.

Data from an empirical investigation of the absorption of proton doses in shielding substances and biological tissue. The experiments were carried out with high-energy protons in a synchrocyclotron. The materials tested included polyethylene, aluminum, lead, and combinations of polyethylene with both lead and titanium hydride. Several absorption parameters are plotted for various protective materials and proton energy levels. R. A. F.

A66-15412
EFFECTS OF PROLONGED CENTRIFUGATION ON GROWTH AND ORGAN DEVELOPMENT OF RATS.
Jiro Oyama and William T. Platt (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.).
American Journal of Physiology, vol. 209, Sept. 1965, p. 611-615. 14 refs.

Mature and weanling Sprague-Dawley female rats were centrifuged at 2.5, 3.5, and 4.7 g for periods of time ranging up to one year. The growth rates and final body weights of weanling rats were significantly lower than those of noncentrifuged control rats. Both mature and weanling rats experienced initially a temporary loss in body weight due to inanition and reduced food consumption. Comparison of organ-to-body weight ratios of 4.5-month and one-year centrifuged rats with corresponding control rats indicated that prolonged exposures caused only a few changes. Relative weights of the adrenals of 4.5-month centrifuged rats were reduced, whereas the livers of one-year centrifuged rats were increased. There was an apparent decrease in red blood cells and a significant decrease in hematocrit values of centrifuged rats. No histopathology was found in any of the centrifuged groups of rats which could be attributed to the exposure treatment. Results of this study show that rats are able to tolerate prolonged periods of simulated high-gravity environments with little, if any, serious deleterious effects. (Author)

A66-15478
ELECTRICAL ENERGY FROM MICROORGANISMS.
J. Brake, R. Townsend, and H. Silverman (Thompson Ramo Wooldridge, Inc., Anaheim, Calif.).
Chemical Engineering Progress, vol. 61, Dec. 1965, p. 65-68. 6 refs.
Army-supported research.

Study of the process of biological-electrical energy production. Biological electrical energy production, it is noted, is essentially a very cheap source of power; the fuels required are all natural products. An example of a biological electron transfer reaction is the oxidation of glucose, which is catalyzed by the enzyme glucose oxidase. In this reaction, electrons are transferred from glucose to oxygen. If the oxygen can be replaced by an electrode which can accept electrons, this would be an example of the so-called direct process of biological-electrical energy production. If, on the other hand, a product of the biochemical reaction, such as hydrogen peroxide, is made to react at the electrode, then the process is termed "indirect." An interesting example of the indirect process involves the production of oxygen by algae. It is noted that there are 2 considerations in obtaining the greatest amount of electrical energy from a microbial reaction. One is essentially bacteriological: how to get the greatest amount of fuel from the substrate. The second is mainly electrochemical: how to get the most power from the fuel. M. F.

A66-15503
AN ADVANCED BIOCHEMICAL INSTRUMENTATION CONCEPT.
Jean Bordeaux, Ernest Carlsen, and Charles A. Spezia (Beckman Instruments, Inc., Fullerton, Calif.).
Instrument Society of America, Annual Conference and Exhibit, 20th, and National Aerospace Instrumentation Symposium, 11th, Los Angeles, Calif., Oct. 4-7, 1965, Preprint no. 1.2-3-65. 7 p.

This paper concerns the selection of sampling material to allow meaningful measurement of biochemical parameters; a description of the analytical package is included. Biochemical monitoring techniques can be used to predict the mental and physical capability of personnel to continue a space mission. One way this may be accomplished is through multiple-component analysis of the fluid secreted by the parotid gland. Several components, all showing significant change with varying body conditions, can be sequentially analyzed with a single instrument. Telemetered data, correlated with established baselines, can be used for rapid prediction of the physiological condition of an astronaut. (Author)

A66-15693 #
HUMAN VIBRATION-RESPONSE THEORY.

Fred Pradko, Richard A. Lee, and James D. Greene (U.S. Army, Tanks-Automotive Center, SMOTA-RR, Advanced Systems and Concept Research Div., Systems Simulation Branch, Warren, Mich.).
American Society of Mechanical Engineers, Winter Annual Meeting, Chicago, Ill., Nov. 7-11, 1965, Paper 65-WA/HUF-19. 11 p. 9 refs. Members, $0.75; nonmembers, $1.50.

A study of whole-body human vibration under sinusoidal and random conditions is presented. Human-transfer functions are developed and a new parameter to measure human vibration response, "absorbed power," is suggested. It is hypothesized that this criterion describes accurately comfort or tolerance and correlates with subjective response. (Author)

A66-15694 #
CREW SURVIVAL GOALS FOR SPACE MISSIONS.
R. B. Wilson (Douglas Aircraft Co., Inc., Missile and Space Systems Div., Huntington Beach, Calif.).
American Society of Mechanical Engineers, Winter Annual Meeting, Chicago, Ill., Nov. 7-11, 1965, Paper 65-WA/HUF-18. 7 p. 9 refs. Members, $0.75; nonmembers, $1.50.

Realistic crew survival goals to guide system design for manned space missions of various durations are derived from a comparative examination of mortality rates characteristic of our present-day society. These mortality rates include both accident mortality rates for a number of occupations: airline pilots, farmers, construction workers, Air Force officers, and so on, and all-cause mortality rates as found in the life-insurance company mortality tables and U.S. census records. The latter mortality rates are chosen for the 25 to 45 age group, the probable age group for astronauts. Survival criteria are based on the premise that the astronaut need not be safer on the space mission than his counterpart in earth-bound occupations. The fact that mortality rates from natural causes far exceeds mortality rates from accident causes emphasizes the need for system design to maintain crew health on long-duration missions. (Author)

A66-15695 #
THE ROLE OF SIMULATION IN APOLLO SPACECREW TRAINING.
Richard T. Cave (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).
American Society of Mechanical Engineers, Winter Annual Meeting, Chicago, Ill., Nov. 7-11, 1965, Paper 65-WA/HUF-17. 6 p. Members, $0.75; nonmembers, $1.50.

The Apollo program, because of its position in time, will have the advantages of experience both in actual and simulated space flight gained through projects Mercury and Gemini. Apollo crewmen have been selected upon extremely rigorous physical, mental, and experience criteria. Thus, the astronauts selected for the Apollo program will bring with them the combination of preastronaut experience and/or vicarious space experience on the two preceding space programs. The implications of this highly select, small group of potential Apollo crewmen as they relate to Apollo training are discussed, not only in terms of training but also in terms of their participation in engineering simulation. The future Apollo spacecrews currently participate actively in spacecraft development for the Apollo missions. The knowledge gained through these activities adds to the total preparation for the Apollo mission and must be related to the actual training program. Of particular importance here is the astronaut activity in design reviews and within the Apollo simulation program. The more formal Apollo crew-training plans are discussed in detail. (Author)

A66-15696 #
HUMAN FACTORS IN GROUND-SUPPORT EQUIPMENT - CONTROL/INDICATOR PANEL DESIGN.
V. Clark Roberts (General Electric Co., Command Systems Div., Apollo Support Dept., Daytona Beach, Fla.).
American Society of Mechanical Engineers, Winter Annual Meeting, Chicago, Ill., Nov. 7-11, 1965, Paper 65-WA/HUF-16. 7 p. Members, $0.75; nonmembers, $1.50.

The purpose of this paper is to emphasize the need for and importance of adequate human-factors engineering at the ground-support equipment level. The emphasis is on control/indicator panels since this is the interface between human operator and equipment and therefore a potential source of operator error. Problems in the area of GSE control/indicator panels are described and discussed. A practical approach for arriving at solutions is presented with examples which illustrate the benefit of concerted effort in this area. (Author)

A66-15697 #
DISPLAY VERSUS VEHICLE AUGMENTATION AS A MEANS FOR IMPROVING MAN-VEHICLE PERFORMANCE.
Leonard Segel (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).
American Society of Mechanical Engineers, Winter Annual Meeting, Chicago, Ill., Nov. 7-11, 1965, Paper 65-WA/HUF-10. 8 p. 14 refs.
Members, $0.75; nonmembers, $1.50.

The human controller-vehicle system is defined in a generalized format which encompasses both the processes of vehicle and display augmentation. This definition is used to facilitate an assessment of the manual control of vehicles as seen from the perspective of results obtained in (1) aircraft handling-qualities research, (2) human-dynamics research, and (3) control-system investigations on a variety of vehicles including automobiles, submarines, and helicopters. Specific examples of vehicle and display augmentation are cited and the need for criteria for choosing one or the other (or a combination of both) in a particular control-system design is examined. Some previously unpublished data are presented showing the effectiveness of vehicle augmentation in improving the control of submarines. (Author)

A66-15698 #
MECHANICAL CHARACTERISTICS OF BONE AND ITS CONSTITUENTS.
A. W. Sweeney (Du Pont de Nemours and Co., Inc., Kerkes Research and Development Laboratory, Buffalo, N.Y.), R. P. Kroon (Pennsylvania, University, Philadelphia, Pa.), and R. K. Byers (Sandia Corp., Albuquerque, N. Mex.).
American Society of Mechanical Engineers, Winter Annual Meeting, Chicago, Ill., Nov. 7-11, 1965, Paper 65-WA/HUF-7. 18 p. 30 refs.
Members, $0.75; nonmembers, $1.50.
U.S. Public Health Service Grant No. HE 07762-02; Contracts No. Nonr-551(18); No. N-4-09125-X-3058.

Stress-strain relationships are presented for tension, compression, and shear of femoral bone, loaded in longitudinal and transverse directions. Mechanical characteristics are also given for the two main constituents of bone - collagen and apatite - which were isolated and tested individually. Bone is shown to be a two-phase material. Initial results regarding the initiation and propagation of cracks in bone are discussed. (Author)

A66-15699 #
DYNAMIC RESPONSE OF BIOLOGICAL MATERIALS.
James H. McElhaney and Edward F. Byars (West Virginia University, Dept. of Theoretical and Applied Mechanics, Morgantown, W. Va.).
American Society of Mechanical Engineers, Winter Annual Meeting, Chicago, Ill., Nov. 7-11, 1965, Paper 65-WA/HUF-9. 9 p. 24 refs.
Members, $0.75; nonmembers, $1.50.
NASA-supported research.

This paper represents a study of impacts of varying velocity on the mechanical response of human bone, bovine bone, and bovine muscle tissue. Load-time and displacement-time records for these materials, as well as for nylon and aluminum, were measured over a wide range of strain rates. This research required the development of a special test machine capable of constant-velocity compression tests with strain rates up to 4000/sec, and also high frequency response instrumentation utilizing a piezoelectric load cell and a capacitance displacement transducer. A unique feature of the test machine was the adjustable stops that allowed predetermined strains to be applied. Tabular results are presented which include various mechanical properties at various strain rates. Also presented are stress-strain diagrams at selected strain rates. A critical velocity for bone was noted at a strain rate of approximately

1/sec. The relationship between ultimate strength of bone and strain rate can be reasonably well represented by an exponential. A stress, strain, strain-rate surface representation of other data is suggested. The mechanical properties of the biological materials were compared with those of nylon and aluminum. (Author)

A66-15700 #
EMG CONTROL OF EXTERNAL POWER.
R. W. Wirta (Philco Corp., Bio-Cybernetics Laboratory, Willow Grove, Pa.).
American Society of Mechanical Engineers, Winter Annual Meeting, Chicago, Ill., Nov. 7-11, 1965, Paper 65 - WA/HUF-3. 5 p. 7 refs
Members, $0.75; nonmembers, $1.50.

A control theory based upon pattern-recognition techniques is described for using EMG (electromyography) signals to control external power. EMG signal-analysis techniques, the concept of pattern recognition, and control implementation are briefly discussed. The combined use of mechanical, electrical, and vocal means for man to introduce command information into a machine system, greater use of man's innate faculties in feedback mechanisms, and the use of subroutine operations are stressed as ways to increase man's effectiveness and performance. (Author)

A66-15732
CHANGES IN THE SIMULTANEOUS MASKED THRESHOLD OF BRIEF TONES.
Lois L. Elliott (Central Institute for the Deaf, St. Louis, Mo.).
(Acoustical Society of America, Meeting, 69th, Washington, D.C., June 2-5, 1965, Paper.)
Acoustical Society of America, Journal, vol. 38, Nov. 1965, p. 738-746. 16 refs.
Research supported by the National Institutes of Health, and U.S. Department of Health, Education, and Welfare.

Simultaneous monotic masking of a 5- or 10-msec, 1000-cps signal by bursts of wide-band noise of 30-1000 msec duration (70 db SPL) changes and is dependent upon delay of the tone (Δt) relative to masker onset. The elevated masking of the tone at short Δt's (overshoot) is independent of masker duration, while minimum masking occurs at delay times of 200 or 300 msec. A 500-msec-long, 400-cps noise band centered at 2550 cps produces little overshoot for 10-msec tonal signals with frequencies located within the band but considerable overshoot for frequencies just outside it. This occurs also for a 200-cps band centered at 1270 cps but not for a 100-cps band at 250 cps. These effects were observed for dichotic masking also. For 500-msec bursts of wide-band masking noise, greater overshoot occurs at higher signal frequencies than at lower. Several different psychophysical procedures produced similar results. (Author)

A66-15733
BINAURAL BEATS AND BINAURAL AMPLITUDE-MODULATED TONES - SUCCESSIVE COMPARISON OF LOUDNESS FLUCTUATIONS.
Jacques Rutschmann and Leo Rubinstein (Columbia University; New York State Psychiatric Institute, New York, N.Y.).
(Eastern Psychological Association, Meeting, New York, N.Y., 1963, Paper.)
Acoustical Society of America, Journal, vol. 38, Nov. 1965, p. 759-768. 16 refs.
Research supported by the Department of Health, Education, and Welfare.

An objective psychophysical method for measuring one of the results of binaural (neural) interaction to low-intensity pure tones is presented. Successive comparison of the strength of loudness fluctuations of binaural beats (BB) with loudness fluctuations produced by binaurally presented amplitude-modulated tones is used. The dependency of the percent amplitude modulation (AM) required for a match on stimulus parameters is investigated. At a given frequency level of the tones, the matches are not affected when the frequency difference is changed from 2 to 6 cps. The %AM required for a match increases when sensation level (SL) decreases from 30 to 10 db. When frequency level is changed, the matches are about the same for 150 and 300 cps, but much less AM is required at 600 cps. The discussion is centered on the relationship of the matches to appropriate detection thresholds for AM. Changes in the detection threshold with SL fail to predict the corresponding changes in the matches; e.g., when the SL is lowered, the %AM for detection increases less than the modulation required for the match. (Author)

A66-15734
INFERENCES OF NEURAL ACTIVITY ASSOCIATED WITH BINAURAL ACOUSTIC IMAGES.
F. E. Toole and B. McA. Sayers (London, University, Imperial College of Science and Technology, Dept. of Electrical Engineering, Engineering in Medicine Laboratory, London, England).
Acoustical Society of America, Journal, vol. 38, Nov. 1965, p. 769-779. 9 refs.

Experimental results relating to the nature of acoustic images arising from binaural, repetitive, wide-band acoustic transients are reported. In addition to the tonal harmonic images that may be identified in certain circumstances, there appear to be two dominant images of impulsive character. The latter images appear to be associated with neural activity arising in specific regions of the cochlea; their lateralization characteristics may be interpreted in terms of inferred temporal features of the basilar-membrane responses in the relevant regions. Implications germane to the physiological mechanisms of binaural interaction are discussed. (Author)

A66-15735
COMPUTER RECOGNITION OF SPOKEN DIGITS BASED ON SIX NONACOUSTIC MEASURES.
W. A. Hillix, M. N. Fry, and R. L. Hershman (U.S. Navy, Electronics Laboratory, San Diego, Calif.).
Acoustical Society of America, Journal, vol. 38, Nov. 1965, p. 790-796. 8 refs.

Six low-bandwidth measures were used in three types of programs for the automatic recognition of spoken digits. The measures were chosen to be closely related to articulatory rather than to acoustic properties of speech. The first program, without any learning feature, asked specific questions about the values of the six measures; its accuracy ranged from 64% to 97% correct. Two speaker/specific programs, which learned with a sample of two utterances per digit, yielded accuracies averaging 97% when tested on new utterances from the same talker. Performance fell to 88% and 94% when learning was carried out on a pool of four speakers, and to 78% and 86% when a 3-speaker pool provided the learning for classification of a fourth speaker's utterances. It is suggested that such "nonacoustic" measures can be of substantial value in more general speech-recognition procedures. (Author)

A66-15755
MAN IN SPACE.
Winifred Sawtell Cameron (NASA, Goddard Space Flight Center, Greenbelt, Md.).
IN: INTRODUCTION TO SPACE SCIENCE (Professional Edition). Edited by W. N. Hess.
New York, Gordon and Breach Science Publishers, Inc., 1965, p. 527-547. 11 refs.

Discussion of the scientific achievements resulting from manned space flights. The main scientific results that were obtained from planned observations were - (1) confirmation of the predicted flattened sun effect of refraction on extended objects at sunrise and sunset, (2) confirmation of the normal airglow, seen as a separate band from the twilight arc, (3) finding small luminous particles, sometimes known as the Glenn effect, and (4) photographs of clouds, ocean, and land areas. Observations by Glenn, Carpenter, and Schirra are interpreted and analyzed. The results of the Soviet Voskhod I mission are described followed by similar treatment for Voskhod II. The observations made by the Gemini space flights are listed and White's walk in space is mentioned as an example of human capability in space. D.P.F.

A66-15904 #
WEIGHTLESSNESS EFFECTS ON THE HUMAN ORGANISM.
International Astronautical Federation, International Astronautical Congress, 16th, Athens, Greece, Sept. 13-18, 1965, Paper. 5 p.

Consideration of the effects of weightlessness on the human organism with particular reference to the cardiovascular system. The principles upon which this hydromechanical system operates are reviewed and it is shown that there are three predominant factors which affect the pressure in such a system - (1) the length of the fluid column in the G axis for a fluid of constant density P, (2) the volume V within, and (3) the distensibility DV/DP of the containing walls. Weightlessness or subgravity states alter the dynamic equilibrium of the system. Cardiodynamic changes in cardiac insufficiency are discussed and it is seen that weightlessness is most beneficial as a therapeutic measure. Possible counterindications are the asthenic effects provoked by prolonged exposure to zero gravity and disorders in the partition of fluids between the endovascular and extravascular spaces due to the same cause. D.P.F.

A66-15908 #
ELECTROENCEPHALOGRAPHIC (EEG) VARIATIONS IN ALBINO RATS SUBMITTED TO STRONG TANGENTIAL (TRANSVERSE) ACCELERATIONS BEFORE AND AFTER SPLENECTOMY.
C. Vacca, L. Vacca, and L. Causa (Naples, University, Institute of General and Special Physiology of Domestic Animals and Biochemistry, Naples, Italy).
International Astronautical Federation, International Astronautical Congress, 16th, Athens, Greece, Sept. 13-18, 1965, Paper. 10 p.

Analysis of the EEG, taken from 12 albino rats with an average body weight of 250 g, during sleep induced by barbiturate anesthesia in normal animals and in animals 10 days after splenectomy, before, during, and after the application of strong tangential (transverse) accelerations. It is pointed out that the results show that the changes observed in frequency, morphology, and voltage of the EEG patterns of albino rats 10 days after splenectomy, although clear enough, are not so constant and sizeable to be considered as indicative of changes in the bioelectric activity of the nervous cells. It is noted that the application of strong tangential acceleration (8 g for 90") from side to side of the animals, while bringing about very clear and deep coronary troubles, more apparent after splenectomy, did not clearly alter the EEG readings of these animals, taken either before or after splenectomy. M.M.

A66-15909 #
MICROBIAL LIFE DETECTION BY MEASUREMENT OF PHYSICAL PARAMETERS.
J. J. Konikoff (General Electric Co., Missile and Space Div., Re-Entry Systems Dept., Philadelphia, Pa.).
International Astronautical Federation, International Astronautical Congress, 16th, Athens, Greece, Sept. 13-18, 1965, Paper. 23 p. 13 refs.

This paper describes a research and development study aimed at defining a technique for the detection of microbial life by the measurement of physical parameters. Both gas and heat exchange are the parameters that are compared to infer life. These measurements are obtained while the organisms, should they be present, are metabolizing on the indigenous substrate found at the remote location. Thus, no preconceived concept concerning the basis of life nor presupplied nutrient media must be carried to the remote location. Results of preliminary experiments are presented which suggest that the approach is technically feasible and results in several advantages over presently conceived techniques. (Author)

A66-15910 #
INDEX OF LITERATURE ON SPACE MEDICINE AND BIOASTRONAUTICS PUBLISHED IN THE USSR IN 1964 AND 1965 [UKAZATEL LITERATURY PO AVIAKOSMICHESKOI MEDITSINE I BIOASTRONAVTIKE, IZDANNOI V SSSR (1964-1965)].
L. I. Boreva and E. M. Zavodovskaia.
International Astronautical Federation, International Astronautical Congress, 16th, Athens, Greece, Sept. 13-18, 1965, Paper. 68 p. In Russian.

Bibliography of Soviet papers on various aspects of space medicine and bioastronautics published in 1964 and 1965. The material covers biology, neurophysiology, sensory physiology, psychology, psychiatry, pharmacology, toxicology, and the general medical problems of space flight as well as man-machine integration and life support systems. V.Z.

A66-15914 #
EXOBIOLOGICAL STUDIES OF INTERPLANETARY SPACE AND UPPER ATMOSPHERIC LAYERS [KOSMOBIOLOGISCHE UNTERSUCHUNGEN DES INTERPLANETAREN RAUMES UND HOCH-ATMOSPHÄRISCHER SCHICHTEN].
Konstantin Tzonis.
International Astronautical Federation, International Astronautical Congress, 16th, Athens, Greece, Sept. 13-18, 1965, Paper. 4 p. In German.

Suggestion for a means of determining whether living organisms exist in interplanetary space or in the upper layers of the atmosphere. An apparatus, called a "biosyllektes" (from the Greek bios-life, syllegein-collect), for collecting such microorganisms is described. R.A.F.

A66-15925 #
THE TWO GAS SPACECRAFT CABIN ATMOSPHERE - ENGINEERING CONSIDERATIONS.
J. L. Mason.
International Astronautical Federation, International Astronautical Congress, 16th, Athens, Greece, Sept. 13-18, 1965, Paper. 8 p.

Engineering comparison between the 5 psia normal/3.5 psia emergency pure-oxygen atmosphere used in space missions to date, and the so-called two gas atmosphere, consisting of oxygen plus an inert diluent gas such as nitrogen or helium. Medical factors, although of decisive importance in final selection of an atmosphere, are not considered. Data preliminary to a final atmosphere selection are provided, and it is demonstrated that a two gas atmosphere can be reliably provided at only nominal penalty to the spacecraft relative to the pure oxygen atmosphere. B.B.

A66-15927 #
THE DESIGN OF RIGID, ARTICULATED PRESSURE SUITS.
G. Fonda-Bonardi (Litton Industries, Inc., Space Sciences Laboratories, Beverly Hills, Calif.).
International Astronautical Federation, International Astronautical Congress, 16th, Athens, Greece, Sept. 13-18, 1965, Paper. 21 p.

Study of factors affecting the design of protective suits for external pressures lower than normal. The historical background of pressure suits is surveyed, the basic requirement of mobility is discussed, and the problem of mechanization of body articulations is analyzed. The design, construction, and operation of the rotary seal and hingelike articulated joint are described. The degrees of freedom that are found to be necessary for adequate mobility are tabulated, using modern anatomical nomenclature. B.B.

A66-15929 #
ELECTROLYSIS-HYDROGENOMONAS BACTERIAL BIOREGENERATIVE LIFE SUPPORT SYSTEM.
Dale W. Jenkins (NASA, Washington, D.C.).
International Astronautical Federation, International Astronautical Congress, 16th, Athens, Greece, Sept. 13-18, 1965, Paper. 25 p. 25 refs.

Development of a new bioregenerative life support system for manned spaceflight of long duration through the combined use of electrolysis of water and growth of Hydrogenomonas eutropha bacteria. In this system, water is split into oxygen, supplied to the astronaut and bacteria, and hydrogen, which is utilized by the Hydrogenomonas bacteria together with CO_2 and urine from the astronaut. Water of respiration from the astronaut and water produced by the bacteria are used in the electrolytic process. The bacteria can be a potential partial food source. A hypothetical flow diagram shows the processes and flow of components. An electrolysis system is described which operates under conditions of weightlessness with an efficiency of about 80%. F.R.L.

A66-15941
THE SPINOCERVICAL TRACT - DORSAL COLUMN LINKAGE, CONDUCTION VELOCITY, PRIMARY AFFERENT SPECTRUM.

Arthur Taub (Massachusetts Institute of Technology, Dept. of Biology and Research Laboratory of Electronics, Cambridge, Mass.) and Peter O. Bishop (Sydney, University, Dept. of Physiology, Sydney, Australia).
Experimental Neurology, vol. 13, Sept. 1965, p. 1-21. 53 refs.
Research supported by the Teagle Foundation; National Institutes of Health Grants No. NB-04897-01, No. MH-04737-04; Contracts No. DA-36-039-AMC-03200(E), No. AF 33(615)-1747; NSF Grant No. GN-2495; Grants No. NsG-496, No. AF AFOSR 591-64.

Microelectrode studies of single units in the spinocervical tract of the cat under barbiturate anesthesia demonstrate a monosynaptic linkage between the spinocervical tract and dorsal column cutaneous afferents at the segmental level of dorsal root entry. The spinocervical tract is substantially independent of the dorsal spinocerebellar tract, at least 75% of units studied terminating in the region of the ipsilateral lateral cervical nucleus. Mean overall conduction velocity of units in the spinocervical tract is 58.0 m/sec, compared with mean overall conduction velocity of cutaneous afferents in the dorsal columns providing input to these spinocervical tract units of 38.6 m/sec. The dorsal column input contains the $A\alpha$ cutaneous component, of which the small-fibered half is most effective in exciting spinocervical tract units. The $A\delta$ component is lacking. The spinocervical tract primary afferent input contains at least all of the A group to the $A\delta$ component. Thus slow-conducting cutaneous primary afferent fibers may project to fast-conducting long pathways. Some functional and clinical aspects of the spinocervical tract and its homolog are discussed. (Author)

A66-15942
AN IMPROVED SYSTEM FOR PROLONGED EXPOSURE OF SMALL ANIMALS TO ARTIFICIAL LOW PRESSURES.
James Kollias and John Patrick Jordan (Oklahoma City University, Dept. of Biology and Chemistry, Oklahoma City, Okla.).
American Journal of Applied Physiology, vol. 20, July 1965, p. 742-744.
Grant No. NsG-300-63.

A system has been developed for exposing small animals to a low pressure-high oxygen environment. Several unique features such as (1) pressure control, (2) an electronic watering device, and (3) a constant environmental temperature are discussed. (Author)

A66-16048 #
EXPERIMENTAL STUDY OF ARTIFICIAL ATMOSPHERES OF SUPERSONIC AIRCRAFT AND MAN'S IMPERCEPTIBLE PERSPIRATION [ATMOSPHERE ARTIFICIELLE DES AVIONS SUPERSONIQUES ET PERSPIRATION INSENSIBLE DE L'HOMME - ETUDE EXPERIMENTALE].
Jean Colin and Yvon Houdas (Centre d'Essais en Vol, Laboratoire de Médecine Aéro-Spatiale, Brétigny-sur-Orge, Seine-et-Oise, France).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 10 p. 12 refs. In French.

Experimental investigation of the influence that the vapor pressure of ambient water has on water losses through imperceptible cutaneous perspiration (as well as through the respiratory tract) in an environment that is otherwise comfortable. The importance of such losses in atmospheres as dry as those anticipated for supersonic aircraft was examined. It is noted that the results obtained confirmed the existence of a linear relationship between imperceptible perspiration and the vapor pressure of ambient water, in agreement with the results obtained by Heerd and Ohara, Buettner, Webb et al., and Brebner et al. M.M.

A66-16049 #
AEROSPACE MEDICAL RESEARCH OF THE USAF AEROSPACE MEDICAL DIVISION.
T. C. Bedwell, Jr. (USAF, Systems Command, Aerospace Medical Div., Brooks AFB, Tex.).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 14 p.

Survey in brief of aerospace medical research of the USAF. The activities include research, teaching and consultation, and cover all the medico-biological and psychological problems associated with those developments that are conceivable in propeller-driven, jet, and rocket-propelled craft. The following research equipments are briefly discussed: (1) rotational flight simulator, (2) dynamic escape simulator, (3) a device for testing trace contaminants for periods up to 90 days, and (4) an artist's conception of a large cabin simulator of environmental factors of space flight, including isolation, group behavior, etc., excepting space flight dynamics and radiation. M.M.

A66-16050 #
MEDICAL WASTAGE OF AIRCREW IN THE ROYAL AIR FORCE.
P. J. O'Connor (Royal Air Force, London, England).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 4 p.

Investigation of 500 aircrews grounded permanently over a 4-year period for medical reasons, including deaths from all causes - such as from flying accidents. The medical wastage related to age is shown. The wastage, it is noted, is greatest in the first few years of flying, and the highest rate of 19 per 1000 occurred in aircrews aged from 20 to 24. It is estimated that, at the age of 55, the medical wastage rate would be 20 per 1000 annually. A comparison with similar figures of the Australian Department of Civil Aviation suggests that the medical factors which decide how long aircrews remain fit for flying may be the same in service as in civil flying. The nature of the causes of invalidism of the 500 aircrews who were withdrawn from flying for medical reasons is tabulated. Almost half of the casualties, it is pointed out, was comprised of those who had died as the result of flying accidents. One-quarter of the 500 were withdrawn from flying on the advice of the neuropsychiatrist. Of the 125 men withdrawn from flying on the advice of the neuropsychiatrist, 18 were wholly neurological. There were 9 cases of airsickness, while medical diseases were the cause of withdrawal in 76 instances. M.M.

A66-16051 #
RELATION OF PERFORMANCE TO PLANE OF HEAD TURN IN A REVOLVING SPACE STATION SIMULATOR.
B. D. Newsom, J. F. Brady, and J. M. Lagerwerff.
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 15 p. 10 refs.

Report on the investigation of crew requirements for assisting engineers in establishing design criteria for spacecraft with artificial g. The results obtained, it is noted, provide quantitative substantiation of the theoretical conclusions and empirical findings of earlier investigations that head turns in a revolving space station should preferably be executed in the plane of system rotation, if unusual labyrinthine stimulation with possible subsequent performance decrement and/or kinetosis is to be kept minimal. Some of the subjects, it is noted, experienced little vegetative reaction to making repetitive head turns when separated by time intervals of a few seconds or less. Two factors which may have been responsible for the 8 subjects regarding the 45° plane as being the most stressful are listed. As the test situation closely simulated the space station inertial environment, the results of the test can be directly related to the solution or attenuation of kinesthetic problems in a rotating space vehicle. The test situation was not complicated by the usual problem of inertial misalignment, consequently the only variable was the head-turning plane. It is noted that knowledge of the linear dependency of performance ability on the planar relationship of head rotation and vehicle rotation should be of considerable value in human factors engineering. M.M.

A66-16052 #
CLINICAL ASPECTS OF INTERPLANETARY FLIGHTS.
V. V. Parin, E. B. Zakrzhevske, R. M. Bayevske, A. I. Vorobyen, and A. A. Gurjian.
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 5 p.

Discussion concerning the clinical problems of interplanetary flights. It is demonstrated that probable diseases of astronauts can be studied on earth. Great significance is attached to investigations of clinical models of future cosmic diseases and troubles. Equal significance is attached to automation of diagnostics and medical aid aboard a spacecraft. The role of the physician as a member of the crew is discussed, together with the problem of his training and specialization. M.M.

A66-16053 #
CHEMICAL PROTECTION FROM RADIATION IN SUPERSONIC TRANSPORTS AND MANNED SPACE FLIGHTS.
G. Schafer.
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 6 p.

Consideration of the radiobiological problem of protection against radiation damage, in exposure for long periods, to fractionated radiation with relatively small doses of the most various radiation components. It is noted that, so far, only a few chemical substances have proved effective in protecting the metabolic processes directly caused by radiation or the metabolic changes occurring after exposure to radiation. Also that, apart from cell suspensions of bone marrow and spleen, vitamin B_6 (Pyridoxin) is the only biological protective substance that has been used against radiation in human medicine. The effectiveness of this vitamin is based on the fact that one of its derivatives, pyridoxal-5-phosphate, is one of the vital factors in metabolism. M.M.

A66-16055 #
DESIGNING FOR SAFETY IN THE SUPERSONIC AGE.
David Keith-Lucas.
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 14 p.

Discussion of design safety for solving problems of supersonic flight, with emphasis on aircraft control and the designer's responsibility to the pilot. The problem of navigation and control systems is considered, and the dangers inherent in automated systems - as compared with mechanized systems - are examined. The philosophy of fail-safe design is discussed, together with that of triplex systems. It is concluded that, with the developments in reliability and adaptability combined with advances in microminiaturization and solid-state circuitry, there will soon be centralized airborne computers that will control the aircraft in almost all phases of flight. It is pointed out that the attempt must be made to develop automatic systems which are as reliable as the human pilot but which are quicker at analyzing the situation, react more swiftly, and which are more consistent in their performance. M.M.

A66-16056 #
THE CONTROL OF TOXIC MATERIALS EMPLOYED IN AIRCRAFT MAINTENANCE.
Owen McGirr (British Overseas Airways Corp., London Airport, Hounslow, England).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 16 p.

Discussion of the principles of good engineering control and of the vital role of airline physicians in the application of industrial hygiene techniques. General principles are discussed whereby an airline physician can acquire the engineering and toxicological knowledge necessary for rendering toxicologically safe the day-to-day work of aircraft maintenance. Steps inherent in planning and production, when a new or revised process is contemplated, are briefly reviewed, with emphasis on those stages of environmental surveillance which are the principal concern of the airline physician. M.M.

A66-16057 #
FATIGUE-STUDIES ON OVERSEA FLIGHTS - A PRELIMINARY REPORT.
H. Brüner, K. E. Klein, S. Ruff, and H. M. Wegmann (Deutsche Forschungsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 9 p. 14 refs.

Report on the preliminary results of a study of the fatigue effects of regular flights from Frankfurt to New York and vice versa on 4 crew members (pilot, copilot, engineer, and hostess) of a jet airliner. A "circulatory index" incorporating pulse rate, pulse pressure and systolic pulse pressure, compared with that of a control group performing comparable off-flight operations, is used to measure the fatigue. A diagram of index fluctuations during New York flights, a 24-hour rest there, and return flights to Frankfurt is plotted. The diagram, showing a depression of the index after a flight and its partial recovery during rest, is briefly discussed. V.Z.

A66-16058 #
GASTRIC SECRETION IN X-IRRADIATED CATS AT THE TIME OF AND BEFORE HYPOXIA.
J. Kaulbersz, S. Konturek, R. Bilski, and T. Radecki (Kraków, Medical Academy; Higher School of Physical Education, Dept. of Physiology, Kraków, Poland).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 4 p.

Study concerned with an experimental investigation of gastric secretion in cats after the simultaneous action of hypoxia and X-irradiation. The animals tested were divided into 4 groups: (1) Group 1 was placed in a chamber with pressure lowered to half an atmosphere; this group was not irradiated, (2) Group 2 was subjected to irradiation doses of 450 r and then kept at normal atmospheric pressure, (3) Group 3 was irradiated with 450 r at the time the animals were subjected to a pressure of one-half atmosphere - the hypoxia lasted for 3 hr before irradiation and, after irradiation, the animals were taken out of the chamber and were held at normal atmospheric pressure, and (4) Group 4 was placed in a low-pressure chamber immediately after irradiation with a dose of 450 r. The results, it is noted, indicate that hypoxia applied at the time of irradiation prevents its inhibitory action on gastric secretion in cats and reduces the general post-irradiation symptoms. On the other hand, when it is applied after irradiation, it causes a more marked inhibition of the gastric secretory function than when acting without previous X-ray exposure. In confirmation of previous results, the experiments showed that the inhibitory effect of X rays on the secretory function of the stomach may be considerably intensified after placing the animals in lowered atmospheric pressure. It seems that irradiation preceding hypoxia affects the organism to a considerably greater degree than each of these stress factors separately. Quite different results were obtained in the case of simultaneous application of hypoxia and irradiation. M.M.

A66-16059 #
RADIOACTIVE CONTAMINATION OF AIRCRAFT AND ITS EFFECTS ON AIRCRAFT MAINTENANCE.
Kempton Hare (British Overseas Airways Corp., London Airport, Hounslow, England).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 11 p.

Discussion of problems presented by the accumulation of radioactive fallout dust adhering to the exterior skin and to the internal surfaces of engines and of components subjected to substantial mass airflow in high-flying jet aircraft of civil airlines. Tables show the steady buildup of deposition of the Boeing 707, demonstrating not only the effect of the increase in flying hours, but indicating also a seasonal variation presumably due to the effects of spring fallout. The magnitude of the problem is considered, together with washing and monitoring procedures for its containment and precautions for protecting the personnel involved. It is noted that the International Air Transport Association has issued guidance material to its member airlines, setting forth recommended monitoring procedures and precautions for each contamination range. The object is to ensure that any aircraft of any airline can be handled safely during transit stops at any airport in the world. M.M.

A66-16060 #
VISION AND PILOTING OF A SUPERSONIC COMMERCIAL AIRCRAFT [VISION ET PILOTAGE D'UN AVION COMMERCIAL SUPERSONIQUE].
A. Mercier, R. Laplane, and E. Lafontaine (Compagnie Nationale Air France, Service Médical Central, Paris, France).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 10 p. 23 refs. In French.

Discussion of problems of visual acuity, disturbance of mental processes, and the slowing down of reaction time in pilots flying supersonic commercial aircraft, due to their particular design features. Although the importance of experience acquired during a long aeronautical career should not be minimized, it is noted that age has the effect of lowering the efficiency of visual powers in all significant aspects of supersonic flight. M.M.

A66-16061 #
A CONTRIBUTION CONCERNING THE PROBLEM OF PHYSIOLOGICAL WEIGHTLESSNESS.
W. Briegleb.
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 8 p.

Study concerning an experimental investigation of gravitational influence on living organisms in the laboratory, by the application to microorganisms of the klinostate principle. It is noted that this method can be applied also to tissue cultures and to small eggs of higher organisms. Tests were made on an inclined agar culture of a microscopic alga fixed in a horizontally rotating system. By the use of a cross-line, the equally inoculated agar plate was placed in intersection with the axis of rotation. The velocities of rotation were 140 and 350 rpm. It is pointed out that, under these conditions, loss effects on the functions of the cell can be recognized as macroscopically or microscopically visible changes of the culture in the rotation center; cells of the culture in the center can be separated by inoculation and tested further. In tests with light microscopical observation of alga cultures rotating for 4 weeks at 140 and/or 350 rpm, no reaction was noticed. The next test, it is noted, will call for the application of higher velocities of rotation to test rhythmic appearance with synchronized cultures. M.M.

A66-16062 #
PROTECTION OF FLYING PERSONNEL AGAINST ACCIDENTAL IMMERSION IN COLD WATER [PROTECTION DU PERSONNEL NAVIGANT CONTRE L'IMMERSION ACCIDENTELLE EN EAU FROIDE].
Y. Houdas, R. Yout, and J. Colin (Centre d'Essais en Vol, Laboratoire de Médecine Aéro-Spatiale, Brétigny-sur-Orge, Seine-et-Oise, France).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 7 p. 6 refs. In French.

Experimental investigation of the tolerance of the human organism to sudden immersion in cold water. The results showed that the combination of the stratospheric suit EFA 30 and of the neoprene suit EFA 11 worn by a subject immersed in water at 5°C led to a heat loss four times less than that undergone by a naked subject immersed in water at 15°C (known from studies of accidents to be the threshold temperature). The wearing of the two suits in combination led to a heat loss of half that experienced by a subject wearing a standard suit in water at 17°C. M.M.

A66-16063 #
RESPIRATORY EQUIPMENT AND EXPLOSIVE DECOMPRESSION [EQUIPEMENTS RESPIRATOIRES ET DECOMPRESSIONS EXPLOSIVES].
P. Varene, C. Jacquemin, J. Timbal, and J. Demange (Centre d'Essais en Vol, Laboratoire de Médecine Aéro-Spatiale, Brétigny-sur-Orge, Seine-et-Oise, France).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 5 p. 6 refs. In French.

Investigation of the effects of explosive decompression on the respiratory system as observable in the case of pressurized suits operating at high altitudes. It is shown that if the delay in a pressure suit in adjusting to explosive decompression takes place in the thoracic region it may have a beneficial effect on the response of the respiratory system of the pilot to such decompression, but on the other hand if the delay occurs in the helmet this may be prejudicial. Under the most extreme experimental conditions, with an initial pressure of 370 mb, an initial altitude of 7700 meters, final pressure of 70 mb, and final altitude of 18,500 meters, and where the ratio of the suit volume to the size of the decompression orifice was 17.5/1, intrathoracic suppression was recorded at 30 mb when decompression was applied at the end of normal exhalation. D.P.F.

A66-16064 #
INFLUENCE OF LOCALLY APPLIED ADRENALINE ON RESISTANCE TO ACUTE HYPOXIA [L'INFLUENCE DE L'ADRENALINE APPLIQUEE LOCALEMENT SUR LA RESISTANCE VIS-A-VIS DE L'HYPOXIE AIGUE].
Nikola Dekleva and Jovan Davidović (Hôpital de la Ville de Zemun, Zemun, Yugoslavia).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 16 p. 6 refs. In French.

Investigation of the protective effect of adrenaline, injected subgaleally, on the survival time of rats subjected to acute hypoxia. Six groups of adult albino rats weighing 150 to 180 g were used in this study. All animals, except controls, were treated previously or during the experiment with adrenaline in a dose of 1 or 2 μg per animal. Rats were placed in a decompression chamber and subjected to the simulated altitude of 12,000 m, at rates of ascent of 1000 m/min. The animals were restrained immediately before altitude exposure, and body temperature, ECG, trace, rate of respiration as well as survival time were continuously recorded. On the basis of the results of the experiments, it might be concluded that locally applied adrenaline may both increase the tolerance to acute hypoxia and prevent the development of cerebral edema induced by severe hypoxia. M.F.

A66-16065 #
HEARING TROUBLES AMONG CIVIL AIRCREW PERSONNEL [TROUBLES DE L'AUDITION CHEZ LE PERSONNEL NAVIGANT CIVIL].
A. Hustin (SABENA, Division Médicale, Brussels, Belgium).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 5 p. In French.

Discussion of troubles in the acoustic and vestibulary organs which, in the case of aircrews, are subjected to unusual and possible harmful excitations. Noise, and audible or inaudible vibrations, cause an acoustic fatigue which often involves a special form of deafness. It is considered necessary to conduct regular audiometric surveys and to urge flight personnel to consult specialists when troubles commence. F.R.L.

A66-16066 #
STUDY OF IMPRESSIONS AND NYSTAGMIC REACTIONS IN ALTERNATING ROTATIONS BELOW THE THEORETICAL EXCITATION THRESHOLD [ETUDE DES IMPRESSIONS ET DES REACTIONS NYSTAGMIQUES DANS LES ROTATIONS ALTERNEES EN-DESSOUS DU SEUIL D'EXCITATION THEORIQUE].
A. Hustin (SABENA, Division Médicale, Brussels, Belgium).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 6 p. In French.

Results of generating a sensation of rotation and then a nystagmic reaction by rotating the subject and then abruptly halting the rotation. The threshold of feeling was found to be below that of the excitation of nystagmus. A patient was placed, seated, in a wire-suspended framework which acted like a torsion pendulum, and could be rotated in either direction with uniform acceleration and deceleration. Such motions were found to lower the threshold of excitation of the labyrinth; lowering the threshold, in turn, caused sensations of rotation and of nystagmus which did not follow the direction of rotation in a rigorous manner. F.R.L.

A66-16067 #
BIOLOGICAL RESULTS OF DETONATION AND DECOMPRESSION RESEARCH [RESULTATS BIOLOGIQUES DE RECHERCHES DE DETONATION ET DE DECOMPRESSION].
O. Wünsche (Deutsche Forschungsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
International Congress on Aeronautic and Space Medicine, 13th, Dublin, Ireland, Sept. 14-18, 1964, Paper. 5 p. In French.

Experimental investigation showing that the biological effects (such as the appearance of lesions) produced by explosive decompression resemble the effects resulting from detonation of explosives. In explosive tests conducted to determine the limits of mortality of white mice subjected to abrupt pressure changes, it was found that (1) there resulted pulmonary lesions in the form of hemorrhages of various extent having somewhat the appearance of an infarct with destruction of lung tissue, and (2) there occurred serious disturbances in breathing - including some that caused death - due to loss of breathing surface from hypoxemia. M.M.

A66-16119
ELECTRON MICROSCOPIC AND BIOCHEMICAL CHARACTERIZATION OF FRACTION I PROTEIN.
R. Haselkorn, H. Fernández-Morán, F. J. Kieras, and E. F. J. van Bruggen (Chicago, University, Dept. of Biophysics, Chicago, Ill.).
Science, vol. 150, Dec. 17, 1965, p. 1598-1601. 17 refs.
Research supported by the University of Chicago; U.S. Public Health Service Grants No. AI-04448, No. AI-06279; National Institutes of Health Grants No. NB-04267, No. GM-13243; Grant No. NsG-441-63; AEC Contract No. AT (11-1)-1344.

Electron micrographs of high resolution have been obtained from fraction I protein of Chinese cabbage leaves. The protein, which has ribulose-1, 5-diphosphate carboxylase activity, appears to be a cube with edge of about 120 Å. Substructure can be seen in individual particles, consistent with a model having 24 subunits, the number prescribed by the available physical and chemical data. (Author)

A66-16234
PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965.
Edited by Paul Horowitz (North American Aviation, Inc., El Segundo, Calif.).
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965. 207 p.
$12.75.

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FOODS AND FOOD SYSTEMS AS INFLUENCED BY ZERO-GRAVITY SPACE FLIGHT. A. Richards, B. Wendrow (North American Aviation, Inc., Downey, Calif.), and I. Streimer (San Fernando Valley State College, Northridge, Calif.), p. 31-38. 21 refs. [See A66-16236 06-05]

WEIGHTLESSNESS VERSUS ARTIFICIAL GRAVITY. G. N. Hoover (North American Aviation, Inc., Downey, Calif.), p. 39-46. 15 refs. [See A66-16237 06-05]

BODY HEAT STORAGE IN FULL-PRESSURE SUITS. E. C. Wortz, L. E. Browne, E. J. Prescott, and D. K. Edwards (Garrett Corp., Los Angeles, Calif.), p. 47-61. 13 refs. [See A66-16238 06-05]

EFFECT OF SIMULATION AND ENVIRONMENT ON MAN'S PERFORMANCE IN SPACE. Raymond E. Geller (Lockheed Aircraft Corp., Burbank, Calif.), p. 63-70. 5 refs. [See A66-16239 06-05]

STUDIES CONCERNING LOW-FRICTION SIMULATION. A. T. Pessa and W. R. Pierson (Lockheed Aircraft Corp., Burbank, Calif.), p. 71-78. [See A66-16240 06-11]

AN INTEGRATED APPROACH TO EVALUATING THE PERFORMANCE CAPABILITIES AND PHYSIOLOGICAL STATE OF SPACECRAFT CREWS. R. S. Lincoln and J. E. Mangelsdorf (Lockheed Aircraft Corp., Sunnyvale, Calif.), p. 79-100. [See A66-16241 06-05]

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DETERMINING FLIGHT CREW CAPABILITY FOR A MANNED ORBITAL RESEARCH LABORATORY. J. D. Brower (Douglas Aircraft Co., Inc., Santa Monica, Calif.), p. 119-136. [See A66-16243 06-05]

SOME CONSIDERATIONS REGARDING THE DEFINITION OF MAN'S ROLE IN FUTURE SPACE MISSIONS. Edward R. Jones (McDonnell Aircraft Corp., St. Louis, Mo.), p. 137-148. [See A66-16244 06-05]

HUMAN PERFORMANCE CAPABILITIES IN SPACECRAFT CONTROL. Leland G. Summers (Space Technology Laboratories, Inc., Redondo Beach, Calif.), p. 149-165. 5 refs. [See A66-16245 06-05]

TESTING THE EFFECTS OF EXTENDED SPACE MISSIONS ON PILOTING SKILL. Charles R. Kelley (Dunlap and Associates, Inc., Santa Monica, Calif.), p. 167-186. 16 refs. [See A66-16246 06-05]

TELESCOPE FIELD-OF-VIEW REQUIREMENTS FOR STAR RECOGNITION. R. W. Allen and M. L. Hershberger (Hughes Aircraft Co., Culver City, Calif.), p. 187-199. 8 refs. [See A66-16247 06-21]

THE INFLUENCE OF MAN ON SPACECRAFT DESIGN. Albert H. Urmer (Lear Siegler, Inc., Santa Monica, Calif.), p. 201-207. [See A66-16248 06-05]

A66-16235
PREDICTION OF HUMAN THERMAL COMFORT IN OXYGEN-NITROGEN ATMOSPHERES.
P. J. Berenson (Garrett Corp., AiResearch Manufacturing Co., Los Angeles, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05]
Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 1-29. 15 refs.
NASA-supported research.

The problem of human thermal comfort is analyzed after a summary of the information available in the literature on the interrelated factors of metabolic rates, physiological characteristics, and comfort criteria. Simplified equations for calculating the free- and forced-convection energy transfer rates between man and any oxygen-nitrogen atmosphere are presented. These equations are combined with a general comfort criterion to yield comfort zone predictions for oxygen-nitrogen mixtures as a function of gravity, pressure, temperature, velocity, and metabolism which agree with the comfort zone data obtained on earth. Finally, the effects that were assumed to be negligible are discussed to show where improvements may be possible in the analysis and what additional experimental information is required. (Author)

A66-16236
FOODS AND FOOD SYSTEMS AS INFLUENCED BY ZERO-GRAVITY SPACE FLIGHT.
A. Richards, B. Wendrow (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.), and I. Streimer (San Fernando Valley State College, Dept. of Psychology, Northridge, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05]
Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 31-38. 21 refs.

Examination of certain factors involved in the design of food-handling systems for extended-duration space flight programs. An attempt is made to revise current thought about subsystem requirements of food-handling systems, especially in regard to the variables in metabolic response resulting from work performance, crew activities, mission length, and the influences from other system operational duties. A.B.K.

A66-16237
WEIGHTLESSNESS VERSUS ARTIFICIAL GRAVITY.
G. N. Hoover (North American Aviation, Inc., Space and Informatic Systems Div., Downey, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05]
Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 39-46. 15 refs.

Consideration of artificial gravity through slow rotation as a solution to the weightlessness problem encountered in long, manned space flights. The debilitating effects of weightlessness, particularly cardiovascular deconditioning, and the biological problems associated with rotating environments, are considered. Some design difficulties of a rotating space station are briefly described. Areas needing further investigation to better determine the tradeoffs between weightlessness and artificial gravity are suggested. R.A.F.

A66-16238
BODY HEAT STORAGE IN FULL-PRESSURE SUITS.
E. C. Wortz, L. E. Browne, E. J. Prescott, and D. K. Edwards (Garrett Corp., AiResearch Manufacturing Co., Los Angeles, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05]
Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 47-61. 13 refs.

Description of observations of body-heat storage during experiments conducted to the point of "physiological limit" conditions. The average metabolic rates and their associated heat-removal rates are obtained for subjects walking at various rates on treadmills. It is found that a large amount of heat storage can take place in actively working muscle tissue and that such storage does occur during the pressure-suit activities tested. It is said that, because of this heat storage, a considerably higher overall body-heat storage may be tolerated than is generally considered possible (1000 vs 600 Btu, if the heat is developed during heavy exercise). A.B.K.

A66-16239
EFFECT OF SIMULATION AND ENVIRONMENT ON MAN'S PERFORMANCE IN SPACE.
Raymond E. Geller (Lockheed Aircraft Corp., Lockheed-California Co., Burbank, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05]
Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 63-70. 5 refs.

Study of the problem of earth simulation of the space environment carried out from the standpoint of establishing a common base line from which to measure the in-space maintenance task and to evaluate the simulation results. Factors involved in the selection of subjects, performance evaluation, and measurement of psychological and physiological parameters are taken into account. The influencing or contributing effects of simulation are separated from the experimental results to permit a better understanding of the work-task effort. The results of studies carried out in standard-gravity and low-friction environments are presented. A.B.K.

A66-16241
AN INTEGRATED APPROACH TO EVALUATING THE PERFORMANCE CAPABILITIES AND PHYSIOLOGICAL STATE OF SPACECRAFT CREWS.
R. S. Lincoln and J. E. Mangelsdorf (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05]
Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 79-100.

Description of a development project concerned with all major aspects of crew monitoring - from the development of measurement techniques to the interpretation of processed data. The objectives of the project are: (1) to develop an automatic system to assist in monitoring crew performance capabilities and physiological state, and (2) to develop digital techniques for processing, displaying, and analyzing obtained data. (Author)

A66-16243
DETERMINING FLIGHT CREW CAPABILITY FOR A MANNED ORBITAL RESEARCH LABORATORY.
J. D. Brower (Douglas Aircraft Co., Inc., Santa Monica, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05]
Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 119-136.
Contract No. NAS 1-3612.

Summary of the methodology employed in determining flight crew capability for the MORL and the problems encountered in carrying out the study. The methodology employed and the results of the crew composition analysis are reviewed to illustrate how crew capability determines the size of the vehicle, duration of the mission, and on-board experimental capability of the system. Specific problems involved in developing an experimental program are also discussed. A brief description of the MORL system which evolved from the analysis is provided. Finally, the conclusions reached at the end of the study are outlined. (Author)

A66-16244
SOME CONSIDERATIONS REGARDING THE DEFINITION OF MAN'S ROLE IN FUTURE SPACE MISSIONS.
Edward R. Jones (McDonnell Aircraft Corp., Engineering Psychology Dept., St. Louis, Mo.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05]
Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 137-148.

Description of the status of knowledge regarding man's ability to contribute effectively to operations in space, and definition of some approaches for gaining further information. Measurement issues and potential problems in obtaining information on man's capability from simulators and on-orbit are discussed. The theme is the development of a technology of human performance related to space-specific areas. (Author)

A66-16245
HUMAN PERFORMANCE CAPABILITIES IN SPACECRAFT CONTROL.
Leland G. Summers (Space Technology Laboratories, Inc., Control Systems Dept., Manual Control and Crew Performance Section, Redondo Beach, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05] Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 149-165. 5 refs.

Simulation and experimental studies have been used to determine man's capability in several aspects of spacecraft guidance and control. Analysis of manual control tasks in orbital rendezvous and lunar landing of manned and unmanned spacecraft led to five simulation studies. One study determined man's capability to detect a target satellite illuminated by the sun against a starfield background in an orbital rendezvous. A rendezvous simulation investigated man's capability to control a spacecraft while approaching, station-keeping, and circumnavigating an uncooperative target. Two lunar landing simulation studies investigated man's capability to land an unmanned lunar vehicle by remote control. A third lunar landing simulation evaluated different attitude control modes for hover and landing the LEM vehicle. In all of the studies, experimental data proved to be invaluable for the establishment of design criteria for the guidance and control systems. (Author)

A66-16246
TESTING THE EFFECTS OF EXTENDED SPACE MISSIONS ON PILOTING SKILL.
Charles R. Kelley (Dunlap and Associates, Inc., Santa Monica, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05] Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 167-186. 16 refs.

A three-axis acceleration control task designed to detect space flight-induced decrements in piloting skills is suggested. The task adjusts itself automatically until it is as difficult as the operator is able to handle. The score for such a test is in terms of how difficult a task the operator can cope with at a pre-established level of performance. The development, scoring, mechanization, and validation of such a test are discussed. (Author)

A66-16248
THE INFLUENCE OF MAN ON SPACECRAFT DESIGN.
Albert H. Urmer (Lear Siegler, Inc., Santa Monica, Calif.).
IN: PHYSIOLOGICAL AND PERFORMANCE DETERMINANTS IN MANNED SPACE SYSTEMS; PROCEEDINGS OF THE AMERICAN ASTRONAUTICAL SOCIETY AND HUMAN FACTORS SOCIETY SYMPOSIUM, SAN FERNANDO VALLEY STATE COLLEGE, NORTHRIDGE, CALIF., APRIL 14, 15, 1965. [A66-16234 06-05] Edited by Paul Horowitz.
Baltimore, Md., American Astronautical Society (AAS Science and Technology Series. Volume 5), 1965, p. 201-207.

Consideration of the ways in which spacecraft design is influenced by man in his capacity as a designer and as a crew member. An attempt is made to identify the human performance and physiological parameters most likely to be influenced by the environments he will encounter during space flight. The fallacy of indiscriminate extrapolation of simulation results to the solution of more advanced spacecraft-design problems is pointed out. Certain problems that must be taken into account in designing visual subsystems are cited. A number of factors adversely affecting the performance of in-flight work tasks are discussed. The need to take measures to counter or mitigate physiological changes occurring during space flight is emphasized. A.B.K.

A66-16322 #
LIFE IN THE UNIVERSE - INTIMATIONS, AND IMPLICATIONS FOR SPACE SCIENCE.
Cyril Ponnamperuma (NASA, Ames Research Center, Exobiology Div., Chemical Evolution Branch, Moffett Field, Calif.).
Astronautics and Aeronautics, vol. 3, Oct. 1965, p. 66-69.

Consideration of the relative abundance possibilities of extra-terrestrial life, the biochemical origins of life, and speculation on the nature of life-forms on other planets outside of our solar system. Brown's studies on the distribution of stars according to luminosity indicate that more than 60 invisible bodies larger in mass than Mars exist in the neighborhood of each star; in our galaxy alone, according to Brown, there must be at least 10^{11} possibilities of life. Fraenkel-Conrat's experiments, in which a virus particle was separated into a nucleic acid and a protein and recombined to form a virus with infective character, emphasize the common origin of all living matter. Recent developments in quantum biochemistry, involving the phenomenon of electronic delocalization, are discussed. In the light of these and other pertinent data, it is shown that life elsewhere in the universe will probably be based on carbon and water. D.P.F.

A66-16323 #
AUTOMATED LIFE DETECTION.
Richard S. Young (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Astronautics and Aeronautics, vol. 3, Oct. 1965, p. 70-76.

Consideration of optimization criteria applicable to a choice of experiments designed to verify the existence of life on the planet Mars. The latest data relative to the Martian atmosphere and surface conditions are reviewed. The existence of life can be characterized by growth, movement, irritability, reproduction, and metabolism. In view of the conditions assumed to be prevalent on Mars (extreme diurnal temperature changes), it is shown that chemistry, metabolism, and reproduction seem to be the most suitable criteria upon which an experimental life-detection program could be based. The problems related to chemical life-detection tests are discussed; one of the main problems in the design of metabolic experiments will be the selection of substrates. Heat as a by-product of metabolism may prove to be a more useful criterion. The problems connected with the identification of reproduction as a criterion for life are discussed. D.P.F.

A66-16348
VISUAL CONTOURS IN HOMOGENEOUS SPACE.
T. Shipley (Miami, University, School of Medicine, Bascom Palmer Eye Institute, Miami, Fla.).
Science, vol. 150, Oct. 15, 1965, p. 348-350. 7 refs.

Introduction of the concept of the stereoscopic edge, an edge that exists visually in the absence of physical contours, with the aid of the Julesz figures. This edge, as well as the full complex of normal stereoscopy, can be present in the complete absence of physical contours at the fovea to approximately $\pm 3.00^{\circ}$ from fixation. M.F.

A66-16357
INTERACTION BETWEEN CHLOROPHYLL AND HYDROQUINONE.
Eiji Fujimori and Maria Tavla (USAF, Office of Aerospace Research, Cambridge Research Laboratories, Space Physics Laboratory, Energetics Branch, Photobiology Section, Bedford, Mass.).
Nature, vol. 208, Oct. 2, 1965, p. 78, 79. 13 refs.

Assessment of the effects of hydroquinone on the photovoltaic characteristics of optically excited chlorophyll. The addition of hydroquinone to a solution of chlorophyll in de-aerated methanol is found to reduce greatly the photovoltaic change, which is defined as the difference between the redox-potential of the system and the electrode potential of a saturated calomel electrode. The redox potential of the chlorophyll-hydroquinone system decreases in light, and is restored to approximately the initial value when the light is removed. Electron spin resonance investigations confirm the suggestion that this photo-reversible change is due to one-electron transfer from hydroquinone to chlorophyll. The effect of oxygen on this system is also discussed. P.K.

A66-16405
TEMPERATURE EFFECTS ON THE PERIPHERAL AUDITORY APPARATUS.
Alfred C. Coats (Baylor University, College of Medicine, Houston, Tex.).
Science, vol. 150, Dec. 10, 1965, p. 1481-1483. 14 refs.
Grant No. NsG-390.

Experimental study of the effect of temperature change on the cochlear microphonic and on the action potential of the auditory nerve. It is found that cooling with a thermoelectric cold probe, well localized in the region of the cochlea, produces a rapid, reversible decrease in the amplitude and an increase in the latency of the action potential induced by clicks; and that these changes closely resemble those produced by reducing click intensity. It is shown that temperature also affects the amplitude of the cochlear microphonic, but the amount of change is considerably less than, and is poorly correlated with, the amplitude change of the action potential. It is speculated that temperature may act on a hypothetical "excitatory process" in the cochlea, which comes after the cochlear microphonic in the sequence leading to production of the action potential of the auditory nerve. M. L.

A66-16463
MOLECULES AND MEMORY.
Francis O. Schmitt.
Harvard Review, vol. 3, Spring 1965, p. 1-7.
Grant No. NsG-462.

Discussion of the possible role played by RNA molecules in memory processes. It is suggested that memory is not localized within a specific neuronal net, but is diffused throughout the brain. This implies that each neuron is connected with many others, so that the information delivered to one neuron can be transmitted to others remote from the original location. This can occur if certain molecules operate as synaptic controls in order to switch the impulses out of and into the various possible nets. The possible role of RNA, in acting as a switching element for programing the synthesis of information-bearing molecules, is discussed. P. K.

A66-16493
AIR POLLUTION EVALUATION OF TITAN II TEST FIRINGS.
Philip Diamond and Hamilton K. Johnson (USAF, Systems Command, Aerospace Medical Div., Regional Environmental Health Laboratory, McClellan AFB, Calif.).
American Industrial Hygiene Association, Journal, vol. 26, July-Aug. 1965, p. 419-422.

Analysis of the possible air pollution hazard to personnel from the exhaust gases of Titan II missile engines. The Titan II uses Aerozine-50 fuel, a mixture of equal weights of hydrazine and 1,1-dimethylhydrazine (UDMH), with a nitrogen tetroxide oxidizer. It is noted that the downwind dissipation of toxicologically significant combustion products was examined during static-test firings of the missile engine. The methods used for collecting and analyzing the various components of the exhaust cloud are described. No downwind personnel hazard was found. P. K.

A66-16533
VOLUNTARY DEHYDRATION IN MAN.
John E. Greenleaf and Frederick Sargent, II (Illinois, University, Dept. of Physiology and Biophysics, Urbana, Ill.).
Journal of Applied Physiology, vol. 20, July 1965, p. 719-724. 21 refs.
Public Health Service Grants No. A-4210; No. GPM-15290.

The effects singly and in combination of heat, exercise, and hypohydration upon voluntary dehydration were studied in four acclimated, physically fit, young men. Voluntary dehydration is the delay in complete rehydration following water loss. Hypohydration refers to the state of decreased water content while the osmotic concentration of the body is maintained. Ad libitum drinking during the heat experiments was 146% greater than it was in the cool experiments. Hypohydration increased drinking 109% over the corresponding hydration experiment; exercise increased water intake 41% over resting. Hypohydration and exercise were less effective than heat in stimulating drinking. During the 4-hr experimental periods, the subjects did not or could not drink enough to compensate for the water lost. Regardless of the magnitude of the water deficit at the beginning of the recovery periods, the rates of rehydration were the same. The more stressful the experiment, the greater the water consumption and, in general, the longer it took to regain the lost water. (Author)

A66-16564
ACTION OF GRAVITY ON BASIPETAL TRANSPORT OF AUXIN.
Charles J. Lyon (Dartmouth College, Dept. of Biological Sciences, Hanover, N.H.).
Plant Physiology, vol. 40, Sept. 1965, p. 953-961. 19 refs.
NSF Grant No. G-13140; Grant No. NsG-231.

Experimental study of the movement of auxin in relation to previously reported curvatures in the axes of plants as they grow on horizontal clinostats. Axial growth rates and auxin transport are also studied by growing plants both erect and on clinostats. Bioassays of endogenous auxin from the convex and concave sides of curvatures in bean and cabbage (Coleus blumei) stems are found to indicate no significant imbalance in residual growth hormone extractable with chloroform. But radioassays of the distribution of extractable, radioactive indoleacetic acid (IAA-2-Cl4) within a curved stem are found to indicate that a large excess of this auxin had been transported from a terminal supply into the convex half of the curvature. Similar growth curvatures and unequal distributions of radioactivity are obtained when this auxin is supplied to one side of an axis or when its basipetal transport from a terminal supply was blocked on one side close to the supply. It is emphasized that no such differential distributions are found in erect-grown plants. It is therefore concluded that the action of gravity in maintaining the erect form of the terrestrial plant is direct and significant. M. L.

A66-16565
STAINING PROPERTIES OF LANTHANUM ON CELL MEMBRANES.
C. F. Doggenweiler (Harvard Medical School, Research Laboratory, McLean Hospital, Cambridge, Mass.) and S. Frenk (Massachusetts Institute of Technology, Research Laboratory of Electronics, Cambridge, Mass.).
National Academy of Sciences, Proceedings, vol. 53, Feb. 1965, p. 425-430. 12 refs.
Research supported by the Bell Telephone Laboratories; National Institutes of Health Grants No. B 2665, No. MH-04737-04; NSF Grants No. GB-574, No. GP-2495; Grant No. NsG-496; Contracts No. AF 33(615)-1747, No. DA-36-039-AMC-03200(E).

Experimental investigation of the use of lanthanum as a staining agent in the preparation of tissues for study by electron microscopy. The previous finding that La^{+++} acts in the peripheral nervous system like a "super-Ca^{++}" is noted, as is the fact that lanthanum has an electron scattering power high enough to produce contrast in electron microscope images. The use of La^{+++} either before fixation, using $La(NO_3)_3$, or during fixation, using $La(MnO_4)_3$, is considered. The details of the methods used are presented. The specimens used in the study include pieces of frog retina and sciatic nerve, as well as lobster and crayfish walking leg nerves and crayfish nerve cord. Several micrographs are presented. It is concluded that the use of lanthanum results in the unusual tagging of several inter- and extracellular structures; in particular, a surprising degree of density is produced in the intercellular substance in the nervous systems of vertebrates and invertebrates. M. L.

A66-16605 #
BIOLOGICAL EFFECTS OF CHRONIC ACCELERATION.
A. H. Smith and C. F. Kelly (California, University, Dept. of Animal Physiology, Davis, Calif.).
Naval Research Reviews, vol. 18, Nov. 1965, p. 0-10, 33.

Examination of the biological effects resulting from chronic acceleration for which centrifuges, with specially designed cages for birds and animals, are used. The exposure of animals to chronic acceleration, it is noted, may result in a substantial mortality. The debilities developed by birds in hyperdynamic environments are rather discrete, and two syndromes have been recognized - one of them, which involves leg paralysis, is uniformly lethal, while the other may be reversed spontaneously with the bird returning to a quasi-normal condition. Both syndromes are reversed readily upon return to normal gravity. Death from acceleration sickness generally occurs in 3 to 4 days after the onset of the symptoms. D.P.F.

A66-16730
ELECTROSTATIC ASPECTS OF PHYSICAL ADSORPTION - IMPLICATIONS FOR MOLECULAR SIEVES AND GASEOUS ANESTHESIA.
Sidney W. Benson (Stanford Research Institute, Menlo Park, Calif.) and James W. King, Jr. (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.).
Science, vol. 150, Dec. 24, 1965, p. 1710-1713. 22 refs.
The equations of electrostatics are applied to the adsorption of gases on molecular sieves. Separations on sieves are caused not by the size of the molecules but by electrostatic forces between the gases and the strong electric fields of the sieves. Electrostatic interactions can also explain the phenomenon of general anesthesia. (Author)

A66-16733
SLEEP - EFFECTS OF A RESTRICTED REGIME.
Wilse B. Webb and H. W. Agnew, Jr. (Florida, University, College of Arts and Sciences, Dept. of Psychology, Gainesville, Fla.).
Science, vol. 150, Dec. 24, 1965, p. 1745-1747. 10 refs.
Grant No. AF AFOSR 395-65.
Eight young male subjects were permitted to sleep only 3 hr out of each 24 for 8 days. Electroencephalographic recordings were made during the 3-hr period of sleep. There was an increase in the amount of deep sleep (Stage 4) during this period. On a recovery night, the first 6 hr revealed a significant increase in deep sleep, and beyond this period there was a sharp increase in Stage-1 rapid eye movement sleep. (Author)

A66-16807
BIONIC ADAPTABILITY FOR FLIGHT CONTROL SYSTEMS.
Robert L. Johnson (USAF, Systems Command, Research and Technology Div., Avionics Laboratory, Bionics Branch, Wright-Patterson AFB, Ohio).
Space/Aeronautics, vol. 44, Dec. 1965, p. 91, 92, 94, 96, 98.
Description of a probability state variable (PSV) device called a neurotron, which is a machine model of a neuron and can perform all the 16 functions of two independent input variables. A schematic of the basic operation of the neurotron is given. Although the mathematics and organization of large networks of neurotrons have yet to be worked out, it is thought that PSV devices in general, and the neurotron in particular, can in the meantime be used in self-organizing systems that promise to solve the problem of high-speed flight control. Such systems would not have to be programed, but would merely require formulation of the desired solution to the problem. R. A. F.

A66-16822
ENDOCRINE AND METABOLIC RESPONSE OF DOGS TO WHOLE BODY VIBRATION.
Ben B. Blivaiss, Renato Litta-Modignani, Giorgio Galansino, and Piero P. Foa (Chicago Medical School, Dept. of Physiology, Chicago, Ill.).
Aerospace Medicine, vol. 36, Dec. 1965, p. 1138-1144. 45 refs.
Contract No. AF 33(616)-6889.
To determine the endocrine and metabolic response of restrained dogs to whole body vibration, pentobarbital anesthetized and nonanesthetized dogs were vibrated horizontally. After vibration of anesthetized dogs at either 4 cps, 0.4 G for 30 minutes or 2 hours, or at 10 cps, 2.3 G for 2 hours, there was an average increase of 4.08 mcg 17-hydroxycorticosteroids (17-OH-CS) per 100 ml plasma and a significant increase in blood epinephrine but not serotonin or norepinephrine. Shaking at 4 cps, 1.7 G for 30 minutes produced less of a change in plasma 17-OH-CS than at 0.4 G. However, shaking at 4 cps for 6 hours led to greater increase in plasma 17-OH-CS at 1.7 G than at 0.4 G. Nonanesthetized dogs shaken at 4 cps for 30 minutes had a greater increase of plasma 17-OH-CS than similarly shaken anesthetized dogs, thus showing a greater sensitivity of kinesthetic receptors to vibratory stimuli. Possible mechanisms for alterations in endocrine function are discussed. (Author)

A66-16823
INFLUENCE OF LOWER BODY NEGATIVE PRESSURE ON THE LEVEL OF HYDRATION DURING BED REST.
Lawrence E. Lamb (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Aerospace Medical Sciences Div., Brooks AFB, Tex.) and Paul M. Stevens (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Aerospace Medical Sciences Div., Internal Medicine Branch, Brooks AFB, Tex.).
Aerospace Medicine, vol. 36, Dec. 1965, p. 1145-1151. 8 refs.
In four subjects, bed rest was used to induce recumbency diuresis. This was manifested by a decrease in fluid balance, body weight, and plasma volume, accompanied with an increase in hematocrit. After the changes from bed rest had occurred, the use of lower body negative pressure (LBNP) over a two-day period resulted in rehydration manifested by an increase in fluid balance, body weight, and plasma volume, accompanied with a decrease in hematocrit. The use of LBNP is an effective means to restore hydration after recumbency diuresis has occurred. This has important applications to manned space flight when it is desirable to maintain the level of hydration. (Author)

A66-16824
EFFECTS OF 9-ALPHAFLUOROHYDROCORTISONE ON DEHYDRATION DUE TO PROLONGED BED REST.
Paul M. Stevens and Theodore N. Lynch (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Aerospace Medical Sciences Div., Internal Medicine Branch, Brooks AFB, Tex.).
Aerospace Medicine, vol. 36, Dec. 1965, p. 1151-1156. 19 refs.
The effects of 9-alphafluorohydrocortisone on the metabolic changes which occur during six days of bed rest were studied in four healthy subjects. During the first 24-hours of bed rest, a loss of weight and an increase in urinary water and sodium excretion were noted in all subjects. By the end of the sixth day of bed rest, the hematocrit had increased while the plasma volume had decreased by a mean of 560 cc. The experimental protocol was then repeated but 9-alphafluorohydrocortisone, 2 mg./day, was given during the last two days of bed rest. During this time, the weight increased, water and sodium retention occurred, the hematocrit decreased and the plasma volume showed a significant increase of 239 cc by the end of the sixth day of bed rest. It is suggested that part of the "orthostatic deconditioning" described following prolonged bed rest is due to plasma volume loss and that treatment with two days of 9-alphafluorohydrocortisone is a simple and efficient way to replete plasma volume losses due to prolonged bed rest. (Author)

A66-16826
COMPARATIVE EFFECTS OF PROLONGED ROTATION AT 10 RPM ON POSTURAL EQUILIBRIUM IN VESTIBULAR NORMAL AND VESTIBULAR DEFECTIVE HUMAN SUBJECTS.
Alfred R. Fregly and Robert S. Kennedy (U.S. Naval School of Aviation Medicine, Pensacola, Fla.).
(Aerospace Medical Association, Meeting, New York, N.Y., Apr. 26, 1965, Paper.)
Aerospace Medicine, vol. 36, Dec. 1965, p. 1160-1167. 24 refs.
NASA-sponsored research.
Experimental investigation of the role of the vestibular organs in relation to ataxic responses to prolonged rotation. Two contrasting groups of subjects were used to: (1) determine quantitatively to what extent two visually enhanced postural equilibrium test performances of labyrinthine defective subjects (L-D's) on a single rail of optimum difficulty become disturbed along the time axis of rotation (Experiment A), and (2) compare the performances of these L-D subjects with those of normal subjects in terms of postrotation effects as studied with a new standardized ataxia test battery (Experiment B). Rotation-induced ataxia was superimposed to an appreciable extent upon the previously present and characteristic vestibular ataxia in the L-D's; upon cessation of rotation, there were significant decrements on all test battery performances of the normal group, whereas in the L-D group significant decrements were observed only on the two visually enhanced tests. Other findings, which were considered tentative, are discussed in terms of several unresolved methodological problems in such experiments. M.M.

A66-16827 #
VERBAL COMMUNICATION INTELLIGIBILITY IN OXYGEN-HELIUM, AND OTHER BREATHING MIXTURES, AT LOW ATMOSPHERIC PRESSURES.
Julian P. Cooke and Sarah E. Beard (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).
Aerospace Medicine, vol. 36, Dec. 1965, p. 1167-1172. 16 refs.
USAF-sponsored research.

A total of 13 simulated flights with 25 subjects and 4 chamber operators were performed using some 8, 300 numbers and words and 2, 200 words in sentences to help evaluate communication intelligibility in oxygen at 5 and 3.5 psia, in oxygen-and-nitrogen at 7 psia, in oxygen-and-helium at 7 psia, and to compare these findings with those obtained in room air at ground level. Three-way communication was carried out between chamber subjects and ground level operators in room air. No statistically significant differences could be detected in test results when either words within sentences or random numbers were employed, but unrelated words resulted in statistically significant differences in some cases. The same order of magnitude or less of errors resulted in a reduced oxygen-and-helium environment as in an oxygen environment at the same oxygen partial pressure, thus indicating that no new communication intelligibility problems are created by the addition of helium. Also, the effects due to tiring or lack of alertness create as many problems in room air as do the reduced pressures if subjects are alert. More errors result between subjects in test environments than between subjects and operators, in which case phone communication equipment is necessary. Most errors are of the rhyming type. (Author)

A66-16828
VALIDITY OF THE OCULOGRAVIC ILLUSION AS A SPECIFIC INDICATOR OF OTOLITH FUNCTION.
Ashton Graybiel and Brant Clark (U.S. Naval School of Aviation Medicine, Pensacola, Fla.).
Aerospace Medicine, vol. 36, Dec. 1965, p. 1173-1181. 18 refs.
NASA Grant No. R-37.

In experiments carried out on a human centrifuge normal subjects perceived the oculogravic illusion in both its dynamic and static aspects while the typical illusion was not seen by any of the subjects with loss of labyrinthine function. Only two of these ten subjects described the dynamic characteristics of the illusion and none responded consistently in a normal manner. It is concluded that the typical oculogravic illusion is a valid indicator of otolith function. Arguments are presented for concluding that nonotolith cues may evoke an atypical illusory response. Explanatory material on the nature of the oculogravic illusion is included as an introduction. (Author)

A66-16829
EFFECTS OF ADRENALIN OR INSULIN ON THE PERFORMANCE OF WORKING AND RESTING SUBJECTS.
Clayton R. Coler, William A. McLaurin, and Donald R. Young (NASA, Ames Research Center, Moffett Field, Calif.).
Aerospace Medicine, vol. 36, Dec. 1965, p. 1181-1186.

Experimental investigation of the performance and physiological effects of adrenalin or insulin in human subjects. After approximately 8 hr of enforced work or rest, one group of nine subjects received insulin, and another group of nine subjects received adrenalin. The subjects in each drug group participated in both a working condition and a resting condition on separate occasions. Short-term memory, choice reaction time, and steadiness tests were used to evaluate subject performance. Ten preinjection and seven postinjection sessions of performance testing were given. Postinjection performance decrements occurred in all three tests for all subjects, both working and resting, in the insulin group. Fewer decrements occurred in the adrenalin group. For the insulin group, postinjection decrements were most frequent in the working condition. However, for the adrenalin group, postinjection decrements were most frequent in the resting condition. M. M.

A66-16830
SURVEY OF SOVIET ACTIVITY IN THE USE OF ACTIVE CHEMICALS FOR SPACE CABIN AIR REVITALIZATION.
A. W. Petrocelli (General Dynamics Corp., General Dynamics/Electric Boat Div.; Groton, Conn.).
Aerospace Medicine, vol. 36, Dec. 1965, p. 1187-1191. 63 refs.

The Soviet manned space flights have relied on an "active chemical" for the maintenance of a habitable cabin atmosphere. The "active chemical" has not been specifically identified in the available Soviet published literature. However, reasonably detailed descriptions of the properties of the "active chemical" have been given and, on the basis of those descriptions, it is concluded that the material employed was an alkali metal superoxide. Soviet scientists have been active for many years in the study of inorganic peroxides, superoxides, and ozonides as air revitalization materials. This activity is reviewed and the significance of current Soviet basic chemical studies to future chemical air revitalization systems is analyzed. (Author)

A66-16831 #
BEHAVIOR OF SERUM LACTIC DEHYDROGENASE IN MEN EXPOSED TO BRIEF, INTENSE THERMAL IMPULSES.
Duncan E. McVean and Leandro Rendon (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 36, Dec. 1965, p. 1192, 1193.
USAF-sponsored research.

Electrophoretic determination on acrylamide gel of lactic dehydrogenase isozyme patterns in serum obtained from human subjects exposed to brief, intense thermal impulses. The total lactic dehydrogenase activity of the serum was also determined using a standard clinical method. No change was observed in either the serum lactic dehydrogenase isozyme pattern or in the total lactic dehydrogenase activity. M. M.

A66-16832
CLINICAL PROBLEMS IN AVIATION MEDICINE - DIAGNOSTIC CRITERIA FOR GLAUCOMA AND THE PILOT.
John R. Finlay.
Aerospace Medicine, vol. 36, Dec. 1965, p. 1196-1199. 17 refs.

Discussion of diagnostic standards for primary glaucoma in pilots. It is pointed out that the FAA examination does not detect early glaucoma - only blindness due to glaucoma. Statistics suggest a significant amount of undetected glaucoma in pilots. Glaucoma should not be disqualifying. The standards regarding glaucoma should be made more realistic to reject only those patients who could be subject to sudden incapacitation or functional disability during the period for which they are licensed. It is noted that to detect glaucoma and prevent blindness, instrument tonometry should be a requisite part of the FAA examination in pilots over 35 years of age. M. M.

A66-16833
AIRSICKNESS IN STUDENT AVIATORS.
G. J. Tucker, R. F. Reinhardt (U.S. Naval School of Aviation Medicine, Div. of Psychiatry and Neurology, Section on Neuropsychiatry, Pensacola, Fla.), D. J. Hand (U.S. Navy, Naval Air Station, South Weymouth, Mass.), and A. L. Godbey (U.S. Navy, Naval Air Station, Pensacola, Fla.).
Aerospace Medicine, vol. 36, Dec. 1965, p. 1200-1202.

One thousand sixty-seven student naval aviators were rated at the end of each flight during the pre-solo and basic acrobatic phase of training by the flight instructor for the presence or absence of nausea or vomiting during the flight. To be so rated, the airsickness had to be severe enough to cause inability to control the aircraft. In this manner, a profile of the patterns of airsickness was obtained on each student over the course of the primary flight training. The incidence of this type airsickness was 17.6% (188 students out of 1, 067). Correlations between incidents of airsickness per student and their ground school grades and flight grades were not statistically significant. There are three main periods during which the majority of airsickness occurs (79%). These are the initial three training flights, the seventh, and the first three dual acrobatic flights. These periods are closely correlated with the various and different peaks of physiologic and psychologic stresses during this phase of training and provide useful base-lines for the evaluation of airsickness in student aviators. (Author)

A66-16849
SIMULATION OF A VISUAL RECEPTOR NETWORK.
M. P. Beddoes, D. J. Connor (British Columbia, University, Electrical Engineering Dept., Vancouver, Canada), and Z. A. Melzak (British Columbia, University, Mathematical Dept., Vancouver, Canada).
IEEE Transactions on Bio-Medical Engineering, vol. BME-12, July-Oct. 1965, p. 136-138. 6 refs.
Research supported by the National Research Council of Canada.

Description of an analog method for simulating a visual receptor network of the type described by Hartline, Ratliff, and Miller as a model for inhibitory interaction in the retina. The number of elements required in the model is drastically reduced by using a process of repeated approximation which converges. The activity of a large receptor field is simulated by breaking it up into much smaller, overlapping subfields, the activity of which can be determined using the model equations. M. M.

A66-16850
ABSENCE OF AN ODD-ERROR SIGNAL MECHANISM IN HUMAN ACCOMMODATION.
L. Stark (Illinois, University, Chicago, Ill.) and Y. Takahashi (Tokyo Shibaura Electric Co., Ltd., Central Research Laboratory, Kawasaki, Japan).
IEEE Transactions on Bio-Medical Engineering, vol. BME-12, July-Oct. 1965, p. 138-146. 27 refs.
U.S. Public Health Service Contracts No. NB-3055-3; No. NB-3090-3; No. DA-18-108-405-CML-942; Grant No. AF AFOSR 155-63.

Experiments have been designed to demonstrate that the human accommodative system operates with an even-error signal mechanism under restricted monocular viewing conditions. Retinal blur is such an even-error input signal and, thus, these experimental results add to the evidence considering blur as the effective input signal in accommodation. The random 50% erroneous initial direction of movement is a null experimental result which should be robust to a variety of experimental artifacts that may have contaminated previously published results. The 2 c/s oscillation does not have a physiological role in converting the even-error blur signal to an odd-error signal by some phase-sensitive demodulation operation. The oscillation may rather be understood as the consequence of important nonlinear characteristics of the accommodative servomechanism. Input-adaptive predictive capability of the accommodative system is related to similar capabilities in versional visual tracking and in hand tracking studies. (Author)

A66-16851
DATA EXTRACTION FROM A VIDEO DISPLAY.
J. J. Sanders (International Business Machines Corp., Advanced Systems Development Div., Medical Applications Dept., Rochester, Minn.).
IEEE Transactions on Bio-Medical Engineering, vol. BME-12, July-Oct. 1965, p. 147-154. 11 refs.
U.S. Public Health Service Grant No. H-3532; Grant No. NsG-327.

Description of a device for the extraction of data from a video display. A medical research application using a video tape recording of a densicardiogram as an example is explained. The methods of recording, reproducing, digitizing, and analyzing cardiovascular characteristics is described from the standpoint of development experience. Further applications outside of the medical field are suggested. M. M.

A66-16852
ENERGY TRANSPORT TO A COIL WHICH CIRCUMSCRIBES A FERRITE CORE AND IS IMPLANTED WITHIN THE BODY.
J. C. Schuder and H. E. Stephenson, Jr. (Missouri, University, School of Medicine, Dept. of Surgery, Thoracic and Cardiovascular and General Sections, Columbia, Mo.).
(Annual Conference on Engineering in Medicine and Biology, 17th, Cleveland, Ohio, Nov. 16, 1964, Paper.)
IEEE Transactions on Bio-Medical Engineering, vol. BME-12, July-Oct. 1965, p. 154-163. 14 refs.
U.S. Public Health Service Grant No. HE-05854.

In systems involving inductive coupling between an external coil or coils and an internal coil, an improvement in the efficiency of energy transport is usually realized when a suitable ferrite core is utilized for the implanted coil. A detailed theoretical analysis, with particular emphasis upon hollow spherical and oblate spheroidal cores indicates the manner in which the improvement is related to the geometry of the core and the electrical and magnetic parameters of the ferrite. For a system with a low initial value of efficiency, the insertion of a suitable core results in a several-fold improvement in energy transport efficiency. The analysis indicates that unless the almost field-free region within the ferrite shell can be utilized to advantage, increased efficiency of energy transport can probably be achieved more easily by increasing the diameter of a coreless coil than by using a ferrite core. (Author)

A66-16853
THE DESIGN AND APPLICATION OF AN FM/AM TEMPERATURE TELEMETERING SYSTEM FOR INTACT, UNRESTRAINED RUMINANTS.
A. J. Kurtenbach (South Dakota State University, Dept. of Electrical Engineering, Brookings, S. Dak.) and A. E. Dracy (South Dakota State University, Dept. of Dairy Science, Brookings, S. Dak.).
IEEE Transactions on Bio-Medical Engineering, vol. BME-12, July-Oct. 1965, p. 187-190. 11 refs.

The system contains up to 11 channels, each consisting of a transmitter and receiver. An input scanner is used to time share a counter and printer among the channels. Any two channels may be selected for analog recording. All of the data acquisition equipment is commercially available. The transmitter RF stage is amplitude-modulated by a frequency-modulated subcarrier. Thermistors are used as temperature sensors. The battery voltage and current are at 5.6 volts and 350 μA, respectively. The near radiation field is utilized with 3×10^{-9} joules stored in the magnetic field at 0% modulation. Excellent reception was obtained up to a radius of 1.5 meters. The transmitters were fabricated from selected components by utilizing cordwood construction techniques. A typical volume is 10 cm^3, of which the battery requires at least half. The closed package is coated with a nonirritating substance. Each unit was calibrated against a Bureau of Standards thermometer before application. (Author)

A66-16854
IMPLANTED TRANSMITTERS AND BODY FLUID PERMEABILITY.
R. S. Mackay (California, University, Space Sciences Laboratory and Div. of Medical Physics, Berkeley, Calif.).
IEEE Transactions on Bio-Medical Engineering, vol. BME-12, July-Oct. 1965, p. 198, 199.
Grant No. NsG-600.

Discussion of results obtained in attempts to minimize transmitter drift caused by the body-fluid permeability of the cases of low-power radio transmitters implanted in the body in order to telemeter physiological information. Using Hamilton batteries No. 505, no trouble was experienced in transmitting rapidly fluctuating variables such as EKG continuously for over a year after implanting the circuit in animals such as dogs and rabbits. However, it is noted that the problem is much more difficult when one attempts telemetry of absolute quantities such as temperature or instantaneous blood pressure for periods of over a few weeks. It is noted that quite good units can be made by sealing in glass or certain ceramics with metal, glass or ceramic end pieces. In some cases, it is quite possible to coat the glass or ceramic with metal so that end pieces can be soldered to them, taking precaution that the temperature of the components does not go above 50°C. M. M.

A66-16917
SECOND GROUP SPACE FLIGHT AND SOME RESULTS OF THE FLIGHTS OF SOVIET COSMONAUTS IN THE VOSTOK SPACESHIPS [VTOROI GRUPPOVOI KOSMICHESKII POLET I NEKOTORYE ITOGI POLETOV SOVETSKIKH KOSMONAVTOV NA KORABLIAKH "VOSTOK"].
Edited by N. M. Sisakian.
Moscow, Izdatel'stvo Nauka, 1965. 228 p. In Russian.

This book discusses the results of electrocardiographic, pneumographic, electroencephalographic, seismocardiographic, and cutaneogalvanic observations on the cosmonauts Bykovskii and Tereshkova, conducted during their simultaneous flights in June 1963 in the Vostok 5 and 6 spaceships. The book also describes

the preflight training and medical examinations of the cosmonauts, gives an assessment of the life support and safety systems of the spaceships. Attention is given to the air regeneration and air conditioning systems, clothing worn under the spacesuits, the water supply systems, and the diet of the cosmonauts. The general condition of the cosmonauts, their performance during the flight, vestibular and cardiovascular reactions, and the effects of weightlessness are discussed at length. The book, based on data from a large group of scientists, is illustrated by numerous graphs, diagrams, and photographs. V.Z.

A66-17175 #
APPLICATION OF CORRELATION-ANALYSIS METHODS TO THE STUDY OF REACTIONS OF THE HUMAN CARDIOVASCULAR SYSTEM DURING THE SPACE FLIGHT OF THE "VOSKHOD" SPACESHIP [PRIMENENIE METODOV KORRELIATSIONNOGO ANALIZA DLIA IZUCHENIIA REAKTSII SERDECHNO-SOSUDISTOI SISTEMY CHELOVEKA V KOSMICHESKOM POLETE NA KORABLE "VOSKHOD"].
A. D. Voskresenskii and M. D. Venttsel'.
Kosmicheskie Issledovaniia, vol. 3, Nov.-Dec. 1965, p. 927-934. 16 refs. In Russian.

Discussion regarding electrocardiograms of the crew (Komarov, Feoktistov, Egorov) of Voskhod 1 (1964 65A). Specifically examined are the regions containing 100 to 300 cardiac cycles, which were used to calculate the autocorrelation and cross-correlation functions for the intervals R - R and Q - T. It is noted that, in the prelaunch period, each of the cosmonauts revealed slow wavelike changes in R - R and Q - T, with an oscillation period of 56 to 64 cardiac cycles, and that the cross-correlation function for R - R and Q - T had a nearly cosinusoidal shape. During the fourteenth orbit, Komarov showed fluctuations in R - R of a period of 12 to 16 cardiac cycles, at the same pulse rate as during the prelaunch period. The interval Q - T, at that time, hardly changed, which supports the view that the functioning of the heart is not impaired by weightlessness. Such slow fluctuations in R - R were not observed at low pulse rates during sleep. It is seen that slow fluctuations in R - R and Q - T can be caused by the effect of emotional factors on the regulation of blood circulation. V.P.

A66-17176 #
INVESTIGATION OF THE KIDNEY FUNCTIONS OF THE CREW OF THE SPACESHIP "VOSKHOD" [ISSLEDOVANIE FUNKTSII POCHEK U EKIPAZHA KOSMICHESKOGO KORABLIA "VOSKHOD"].
Iu. V. Natochin, M. M. Sokolova, V. F. Vasil'eva, and I. S. Balakhovskii.
Kosmicheskie Issledovaniia, vol. 3, Nov.-Dec. 1965, p. 935-939. 8 refs. In Russian.

Study of the functioning of the renal systems of the astronauts (Komarov, Feoktistov, Egorov) of the Voskhod 1 (1964 65A), by means of a water-balance test. It was found that the capability of the organism promptly to excrete water consumed on an empty stomach was impaired after two days of flight. The reason for this is seen to be due to a change in endocrine regulation. No damage to kidney tissue was observed after the flight. V.P.

A66-17177 #
ORIENTATION OF MAN IN SPACE [OB ORIENTATSII CHELOVEKA V KOSMICHESKOM PROSTRANSTVE].
A. A. Leonov and V. I. Lebedev.
Kosmicheskie Issledovaniia, vol. 3, Nov.-Dec. 1965, p. 940-945. 25 refs. In Russian.

Analysis of the psychophysical orientation mechanisms of man under gravity conditions encountered on the earth, under weightlessness conditions simulated by an aircraft flying a parabolic curve, in orbital flight, and during the free floating of man in space. It is found that even in the latter case, an astronaut rapidly adapts himself to the unusual conditions. This was true during periods when the astronaut's body rotated horizontally about its axis, during part of which time the astronaut could not see the spaceship. However, for longer periods of free floating, a very thorough medical selection and extensive training are considered vital. V.P.

LC ENTRIES

A66-80407
CONSUMMATORY BEHAVIOR IN RATS MAINTAINED A-PERIODICALLY.
Robert C. Bolles (Hollins Coll., Hollins College, Va.)
Journal of Comparative and Physiological Psychology, Vol. 60, Oct. 1965, p. 239–243. 27 refs.
NASA Grant NsG-396 and Grant NSF G-10731.

One hundred and thirty-five rats were maintained and tested on irregular feeding or drinking schedules so that food and water consumption could be assessed as a function of the time of day of testing, hours deprivation, and deprivation experience, without the usual experimental confounding among these variables. For hungry and thirsty subjects tested in their home cages in Experiment 1, drinking increased with deprivation time at least up to 42 hr., whereas eating changed very little between 7 and 42 hr. deprivation. In Experiment 2, hungry subjects tested in a bar-press situation showed maximum intake at 24–32 hr. deprivation. The relatively slight effect of deprivation time is attributed to the predominating importance of weight loss.

A66-80408
EFFECTS OF DEPRIVATION CONDITIONS UPON THE RAT'S HOME CAGE BEHAVIOR.
Robert C. Bolles (Hollins Coll., Hollins College, Va.)
Journal of Comparative and Physiological Psychology, Vol. 60, Oct. 1965, p. 244–248. 6 refs.
NASA Grant NsG-396.

The subjects were observed in their home cages by sampling their behavior across time to determine how the pattern of behavior changes as a function of deprivation experience. Subjects were deprived either continuously, i.e., deprived throughout 9 days of observation, or cyclically, i.e., maintained on a daily schedule, for 15 days. Relative to satiated controls, both hungry groups showed a marked increase in activity and disruption of the normal diurnal cyclicity and thirsty subjects showed little change. There was little difference between cyclically and continuously deprived subjects.

A66-80409
TWO-TRIAL LEARNING-SET FORMATIONS BY BABOONS AND BY STUMP-TAILED MACAQUES.
W. Lynn Brown, A. A. McDowell, and H. A. Gaylord (Tex. U., Austin).
Journal of Comparative and Physiological Psychology, Vol. 60, Oct. 1965, p. 288–289. 6 refs.
Contract AF 41(609)-2005.

Both West African Baboons (Papio papio) and Stump-tailed Macaques (Macaca [Lyssodes] speciosa) were trained on 2-trial learning-set formations. Results showed for each species, as has previously been shown for the rhesus monkey, faster acquisition of 2-trial response perseveration learning sets to nonrewarded cues than of 2-trial response perseveration learning sets to rewarded cues.

A66-80410
RAT'S ANTICIPATION OF DIURNAL AND A-DIURNAL FEEDING.
Robert C. Bolles and Louis W. Stokes (Hollins Coll., Hollins College, Va.)
Journal of Comparative and Physiological Psychology, Vol. 60, Oct. 1965, p. 290–294.
NASA Grant NsG-396.

Rats, confined either to Skinner boxes or to activity wheels, were fed at regularly scheduled feeding times which were either diurnal, i.e., every 24 hrs., or a-diurnal, i.e., every 19 or 29 hrs. Even though the a-diurnal subjects had been born, reared and tested under 19- or 29-hr. schedules to provide further support for the anticipation of feeding, they failed to show such an effect. The fact that the diurnal subjects showed both increased running and increased bar pressing in the hours just before feeding indicates that when such an anticipation occurs, it is governed by a 24-hr. biological clock rather than being based upon deprivation produced stimuli.

A66-80411
UNIT RESPONSES OF THE LATERAL GENICULATE BODY TO LIGHT FLASHES DURING WAKEFULNESS AND SYNCHRONIZED SLEEP.
L. Maffei and G. Rizzolatti (Pisa U., Ist. di Fisiol.; and CNR, Centro di Neurofisiol. e Gruppo d'Elettrofisiol., Pisa, Italy).
Experientia, vol. 21, Oct. 15, 1965, p. 599–600.
Grant AF EOAR 64-37.

Evoked responses of single units of the lateral geniculate body (LGB) were studied in cats with the brain stem sectioned immediately rostral to the exit of the 5th nerve (midpontine pretrigeminal preparation). Their pupils were paralyzed with atropine. Some cats were curarized to control the effect of eye movements. During sleep, LGB cell activity occurs in high frequency bursts, while during wakefulness it shows a random pattern. The firing rate of LGB units in response to light pulses is always greater during wakefulness. When the light pulse is decreased by means of a neutral density filter, a stimulus evoking a clear-cut discharge during wakefulness will become ineffective during synchronized sleep. It can be seen that during synchronized sleep any correlation between light stimulus and cell firing response is lost. It is concluded that LGB units are strongly facilitated or disinhibited during wakefulness. This effect appears to be related to a state of wakefulness rather than arousal phase.

A66-80412
SENSORY TRANSMISSION IN THE GENICULOSTRIATE SYSTEM OF THE CAT DURING NATURAL SLEEP AND AROUSAL.
Nicola Dagnino, Emilio Favale, Carlo Loeb, and Mario Manfredi. (Genoa U., Ist. di Fisica, and Clin. delle Mal. Nervose e Mentali, Genoa, Italy).
(Soc. Ital. di Elettroencefalografia e Neurofisiol., Meeting, Bologna, May 12, 1963).
Journal of Neurophysiology, vol. 28, May 1965, p. 443–456. 31 refs.

Cortical and subcortical recordings of the responses evoked by stimulation of the optic chiasma, optic tract, lateral geniculate body, and optic radiations have been carried out during the sleep–wakefulness cycle in cats with chronic inplanted electrodes. The amplitude of single responses appeared variable; this variability mainly concerned postsynaptic components of cortical responses and was dependent on the level of vigilance, being higher during light sleep. Significant modifications of the mean amplitude of the responses were found during the various phases of sleep and during arousal; these modifications were due to variations of synaptic transmission at the level of the lateral geniculate body and to variations of cortical responsiveness. Synaptic transmission at the level of the lateral geniculate body was enhanced during the waking state and even more during deep sleep as compared to the light sleep phase. The responsiveness of the striate cortex was lower during the waking state than during sleep; inconstant variations in responsiveness occurred during the two phases of sleep. A comparative review of the behavior of visual and somatosensory systems during the sleep–wakefulness cycles has been presented.

A66-80413
MICROPERFUSION STUDY OF CALCIUM TRANSPORT IN THE PROXIMAL TUBULE OF THE RAT KIDNEY.
Anselm Frick, Gerhard Rumrich, Karl J. Ullrich, and William E. Lassiter (Freie U., Physiol. Inst., Berlin, East Germany).
Pflügers Archiv. für Die Gesamte Physiologie, vol. 286, 1965, p. 109–117. 21 refs.
Deutsche Forschungsgemeinschaft supported Research.
Grant NIH AM 06906-03.

Microfusion experiments on the proximal convolution of the rat kidney in situ led to the following observations: The concentration of Ca^{++} in tubular fluid at which the net flux of Ca^{++} is zero is about 2.66 mEq/L. This corresponds to a tubular fluid to plasma ratio (TF/P) of 0.70 very similar to the equilibrium Na^{+} TF/P of 0.76. The active pump potential for Ca^{++} under these conditions is $E_{Ca}^{++} = 3$ mV. The rate of Ca^{++} reabsorption in the proximal convolution varies linearly with concentration up to a tubular fluid concentration of 15 mEq/L. Parathyroid hormone deficiency or excess has no influence on Ca^{++} reabsorption in the proximal convolution. The ratio of net outward transport rates of Na^{+} and Ca^{++} at a TF/P of 1, is the same as the ratio of the concentrations of these ions in tubular fluid. The ratio of net influxes of Na^{+} and Ca^{++} into Na^{+}-free and Ca^{++}-free perfusion solutions is the same as the ratio of the plasma concentrations of these ions. Because of the striking similarities in the transport characteristics of Na^{+} and Ca^{++}, it is postulated that similar or identical mechanisms are involved in the transtubular transport of the two ions.

A66-80414
THE EFFECT OF TEMPERATURE ON THE CO_2 THRESHOLD OF THE RESPIRATORY SYSTEM [DER EINFLUSS DER TEMPERATUR AUF DIE CO_2-SCHWELLE DES ATEMSYSTEMS].
Klaus Pleschka, Claus Albers, and Ewald Heerd (Max Planck-Ges., W. G. Kerckhoff-Inst., Bad Nauheim; and Justus Liebig-U., Physiol. Inst., Giessen, West Germany).
Pflügers Archiv für die gesamte Physiologie, vol. 286, 1965, p. 142–158. 44 refs. In German.

The effect of body temperature on the CO_2 response threshold was determined in 41 anesthetized, artificially ventilated dogs. The threshold was assessed by observing the cessation and the return of the action potentials of the phrenic nerve due to hyperventilation and return to normal ventilation respectively. Body temperature was changed by cooling or heating the blood by means of an arterio-venous by-pass and a controllable heat exchanger. Shivering was abolished by administration of succinylcholie. The threshold value of the arterial CO_2 tension at 38°C. was 41 Torr. During hypothermia the threshold CO_2 decreased to a minimum of 31–34 Torr at 32° C. and then increased to 67 Torr at 25° C. During hyperthermia the

threshold pCO_2 decreased to 29 Torr at 40° C. With still higher body temperatures, panting frequently occurred. Overventilation apnea could not be obtained during this stage even with arterial CO_2 tensions as low as 5 Torr. The direct and indirect effects of temperature on the respiratory center and the interaction of temperature regulation and the respiratory regulation are briefly discussed.

A66-80415
RETINAL RIVALRY, VASOMOTOR TONE AND SENSORY STIMULATION.
Eeva Jalavisto (Helsinki U., Inst. of Physiol., Finland).
Annales Academia Scientiarum Fennicae, Series A, V. Medica, 117, 1965, 14 p. 14 refs.
Signe och Ane Gyllenberg's Stiftelse supported research.

The phenomenon of binocular, so-called retinal rivalry was studied in three subjects under standard conditions with light-adapted eyes during sensory (acoustic, proprioceptive and labyrinthine) stimulation and after-dark-adaptation. The competing figures were two squares, one red and one blue viewed in a stereoscope. The frequency of oscillation tended to slow down with prolongation of the observation time. The duration of red showed pronounced periodicity in 71 percent of the experiments. These phenomena were particularly striking in the dark-adaptation experiments, in which the oscillation frequencies were very slow. Only proprioceptive stimulation (weight lifting) had a slight tendency to increase the oscillation frequency and shorten the period length of red dominance. Acoustic stimulation was without effect. During a part of the experiments finger plethysmograms were recorded in order to compare the periodicity of the retinal rivalry phenomenon. Although certain similarities in the period length were noted, no conclusive evidence of correlation between the two phenomena was obtained.

A66-80416
PERCEPTUAL ADAPTATION TO INVERTED, REVERSED, AND DISPLACED VISION.
Charles Samuel Harris (Pa. U., Philadelphia).
Psychological Review, vol. 72, Nov. 1965, p. 419–444. 74 refs.
Grants NIMH MH-10,771 and NSF GB-3546.

Recent research has shown that a simple form of adaptation to prism-produced displacement of the visual field consists primarily of a proprioceptive change—a change in the felt position of the arm seen through prisms-rather than a visual, motor, or visuomotor change. More complex sorts of adaptation (to inversion, reversal, and other optical transformations) can also be understood as resulting from changes in the felt locations of parts of the body relative to other parts. Contrary to the usual empiricist assumption, vision seems to be very stable, whereas the position sense is remarkably flexible. When the two senses provide discrepant information, it is the position sense that changes.

A66-80417
ECOLOGICAL OPTICS AND VISUAL SLANT.
Robert B. Freeman, Jr. (Fa. State U., University Park).
Psychological Review, vol. 72, Nov. 1965, p. 501–504. 13 refs.
Grant NIH MH08856-01.

Flock's "A Possible Optical Basis for Monocular Slant Perception" (1964) is criticized as being a theory of stimuli rather than a theory of perception. To account for accurate monocular slant perception, the theory requires 9 assumptions, including the unproved ability of the eye to register texture density. The alternative hypothesis is proposed that monocular visual slant is a function primarily of contour perspective which varies with the size, shape, and viewing distance, as well as slant, of plane surfaces.

A66-80418
OPTICAL TEXTURE AND LINEAR PERSPECTIVE AS STIMULI FOR SLANT PERCEPTION.
Howard R. Flock (Dartmouth Coll., Hanover, N. H.).
Psychological Review, vol. 72, Nov. 1965, p. 505–514. 24 refs.
Grant NSF GB 2474.

Experiments critical of the effectiveness of variables of optical texture in evoking accurate judgments of slant are shown to be inappropriate, inadequate, or deficient. Experiments supporting linear perspective as a stimulus for slant are evaluated. The contention that perceived slant is a function primarily of linear perspective is shown to be oversimplified and hardly adequate to cope with the facts. Some aspects of Flock's theoretical model specifying optical stimuli for slant are discussed.

A66-80419
PARTIAL VISUAL FEEDBACK OF COMPONENT MOTIONS AS A FUNCTION OF DIFFICULTY OF MOTOR CONTROL.
John D. Gould and Amy Schaffer (IBM Watson Res. Center, Yorktown Heights, N. Y.)
Journal of Experimental Psychology, vol. 70, Dec. 1965, p. 564–569. 16 refs.

This research studied the interrelations of visual perception and movement. Closed-circuit television techniques allowed the joint action of subject's hand, control instrument, and operational effects to be visually fed back singly or in various combinations. Two levels of difficulty of each of the three task components responsible for the types of visual feedback were varied independently of feedback in a task where subject steered a ball through a maze. Results showed vision of the tool to be most important followed by vision of operational effects and hand-arm movements. No significant difference was found on the task-difficulty variable which may have influenced the absence of a significant interaction between type of visual feedback and movement difficulty.

A66-80420
EFFECTS OF THE VISUAL FIELD UPON PERCEPTION OF CHANGE IN SPATIAL ORIENTATION.
Norman L. Corah (Washington U., St. Louis, Mo.)
Journal of Experimental Psychology, vol. 70, Dec. 1965, p. 598–601. 9 refs.
Grant NSF G-22296.

The study investigated the effects of a frame and its orientation upon the perceived change in orientation of a rod target rotated at a speed below threshold for movement. Eighty-four subjects were equally divided among 7 conditions. The results demonstrated that field structure was generally less important than starting position of the target. Change was more readily perceived when initial target position was at the vertical than when it was tilted. Atilted field with the target rotating away from the vertical produced the greatest lag in detection. The results are interpreted in terms of adaptation-level theory.

A66-80421
CUTANEOUS SOUND LOCALIZATION.
George A. Gescheider (Va. U., Charlottesville).
Journal of Experimental Psychology, vol. 70, Dec. 1965, p. 617–625. 7 refs.
Grant Natl. Inst. of Neurol. Diseases and Blindness NB 04177.

Cutaneous sound localization when stimuli were delivered to the skin through a pair of vibrators was compared with auditory localization when stimuli were presented through earphones. Auditory localization was more precise for random noise bursts than for low-frequency tones. Cutaneous localization, however, was as accurate for the tone as for the noise stimuli. Cutaneous localization of low tones was a great deal more precise than auditory localization of low tones. Localization of noise bursts, however, was slightly more accurately performed by the ears. Independent manipulation of intensity and temporal-difference cues revealed that auditory localization was influenced by both types of cue. Cutaneous localization was found to depend mainly on intensity differences. Small time-difference effects were observed, however, and were found to depend on the locus of stimulation.

A66-80422
SUBJECTIVE DISTANCE AND EMOTIONAL INVOLVEMENT: A PSYCHOLOGICAL MECHANISM.
Gosta Ekman and Oswald Bratfisch (Stockholm U., Psychol. Labs., Sweden).
Acta Psychologica, vol. 24, Oct. 1965, p. 430–437. 10 refs. AFOAR and Swedish Council for Social Sci. Res. supported research.

A group of 46 subjects were instructed to estimate 10 inter-city distances with Stockholm as the center. In another part of the experiment the same subjects estimated the degree of emotional involvement which they would experience in things happening in the various cities. In addition, estimates of the importance of the cities were obtained. Emotional involvement was inversely proportional to the square root of subjective distance, when importance was kept constant.

A66-80423
ANALYSIS OF THE SPINAL REFLEXES DURING WAKEFULNESS AND SLEEP [ANALISI DEI REFLESSI SPINALI DURANTE LA VEGLIA E EL SONNO].
F. Baldissera, G. Broggi and M. Mancia (Milan U., Ist. di Fisiol. Umana; and C. N. R., Impresa di Elettrofisiol., Sez. di Milano, Italy).
(Soc. Italiana di Fisol., 16th Natl. Congr., Oct. 8–10, 1964, S. Margherita Ligure, Italy).
Bollettino della Societa Italiana di Biologia Sperimentale, vol. 40, Dec. 31, 1964, p. 1868–1871. 7 refs. In Italian.

The behavior of monosynaptic (MR) and polysynaptic (RP) spinal reflexes and post-tetanic potentiation of the monosynaptic reflex during sleep and spontaneous and natural wakefulness were studied in anesthetized, free-moving animals with electrodes implanted in the dorsal radix of L7 in the spine. Electroencephalographic activity of the frontoparietal regions and electromyographic activity of muscle nuclei were also studied. From the results obtained it was concluded that supraspinal tonic control of spinal interneuron and motorneuron activity fluctuates during wakefulness and synchronized sleep and is not changed in the passage from one phase to the other. In desynchronized sleep, more significant changes were seen in polysynaptic and monosynaptic reflexes. Both reflexes are generally abolished

during sleep, the RP disappears normally for the entire duration of the episode whereas the MR may reappear. Tonic inhibition can be interrupted from phasic episodes of inhibition possibly related to ocular movements. Elevation of the threshold to evoke MR and the abolition of post-tetanic potentiation demonstrate that spinal excitability concerns the reflex and markedly reduces the descending influences to the spinal cord during desynchronized sleep. Indirect experimental tests suggest the hypothesis that these influences can affect the spinal cord in the deepest stage of sleep as can the presynaptic mechanism.

A66-80424
INFLUENCE OF THE VESTIBULAR LABYRINTH ON THE UNIT DISCHARGE OF THE OCULOMOTOR NUCLEUS [INFLUENZA DEL LABIRINTO VESTIBOLARE SULLA SCARICA UNITARIA DEL NUCLEO DELL'OCULOMOTORE].
E. Manni, G. B. Azzena, H. Casey, and R. S. Dow (Good Samaritan Hosp., Neurophysiol. Lab., Portland, Ore.; and Sassari U., Ist. di Fisiol. Umana, Italy).
(Soc. Italiana di Fisiol., 6th Natl. Congr., Oct. 8–10, 1964, S. Margherita Ligure, Italy).
Bollettino della Societa Italiana di Biologia Sperimentale, vol. 40, Dec. 31, 1964, p. 1885–1886. 7 refs. In Italian.

The electrical responses were studied from 25 localizations of the oculomotor nucleus, 2 in the trochlear nucleus, and one in an intermediate position between the two nuclei in anesthetized craniotomized guinea pigs. The frequency of the oculomotor nucleus unit discharge under normal conditions varies between 5–10 impulses per second with an average of 8/second. Stimulation with hot (40–50° C.) and cold (5–10° C.) water on the labyrinth induced significant changes in the unit discharge. The following three types of activation were observed: (1) active response (frequency of unit discharge, 2–5/second); (2) slow response (frequency of unit discharge, 10/second to about 50/second); and (3) continued activation (continued and prolonged increase of unit frequency up to 50/second). The type of response of a unit could be modified by stimulating the same labyrinth with hot or cold water. In trying to correlate these responses with ocular changes during labyrinthine stimulation, ocular nystagmus could not be registered in the curarized animals under the experimental conditions. It is suggested that the modifications of oculomotor unit discharge correspond to the nystagmogenic activity of the nucleus induced by caloric stimulation of the labyrinth, of which responses, rapid and slow, are correlated to the rapid and slow phases of ocular nystagmus. Continuous activation may be correlated to the ocular deviation which preceeds, follows, and substitutes ocular nystagmus.

A66-80425
INFLUENCE OF THE VESTIBULAR LABYRINTH ON THE UNIT DISCHARGE OF THE MESENCEPHALIC UNITS SITUATED AROUND THE NUCLEUS OF THE OCULOMOTOR NERVE [INFLUENZA DEL LABIRINTO VESTIBOLARE SULLA SCARICA UNITARIA DI UNITA MESENCEFALICHE SITUATE ATTORNO AL NUCLEO DELL'OCULOMOTORE].
E. Manni, G. B. Azzena, H. Casey, and R. S. Dow (Good Samaritan Hosp., Neurophysiol. Lab., Portland, Ore.; and Sassari U., Ist. di Fisiol. Umana, Italy).
(Soc. Italiana di Fisiol., 16th Natl. Congr., Oct. 8–10, 1964, S. Margherita Ligure, Italy).
Bollettino della Societa Italiana di Biologia Sperimentale, vol. 40, Dec. 31, 1964, p. 1887–1888. In Italian.
Grant Natl. Inst. of Neurol. Diseases and Blindness NB 03707.

The effects of thermal stimulation (hot and cold water) of the labyrinth on the mesencephalic units surrounding the oculomotor and trochlear nuclei were studied in curarized craniotomized guinea pigs. These units included the reticular formation, red nucleus, grey matter around the aqueduct, and medial longitudinal fasciculus. Three types of responses were registered with tungsten microelectrodes implanted in the surrounding areas: rapid (type 1), slow (type 2), and continuous activation (type 3). Thermal stimulation of the labyrinth produced significant changes in the mesencephalic structures adjacent to the oculomotor and trochlear nuclei. The most common response and therefore representative of continuous activation was found in the region of the medial longitudinal fasciculus.

A66-80426
KINETICS OF CARDIOCIRCULATORY ADAPTATION DURING WORK IN DOGS [CINETICA DEGLI ADATTAMENTI CARDIOCIRCOLATORI DURANTE LAVORO NEI CANI].
F. Mangili and F. Cuttica (Milan U., Inst. di Fisiol. Umana, Italy).
(Soc. Italiana di Fisiol., 28th Natl. Congr., 8–10 Oct. 1964, S. Margherita Ligure, Italy).
Bollettino della Societa Italiana di Biologia Sperimentale, vol. 40, Dec. 31, 1964, p. 2080–2083. In Italian.

Cardiac blood flow, cardiac frequency, and pulse flow were determined in three dogs performing muscular work on a bicycle ergometer at a speed of 4, 8, 11.5, and 13 kilometers/hour. Cardiac blood flow was found to increase progressively with time at the beginning of work until it reached a value of equilibrium, distinct from the intensity of exercise. The equilibrium value was reached about one minute after the beginning of work. An increase was observed in cardiac frequency, faster than that of cardiac blood flow (5–6 seconds) and strictly related to work intensity. Pulse flow also increased, but slower, reaching maximum values about 1 1/2 minutes after the start of exercise. Cardiac frequency appears to be the unique factor determining the increase of cardiac blood flow during the first 5–10 seconds of work. Included are logarithmic diagrams of cardiac blood flow, cardiac frequency, and pulse flow in function of time during work at varying intensity.

A66-80427
EFFECTS OF RESPIRATION OF LOW-O_2 MIXTURES ON THE HEMODYNAMICS OF THE GREATER AND LESSER CIRCULATIONS IN MAN [EFFETI DELLA RESPIRAZIONE DI MISCELE A BASSO CONTENUTO DI O_2 NELLA EMODINAMICA DEL GRANDE E DEL PICCOLO CIRCOLO NELL'UOMO].
G. Giuffrida, P. P. Campa, U. Basile, G. Filocamo Jr., G. Bellisario, and M. Condorelli (Rome U., Clin. Med., Italy).
(Soc. Ital. di Biol. Sper., 33rd Gen. Meeting, 8–10 Oct. 1964, S. Margherita Ligure, Italy).
Bollettino della Societa Italiana di Biologia Sperimentale, vol. 40, Dec. 31, 1964, p. 2117–2121. 21 refs. In Italian.

Eight normal subjects breathed a hypoxic mixture (10% oxygen in nitrogen) for 5–10 minutes. After this period the subjects continued to breathe the hypoxic mixture while ventilatory and hemodynamic parameters were determined. In most cases an increase was observed in oxygen consumption, respiratory and cardiac frequency, circulatory capacity, pulmonary resistance, pulmonary arterial pressure, and pulmonary capillary blood oxygen saturation. There appeared to be no clear relation between arterial oxygen desaturation and increase in pulmonary artery pressure values. Tabulations are included of the relation of percent variations between arterial oxygen saturation and pulmonary artery pressure during hypoxia, and of the hemodynamic changes found in each subject during hypoxia.

A66-80428
NERVE STIMULI AT HYPERVENTILATION DURING MUSCULAR WORK [STIMOLI DI NATURA NERVOSA ALL'IPERVENTILAZIONE DURANTE IL LAVORO MUSCOLARE].
E. D'Angelo, G. Torelli, A. Pini, and R. Margaria (Milan U., Ist. di Fisiol. Umana, Italy).
(Soc. Ital. di Fisiol., 8–10 Oct. 1964, S. Margherita Ligure, Italy).
Bollettino della Societa Italiana di Biologia Sperimentale, vol. 40, Dec. 31, 1964, p. 2227–2230. 10 refs. In Italian.

Two subjects, 26 years of age, performed muscular work on a bicycle ergometer at a speed of 5–7 kilometers/hour for 5–20 seconds, followed by rest periods of equal time. Work and rest cycles were repeated ten times. Pulmonary ventilation was measured by spirometry and alveolar carbon dioxide tension ($P_{A}CO_2$) measured with a carbon dioxide infrared ray meter. Pulmonary ventilation increased at the beginning of work and decreased at the end of it. A parallel increase was observed in $P_{A}CO_2$. Since ventilation changes were accompanied by $P_{A}CO_2$ changes in an opposite sense, this was not considered a hyperventilation stimulus. According to the speed with which pulmonary ventilation adapted to muscular exercise, the hyperventilation stimulus was similar to nervous activity and present throughout the duration of exercise. The presence of a chemical nature stimulus due to carbon dioxide, produced in moving muscle, was evidenced by the slow progressive increase of ventilation during the experiment. The relationship between $P_{A}CO_2$ and pulmonary ventilation appears to be of the same type at rest and during work.

A66-80429
EFFECT OF TRANSLOCATION IN ALTITUDE ON ENDURANCE RUNNING OF DEER MICE.
Raymond J. Hock (Calif. U. White Mountain Res. Sta., Bishop).
Physiological Zoology, vol. 38, Oct. 1965, p. 353–360. 13 refs.

Deer mice, Peromyscus maniculatus sonoriensis, from high and low altitudes were tested for endurance time on a treadmill at a 40 m. min. speed and a 50% grade. Thirteen mice native to 1,220 m. gave a mean endurance time of about 16.7 min; 10 mice native to 3,800 m. tested at that altitude showed a mean endurance time of approximately 11.2 min. Difference in means is significant at the .02 level. Mice were translocated to opposite altitudes and tested at intervals for 90 days. Valley mice moved to a high altitude showed an immediate decrease in mean endurance time (p .001), and at the end of the 90-day period, mean endurance time closely approximated that of the mice native to this altitude. Thus hypoxia reduced mean endurance time in these animals. High-altitude mice translocated to a low altitude showed continuous deterioration in performance level, significant

at the end of 90 days ($p<.02$). Thus endurance time did not increase after removal of the hypoxic influence. Cardiac anomalies, respiratory upsets, seasonal fluctuations, or some combination of factors may be responsible for this decreased performance.

A66-80430
IMPULSE TRANSMISSION IN CAT LATERAL GENICULATE AND SO-CALLED DEEP SLEEP WAVE.
Kitsuya Iwama and Hisatoshi Sakakura (Osaka U. Med. School, Inst. of Higher Nervous Activity, Osaka, Japan).
Proceedings of the Japan Academy, Vol. 41, Jun. 1965, p. 499–502. 6 refs.

In unrestrained cats, upon entering the phase of rapid eye movement state (paradoxical or deep sleep), a distinct burst of 3–4 waves of uniform size (8 per sec.) has been recorded in the lateral geniculate body (LGB), the oculomotor nucleus and the pontine reticular formation. In this experiment on cats with electrodes implanted in the sensorimotor cortex, in the LGB, and in the optic tract at the optic chiasma, it was shown that the impulse transmission in LGB is profoundly modified by the deep sleep wave in a characteristic manner. There is inhibition on the presynaptic side and facilitation on the postsynaptic side. The functional significance of this is still unclear. The authors hypothesize that the deep sleep wave may serve to maintain the phase of deep sleep by minimizing disturbance by visual impulses.

A66-80431
INFLUENCE OF 1,3-BUTANEDIOL ON TISSUE LIPIDS OF COLD-EXPOSED RATS.
G. S. Stoewsand, H. A. Dymsza, M. A. Mehlman, and D. G. Therriault (U. S. Army Natick Labs., Food Div., Nutr. Branch; and U. S. Army Res. Inst. of Environ. Med., Natick, Mass.).
Journal of Nutrition, vol. 87, Dec. 1965, p. 464–468. 10 refs.

The influence of feeding the polyhydric alcohol 1,3-butanediol (BD), on tissue lipids of normal and cold-exposed rats was investigated. The addition of 20% BD to a 30% fat diet lowered adipose tissue lipids with a concomitant elevation of liver lipids at either normal or cold environments. Feeding a 30% fat diet to rats for 2 weeks and then exposing them to moderate cold of 5°, or severe cold of –10° without food for 72 hours produced decreases in the total lipid content of epididymal adipose tissue, liver and muscle. Rats fed a similar diet, without cold exposure but also starved for 72 hours showed no decrease in the total quantity of adipose tissue lipids.

A66-80432
RISE OF BLOOD LACTIC ACID IN MODERATE EXERCISE.
K. V. Mani, G. M. Verma, G. P. Dimri, R. S. Raman, S. Ranganathan, N. Srinivasalu, V. R. K. Raju, and B. Bhatia (Defence Inst. of Physiol. and Allied Sci., Madras, India).
Indian Journal of Experimental Biology, vol. 3, Jul. 1965, p. 154–156. 7 refs.

Total oxygen consumption and increase in blood lactic acid level in adult male subjects (age, 21–23 years) subjected to work rates ranging from 476 to 893 m.-kg. min. have been determined. The mean value of oxygen consumption at which blood lactic acid begins to increase, as calculated graphically by extrapolation, has been found to be 1140 ml./min., which is comparable to the values reported in literature. The reasons for lack of agreement in certain cases are discussed.

A66-80433
OXYGEN ADMINISTRATION BY MASK IN A PRESSURE CHAMBER.
D. G. McDowell (Glasgow U., Great Britain), I. McA. Ledingham (Med. Res. Council, Great Britain), I. Jacobson (Western Gen. Hosp., Dept. of Surg. Neurl. Edinburgh, Great Britain), and J. N. Norman (Aberdeen U., Great Britain).
Anesthesiology, vol. 26, Nov.–Dec. 1965, p. 710–726. 15 refs.
Scottish Hosp. Res. and Endowment Trust, I. C. A. and Med. Res. Council supported research.

The mean end-expiratory oxygen concentration in nine volunteers breathing 100% oxygen from a B.I.B. mask was only 61%; furthermore there were wide differences in the efficiency of this mask between subjects. An alternative system of oxygen administration is described, consisting of a pilot's mask and a demand valve. The mean end-expiratory oxygen concentration attained with this system was 83% and individual variations were small. This mask is more comfortable to wear than the B.I.B. and the inspiratory and expiratory pressures are very low. This study was carried out at two atmospheres absolute in order to allow measurements of arterial oxygen tension to be made in some of these subjects. The arterial values obtained indicate that the arterial oxygen tension approaches closely the level predicted theoretically at this pressure. Hyperbaric oxygen therapy is therefore not impeded by the failure of the arterial blood to reach the expected oxygen tension provided that the oxygen administration system is efficient.

A66-80434
A STUDY OF THE SEASONAL PERIODICITY OF CHLORELLA DEVELOPMENT AS DEPENDENT ON CULTIVATION CONDITIONS [IZUCHENIE SEZONNOI PERIODICHNOSTI V RAZVITII KHLORELLY V ZAVISIMOSTI OT USLOVII KUL'TIVIROVANIIA].
O. I. Feoktistova (USSR, Acad. of Sci., K. A. Timiriazeva Inst. of Plant Physiol., Moscow).
Fiziologiia Rastenii, vol. 12, Sep.–Oct. 1965, p. 888–893. 10 refs. In Russian.

The seasonal periodicity in the development of Chlorella sp. K. cultivated over a long period of time in the laboratory and of Chlorella vulgaris isolated from a natural water body was investigated. The algae were cultivated either intensively in the laboratory or were kept under conditions of slow growth. In the actively grown cultures of both Chlorella sp. K. and Chlorella vulgaris no periodicity in development was observed. During a year the growth rate of the algae remained practically constant. Both cultures, when kept under conditions of slow growth, exhibited a seasonal periodicity with maximum growth rate in the spring months and a minimum during the autumn–winter months.

A66-80435
ELECTROGRAPHIC STUDY OF TEMPORARY CONNECTIONS IN MAN [ELEKTROGRAFICHESKOE ISSLEDOVANIE VREMENNYKH SVIAZEI U CHELOVEKA].
V. M. Vasil'eva and V. F. Konovalov (M. V. Lomonosov Moscow State U., Dept. of Physiol. of Higher Nervous Activity, Moscow; and USSR, Acad. of Sci., Inst. of Higher Nervous Activity and Neurophysiol., Moscow).
Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 15, Sep.–Oct. 1965, p. 780–787. 15 refs. In Russian.

A polygraphic investigation was made into the formation of temporary response in man to tactile, acoustic, and proprioceptive stimuli with the action of light, which, according to instructions, was attended with opening and closing the eyes. Some specific features of conditioned electroencephalographic and peripheral shifts were noted, depending on the modality of the signal and on the stage or formation of the temporary connection. A slightly drowsy state led to disappearance of the specificity. The data obtained were analyzed from a point of view of relationships between the conditioned, conditioned orienting, and specialized orienting responses during the formation and consolidation of temporary connections.

A66-80436
THE EFFECT OF RAREFIED ATMOSPHERE ON FUNCTIONS OF THE CENTRAL NERVOUS SYSTEM BY METHOD OF CHAIN MOTOR CONDITIONED REFLEXES [IZUCHENIE VLIIANIIA RAZREZHENNOI ATMOSFERY NA FUNKTSII TSENTRAL'NOI NERVNOI SISTEMY METODOM TSEPNYKH DVIGATEL'NYKH USLOVNYKH REFLEKSOV].
L. G. Voronin and G. P. Doronin.
Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 15, Sep.–Oct. 1965, p. 831–837. 16 refs. In Russian.

The higher nervous activity of ten white rats was studied by means of chain food procuring conditioned reflexes at a simulated altitude of 3,000 to 7,000 m. Anoxia disturbed the system of chain conditioned reflexes, consisting of three food procuring movements and of one movement removing the conditioned inhibitor. At simulated altitudes of 5,000 to 7,000 m. transmarginal inhibition developed, which disturbed the complex analysts and synthesis but did not substantially affect their simple forms.

A66-80437
CORTICAL BIOELECTRICAL ACTIVITY OF ATHLETES AT REST AND UPON REACTIVATION OF A MOTOR DYNAMIC STEREOTYPE [KORRELIATSII BIOELEKTRICHESKOI AKTIVNOSTI KORY BOL'SHOGO MOZGA SPORTSMENOV PRI OZHIVLENII DINAMICHESKOGO STEREOTIPA].
V. K. Petrovich (P. F. Lesgaft State Inst. of Phys. Cult., Moscow, USSR).
Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 15, Sep.–Oct. 1965, p. 846–851. 17 refs. In Russian.

The dynamics of bioelectrical activity of the cerebral cortex were studied in athletes in a state of rest and during reactivation of a motor dynamic stereotype when attention is concentrated before a high jump. Crosscorrelation analysis has shown that the number of synchronously working cortical zones increases considerably at the moment of concentration as compared with rest. A definite localization of dominating foci is observed with enhanced synchronous activity in the motor and inferior parietal areas.

A66-80438
STUDY OF HANDWRITING UNDER CONDITIONS OF SPACE FLIGHT [ISSLEDOVANIE POCHERKA PRI PIS'ME V USLOVIIAKH KOSMICHESKOGO POLETA].

G. V. Altukhov, A. I. Mantsvetova, I. P. Neumyvakin, V. F. Orlova, V. A. Trubnikova, and I. M. Freidberg.
Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 15, Sep.–Oct. 1965, p. 863–868. 5 refs. In Russian.

The handwritings of A. G. Nikolayev and P. R. Popovich were studied from the entries made in the logs. Considerable changes were found in the handwriting during the state of weightlessness. These were more pronounced in the first hours of the flight. Subsequently coordination of movements during writing improved but not up to the initial level. It may be assumed that the disturbances of coordination are due to changes in interaction between the peripheral and central parts of the motor analyzer as a result of an unusual afferent impulsation under conditions of weightlessness. Improvement in the coordination of movements is apparently due to the fact that the cosmonauts adapted themselves to writing under unusual conditions and was accompanied by enhanced tone of the excitatory process in the motor analyzer, expressed in an increase in the force component of the writing process. The changes in both Nikolayev's and Popovich's handwritings during the space flight were of a functional, reversible nature.

A66-80439
THE ROLE OF SIGMOID GYRI IN RESPIRATION CONTROL [O ROLI SIGMOVIDNYKH IZVILIN KORY BOL'SHOGO MOZGA V REGULIATSII DYKHANIIA].
A. V. Pogrebkova (USSR, Acad. of Sci. I. P. Pavlov Inst. of Physiol., Lab. of Comp. Physiol. of Internal Analysers, Moscow).
Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 15, Sep.–Oct. 1965, p. 919–926. 16 refs. In Russian.

In the course of studying the structure and function of the respiratory analyzer, investigation was made in the dynamics of respiratory conditioned and unconditioned responses in dogs of a different age, before and after an ablation of sigmoid gyri. A bilateral stage by stage removal of the cortex of the sigmoid gyri in adult dogs disturbed the cortical respiration control and the activity of the respiratory analyzer. In the months that followed, the exteroceptive respiratory conditioned responses were the first to be restored, followed by the unconditioned hypercapnic reactions. The value of the interoceptive respiratory conditioned reflexes (formed in response to stimulation of the receptors of the respiratory system itself) remained reduced to the end of the observation (about five months). A control bilateral removal of the occipital area cortex did not markedly disturb respiration. Ablation of the cortex of the sigmoid gyri in puppies at an early age (up to six months) had no appreciable effect on the respiration at rest and the magnitude of hypercapnic responses. The data obtained led to the conclusion that the area of the sigmoid gyri forms part of the cortical apparatus of the respiratory analyzer.

A66-80440
INVESTIGATION OF RESPONSE TIME AND ATTENTION IN WORKERS WITH ELECTRONIC COMPUTERS [ISSLEDOVANIE VREMENI REAKTSII I VNIMANIIA U RABOTNIKOV, OBSLUZHIVAIUSHCHIKH BOL'SHIE ELEKTRONNYE VYCHISLITEL'NYE MASHINY].
M. M. Karimova (USSR, Acad. of Med. Sci., Inst. of Hyg. Labor and Prof. Diseases, Moscow).
Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 15, Sep.–Oct. 1965, p. 937–939. In Russian.

A study of response time and degree of attention in personnel working with electronic computers showed that the number of errors and loss of information per unit of time was minimal during the third and fourth hours. The degree of performance during the first and last hours of the working day were the same. Maximum efficiency during midday may be due to an increase in concentration.

A66-80441
SIMPLIFIED METHOD OF MULTIPLE IMPLANTATION OF ELECTRODES IN THE SUBCORTICAL STRUCTURES OF THE BRAIN [UPROSHCHENNYI SPOSOB MNOZHESTVENNOGO VZHIVLENIIA ELEKTRODOV V PODKORKOVYE STRUKTURY MOZGA].
V. N. Sidorov (S. M. Kirov Gorki State Med. Inst., Dept. of Normal Physiol., Gorki, USSR).
Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 15, Sep.–Oct. 1965, p. 943–946. 7 refs. In Russian.

The author describes a simple method for implanting sensors subcortically, which can be kept throughout entire experiments on laboratory animals for the purpose of measuring brain potentials.

A66-80442
VESTIBULAR REACTIONS OF COSMONAUTS DURING THE "VOSKHOD" SPACESHIP FLIGHT [VESTIBULIARNYE REAKTSII KOSMONAVTOV PRI POLETE NA KORABLE "VOSKHOD"].
E. M. IUganov, A. I. Gorshkov, I. I. Kas'lan, I. I. Brianov, I. A. Kolosov, V. I. Kopanev, V. I. Lebedev, N. I. Popov, and F. A. Solodovnik.
Izvestiia Akademii Nauk SSSR. Seriia Biologicheskaia, no. 6, Nov.–Dec. 1965, p. 877–883. 8 refs. In Russian.

Peculiarities in vestibular reactions of the crew members of the Voskhod spaceship are described. Unlike other cosmonauts, the Voskhod's space pilots experienced illusional perception of body position that was of a constant character. The cosmonauts experienced illusions with their eyes closed and opened. It occurred during an orbital flight of the spaceship when it was in both a stabilized and nonstabilized position. It may be supposed that a three-month ground training of subjects with a vestibular analyzer of an average sensitivity cannot secure necessary vestibular tolerance to a weightless environment.

A66-80443
THE LONG RANGE EFFECT OF IONIZING RADIATION ON THE CHROMOSOMES OF BONE MARROW CELLS [DISTANTSIONNOE VLIIANIE IONIZIRUIUSHCHEI RADIATSII NA KHROMOSOMY KLETOK KOSTNOGO MOZGA].
N. F. Barakina and M. I. IAnushevskaia (USSR, Acad. of Sci., A. N. Severtsov Inst. of Animal Morphol., Moscow).
Doklady Akademii Nauk SSSR, vol. 165, Nov. 11, 1965, p. 427–430. 22 refs. In Russian.

A cytological study of mitochondria of cells isolated from the bone marrow of mice subjected to ionizing radiation showed that damage to the chromosome structure took place even in animals protected by a suitable screen. The damage, however, was indirect. The same radiation effects were noted in various tissues of animals exposed to local intestinal radiation, or even by introduction of bone marrow cells from the irradiated animals into normal ones.

A66-80444
RADIATION EXPOSURE FROM HEAVY NUCLEI IN SOLAR PARTICLE BEAMS IN SPACE SYSTEMS OF LOW SHIELDING.
Hermann J. Schaefer (U. S. Naval Aerospace Med. Inst., Pensacola, Fla.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 1–4. 6 refs.
NASA Contract R-75.

In extravehicular activity and in the Lunar Excursion Module, the astronaut is protected from environmental ionizing radiation merely by 0.1 to 0.2 g/cm.^{3} of material. Behind such low shielding, in addition to protons, alpha particles, and heavy nuclei in solar particle beams contribute to exposure. Separate analysis of the proton, alpha, and medium heavy fluxes for the November 12, 1960 flare shows that, on the rad. dose level, only the alpha component contributes significantly to total dose and does so only in the first millimeters of tissue. On the RBE dose level, the alpha component is the predominant contributor in near-surface regions, becoming equal to the proton dose at 2-millimeter depth in tissue. The contribution of the medium heavy group never exceeds, even in the tissue surface and on the RBE dose level, a few percent of total exposure. No experimental data with laboratory radiations exist that would lend themselves to an interpretation of the peculiar depth dose patterns for flare-produced particles behind low shielding in terms of radiation damage or permissible exposure.

A66-80445
INJURIES DUE TO EXPLOSION, DECOMPRESSION AND IMPACT OF A JET TRANSPORT.
J. Robert Dille and A. Howard Hasbrook (Federal Aviation Agency, Western Region, Aviation Med. Div., Los Angeles, Calif.; and Federal Aviation Agency, Civil Aeromed. Res. Inst., Oklahoma City, Okla.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 5–11. 9 refs.

On the night of May 22, 1962, an explosion of a dynamite device occurred in the right rear lavatory of a Boeing 707 cruising at 39,000 feet over Iowa. Overpressure, decompression, separation of the tail section, other breaking up of the aircraft, and, after four minutes, ground impact ensued. All 45 occupants sustained fatal injuries. Eight people were ejected and free-fell to the ground. One of the occupants, however, sustained relative minor injuries, except for a laceration of the inferior vena cava, and survived for 9 1/2 hours. The impact speed of the fuselage is estimated as between 100 m.p.h. and 140 m.p.h. The forces transmitted to this passenger, who was lying across a triple forward-facing tourist seat, are difficult to determine, but are estimated to have been between 90.6 g and 177 g at the seat pan level. The causes of his injuries and his brief survival are discussed in detail. Recommendations are made which include the installation of crash locator beacons on civil aircraft, additional procedures for the investigation of such accidents to insure the collection of maximum crash injury correlation data, and possible design features for future, particularly V/STOL, aircraft to improve crash survivability.

A66-80446
THERMAL TRANSIENTS TO 205° C. (400° F.). BIOCHEMICAL AND HEMATOLOGICAL EFFECTS IN HUMAN SUBJECTS.
Raymond H. Murray (Ind. U., Cardiopulmonary Lab., Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 37, Jan. 1966, p. 11–15. 24 refs.
Contract AF 33(616)8378.

In order to evaluate the hematological and metabolic effects of brief, intense, thermal stress, six clothed human subjects were exposed to thermal transients 20 minutes in duration, wall temperature rising 28° C. min. to peaks of 205° C. with subsequent passive wall-cooling. There was no evidence of hemolysis, and blood cellular elements showed only non-specific "stress" hemoconcentration effects. There were no significant changes in serum electrolytes, blood sugar, total protein electrophoresis. There was an increase in tidal volume without an increase in respiratory rate, an example of heat hypernea, causing an increase in blood oxygen and a fall in carbon dioxide values with consequent increase in pH. Lactic acid rose slightly and a small amount of excess lactate was generated. Lactic dehydrogenase activity decreased although there was no demonstrable change in the LDH isozymes.

A66-80447
HUMAN TOLERANCE TO Gz 100 PERCENT GRADIENT SPIN.
Thomas E. Piemme, Alvin S. Hyde, Michael McCally, and George Potor, Jr. (Aerospace Med. Res. Lab., Biophysics Lab., Multienvironment Div., Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 37, Jan. 1966, p. 16–21. 13 refs

The physiologic tolerance to short radius high gradient positive Gz spin has been studied. Subjects were restrained in the supine position, the z-axis along the radius. Tolerance varies from 2 minutes or less at 7 g (at the feet) to an arbitrary time limit of two hours at 1 g. Heart rate responses are those that would be expected from the consequent lowering of cardiac output attendant upon venous pooling. High gradient spin differs from standard centrifuge accelerative force in the +Gz direction, not only in terms of increased tolerance, but also in Coriolis phenomena observed, and in terms of lesser musculoskeletal fatigue effects of acceleration. High gradient acceleration is not equivalent to a gravity state. Whether or not such acceleration will prevent any of the deconditioning effects of weightlessness remains to be seen.

A66-80448
INJURY MECHANISM OF INTERNAL ORGANS OF ANIMALS EXPOSED TO SINUSOIDAL VIBRATION
J. B. Boorstin, J. R. Hayes, and D. E. Goldman (U. S. Naval Med. Res. Inst., Bethesda, Md.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 22–28. 7 refs.
Navy Dept. supported research.
NASA R-10.

High speed X-ray cinematography has been used to determine organ motion in vibrated cats. Data processing with a motion analyzer and a computer permits rapid analysis of X-ray photographs. Results of experiments at several amplitudes and frequencies are compared to show wave distortions due to heart-lung-chest wall interactions and frequency response characteristics associated with the means of restraint of the animal and the way in which the vibratory motion is impressed. Gross and microscopic pathological studies as well as some chemical determinations provide correlation of mechanical response and tissue damage.

A66-80449
AIR TRAINING COMMAND EJECTION EXPERIENCE, 1 JANUARY 1962 TO 31 DECEMBER 1964.
Robert A. Farmer, A. M. Donnell, Jr., and John P. McCann (Air Training Command, Office of the Surgeon Headquarters, Randolph AFB, Tex.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 28–31.

The solo pilot has no responsibility to another occupant, no cause for assuring that his student or his instructor comprehends the emergency and is prepared to eject. When emergencies occur at very low altitudes little can be done to increase the likelihood of successful escape. Analysis of ATC's ejection experience for flying experience of the ejectees is relatively straightforward. Assessment of the training of the flyers in ejection procedures, parachute landing falls and parachuting is more difficult. Only five of the ejectees had not received ejection seat firing training. One of these men was unsuccessful. It is felt that such small numbers have relatively little significance. The incidence of difficulties during and after ejection, parachuting and landing has alerted us to train all of our flyers as well as possible in the skills and procedures of ejection-parachute escape. The Air Training Command of the USAF has compiled a comparatively good record for ejection success during the last three years. The rates of ejections and of major aircraft accidents for this command are significantly less than those of the entire USAF. Successful ejection rates for the years 1960–1964 compare favorably with USAF rates to which ATC rates contribute.

A66-80450
ERROR IN MEASUREMENT OF PULMONARY VENTILATION DURING SINUSOIDAL VIBRATION AND A METHOD OF CORRECTION.
F. W. Zechman and Davis Peck (Kentucky U., Coll. of Med., Dept. of Physiol. and Biophys., Lexington).
Aerospace Medicine, vol. 37, Jan. 1966, p. 32–34. 5 refs.
Contract AF 33(657)-9331.

During whole-body vibration, respiratory airflow is forced into oscillation. Amplitudes of forced oscillation greater than the amplitude of airflow produced by the subject produce error in measurements of ventilation by the open-circuit technique. The origin of this error is determined and a device proposed for eliminating the forced oscillation component from the airflow signal. The device consists of a time delay and summing circuits.

A66-80451
EFFECTS OF HYPOHYDRATION ON WORK PERFORMANCE AND TOLERANCE TO +Gz ACCELERATION IN MAN.
J. E. Greenleaf, M. Matter, J. S. Bosco, L. G. Douglas, and E. G. Averkin (NASA Ames Res. Center, Biotechnol. Div., Moffett Field, Cal.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 34–39. 33 refs.

Nine men were water depleted up to 6.9 percent of their body weight during controlled 5-day dietary periods and then subjected to various physical performance tests, including grayout tolerance while undergoing + G_z –3.0G/min. acceleration, to define set points (the percent hypohydration where functional deterioration begins). Hypohydration refers to a depletion of body water. The following set points were observed: isometric muscular strength—greater than 4 percent; modified Harvard step-test—4 to 4.5 percent; submaximal O_2 intake—greater than 4 percent; and + G –3.0G min. centrifugation—greater than 4 percent. Total body reaction time decreased with hypohydration. The concept of free circulating water was suggested as a possible explanation for the diversity of results regarding the effects of water depletion on bodily deterioration and work performance.

A66-80452
EFFECT OF POSITIVE PRESSURE BREATHING ON THE VIBRATION TOLERANCE OF THE MOUSE.
J. F. Brady and B. D. Newsom (Gen. Dynamics/Convair, Advanced Design and Technol. Sec., San Diego, Cal.).
Aerospace Medicine, vol. 37, Jan. 1966, p. 40–45. 30 refs.

With increasing size and power, boosters for manned space vehicles expose crews to increasingly intense, low-frequency mechanical vibrations. The displacements involved preclude isolation as a means of protection, but internal and external methods can be combined to increase the inherent tolerance of the man to these stresses. To investigate positive pressure breathing (PPB) as such a method, 153 mice were vibrated along their Z-axis at 20 c.p.s. with an intensity of 7.07 r.m.s. g, for 10 minutes. The 63 controls breathed ambient air and the 90 experimental animals breathed one of three levels of PPB air; 1.5, 3.75, and 6.00 inches of H_2O. Those receiving the two highest levels of PPB air sustained significantly less tissue damage and mortality, validating PPB as a feasible means of low frequency vibration protection for mammals.

A66-80453
EFFECTS OF FLYING EXPERIENCE ON THE VESTIBULAR SYSTEM: A COMPARISON BETWEEN PILOTS AND NONPILOTS TO CORIOLIS STIMULATION.
Patrick J. Dowd, Edwin W. Moore, and Robert L. Cramer (USAF School of Aerospace Med., Aeromed. Indoctrination Branch, Vestibular Sec., Brooks AFB, Tex.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 45–47. 12 refs.

Certain flight maneuvers, as when an aircraft is banking and turning, were simulated by the USAFSAM biaxial stimulator. Subjective responses for pilots were markedly different from nonpilots. A "threatening" maneuver for the pilots was preferred as "exciting" by the nonpilots. Significant differences were found between pilots and nonpilots in the rate of decay of nystagmus in response to two different simulated maneuvers. Such nystagmic differences are discussed with reference to their sensations. Results indicated that flying experience or flight training produced such differences.

A66-80454
TRAINING THE VESTIBULE FOR AEROSPACE OPERATIONS USING CORIOLIS EFFECT TO ASSESS ROTATION.
Kent Gillingham (School of Aerospace Med., Brooks AFB, Tex.)
Aerospace Medicine, vol. 37, Jan., 1966, p. 47–51. 10 refs.

It is common knowledge that the semicircular canals, once they have equilibrated to an angular velocity, cannot respond to that motion, be it pitch, roll, or yaw. By employing self-induced Coriolis stimulation, however, one can perceive otherwise undetectable rotation. How accurately this can be done is studied by determining the psychophysical functions for the discrimination of direction or rotation at different yaw velocities. We have found

that subjects with minimal training can perceive accurately angular velocities slower than the four-minute turn of instrument flight, despite the fact that velocities of much greater magnitude remain unperceived until the Coriolis acceleration is induced. The potential use of this and similar maneuvers as a means of countering spatial disorientation is discussed.

A66-80455
CARDIAC ARRHYTHMIAS OCCURRING DURING ACCELERATION.
D. E. Torphy, S. D. Leverett, and L. E. Lamb (School of Aerospace Med., Brooks AFB, Tex.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 52–58. 15 refs.

Forty-two pilots were exposed to + Gx and + Gz acceleration in a variety of profiles and the incidence of arrhythmias investigated. + Gz acceleration did not increase the incidence of arrhythmias, + Gx acceleration increased the incidence of arrhythmias, and this increase seemed related to both the degree and duration of acceleration. Premature contractions, with and without aberrant conduction, from both the atria and ventricles were noted. One subject had paroxysmal atrial tachycardia with + Gx acceleration. Possible causal mechanisms are discussed.

A66-80456
AN A. M. E.'S EVALUATION OF PILOT FITNESS TO FLY.
J. Harold Brown.
(FAA Advanced Med. Seminar for AME's, Portland, Ore., Jul. 28, 1965).
Aerospace Medicine, vol. 37, Jan. 1966, p. 59–66. 12 refs.

An Aviation Medical Examiner (AME) designated by the Federal Aviation Agency, discusses some of the practical problems in evaluating pilot fitness which may occur in conducting the physical examination required by the Federal Aviation Agency. The presentation is not intended to introduce controversy regarding the present standards and regulations, but to foster thought and discussion. The primary and personal role of the AME in assessing the physical and emotional capability of man to pilot an aircraft is emphasized, this being the physician's contribution to flying safety.

A66-80457
INFLUENCE OF LIGHT ON HUMAN CIRCADIAN RHYTHMS.
F. Gerritzen (K. L. M. Med. Dept., Schiphol, Netherlands).
Aerospace Medicine, vol. 37, Jan. 1966, p. 66–70. 11 refs.
Found. for the Promotion of Medico-Sci. Res. supported research.

The influence of light on the rhythmic excretion of water and electrolytes was studied in 4 groups of 5 healthy students under strict experimental conditions—hourly intake of food and fluid, hourly collection of the urine—during 47 to 62 hours. Inverse illumination resulted in a decrease of the amplitude and a reversal of maxima and minima. This procedure was not able to produce a maximum of a certain magnitude on a different place in the cycle. In a fifth experiment a shorter period of darkness proved to be incapable to depress the amplitude. Light was considered an unsuitable stimulus to shorten the period of adaptation after rapid flights in East–West direction or vice versa. Induction of artificial sleep might be more appropriate. The significance of circadian rhythms in connection with our conception of the stability of the "milieu interieur" is discussed.

A66-80458
PSYCHIATRIC AND PSYCHOLOGICAL PROBLEMS IN COMMERCIAL AVIATION.
C. Blanc, E. Lafontaine, and R. Laplane (Air France Central Med. Dept., Paris).
Aerospace Medicine, vol. 37, Jan. 1966, p. 70–73. 7 refs.

The frequency of neurotic depressive reactions and other neuroses (65 percent) was a rather striking finding in the study of 400 Air France employees of whom 148 were flying personnel. Fifty percent of the personnel showed conflicts having no direct relationship to their professional activities. The importance of neuropsychiatric examinations as a part of the pre-employment evaluation is stressed.

A66-80459
OCCUPATIONAL POISONING WITH INORGANIC SELENIUM COMPOUNDS [BERUFLICHE VERGIFTUNGEN MIT ANORGANISCHEN SELENVERBINDUNGEN].
M. Keysser (Betriebsgesundheitswesen Veb Mansfeld-Kombinat "Wilhelm Pieck" and Bergbaukrankenhaus Eisleben, East (Germany)).
Das Deutsche Gesundheitswesen, vol. 20, Apr. 29, 1965, p. 766–769.
8 refs. In German.

A review is presented of poisoning with inorganic selenium compounds. Therapy is symptomatic since there is no specific antidote. Two cases of selenium poisoning are described in detail. Early symptom in both cases was bronchial asthma.

A66-80460
EFFECTS OF AMPHETAMINES ON MOODS, EMOTIONS, AND MOTIVATIONS.
Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt (Rochester U., Dept. of Psychol., N. Y.)
Journal of Psychology, vol. 61, Sep. 1965, p. 93–121.
Contract ONR N6ori-126, T. O. 1; and Grants Natl. Inst. of Mental Health M-681 and MH-4681.

Nine experiments conducted over a period of 10 years on 239 normal subjects, 21 years or older, with essentially identical procedures, to find the effects of amphetamines on moods, emotions, and motivations as determined by free-choice adjective check list (ACL) and forced-choice ACL are here reported. Subjects, given a normal clinical dose, like the way the drug makes them feel and are more optimistic, friendly, energetic, talkative, decisive, egotistic, keyed-up, and light-headed, at the same time that they are less drowsy, languid, bored, dissatisfied, depressed, or grouchy. A drug-placebo comparison showed t values as high as 8.3. Data or methodological importance are presented, including placebo data and data on variability of emotional states. Data on Dramamine (dimenhydrinate U.S.P.) are presented for comparison.

A66-80461
SUSCEPTIBILITY TO VISUAL ILLUSIONS.
Ethel McGurk (Calif. U., Dept. of Psychol., Berkeley).
Journal of Psychology, vol. 61, Sep. 1965, p. 127–143. 9 refs.

In order to develop a psychometric index of susceptibility to geometrical optical illusions, 47 multiple-choice items were constructed and administered to 116 subjects. The 22 items showing the greatest internal consistency were retained for the final test. Ten nonillusion items were also included to provide a basal measure of perceptual acuity. This 32-item test was presented on slides to 87 subjects. Also administered were: Crutchfield's adaptation of Gottschaldt Figures Test, Adjective Check List, California Psychological Inventory, College Vocabulary Test, a series of self-ratings, and a biographical data sheet. Resistance to illusions was positively correlated with the Gottschaldt Figures Test, and with the personality measures of dominance and need for achievement. Significant additional relationships to measures of flexibility, psychological-mindedness, lability, and self-control were also discovered. From the self-ratings and biographical data, susceptibility to illusions was positively related to ability for leadership, and ability to judge physical things, and negatively to ratings of passivity and self-esteem. Illusions-resistant person may be described as an effective, independent, and resourceful individual, with strong needs for achievement and excellent potentiality for leadership. He is neither aggressive nor domineering in his dealings with others. Although sensitive to the needs and motives of his fellows, he is not by nature affiliative nor nurturant.

A66-80462
SOCIAL PROXIMITY EFFECTS ON GALVANIC SKIN RESPONSES IN ADULT HUMANS.
G. McBride, M. G. King, and J. W. James (Queensland U.; Sydney U., and New South Wales U., Australia).
Journal of Psychology, vol. 61, Sep. 1965, p. 153–157. 5 refs.

The galvanic skin response (GSR) of subjects of both sexes to male and female experimenters was studied with experimenters adopting differing spatio-proximal and -distal positions with respect to subjects. The GSR to experimenters at one, three, and nine feet (with experimenters and singular fixating each other's eyes) showed no difference on the average between one foot and three feet though the response was significantly less at nine feet. The response to male experimenters was greater than that to female experimenters at one foot with eyes fixated. The GSR was greatest when subject was approached frontally, while side approach yielded a greater effect than rear approach. The response to experimenters of the same sex was less than to experimenters of the other sex.

A66-80463
CONSIDERATIONS ON THE ALVEOLAR-ARTERIAL OXYGEN PRESSURE DIFFERENTIAL: THE CARBON DIOXIDE INFLUENCE IN THE ANESTHETIZED DOG [BETRACHTUNGEN ZUR ALVEOLAR-ARTERIELLEN SAUERSTOFFDRUCKDIFFERENZ: DER EINFLUSS VON CO_2 BEIM NARKOTISIERTEN HUND].
Franz R. Egli (Nijmegen U., Physiol. Inst., The Netherlands; and Dartmouth Med. School, Dept. of Physiol., Hanover, N. H.).
Helvetica Physiologica et Pharmacologica Acta, Supplementum 15, 1965, p. 1–72. 228 refs. In German.
Grant Natl. Heart Inst. H-2830-C4.

The connections of the bronchial collateral circulation with the pulmonary circulation are discussed. A detailed review is presented of the literature on the influence of carbon dioxide upon the cardiovascular system. After a theoretical analysis of the alveolar–arterial oxygen gradient ($AaDO_2$) personal experimental data are presented on the influence of CO_2 on $AaDO_2$.

In experiments on anesthetized dogs with continuous recording of alveolar and arterial P_{O_2} in vivo, the effect of CO_2 breathing (2.5–20%) was studied on three levels of oxygenation (10, 21 and 58% O_2). With CO_2 both alveolar and arterial P_{O_2} were increased on all three levels of oxygenation, with a resulting decrease of the alveolar–arterial O_2 pressure difference. No ready explanation can be seen. The following theoretical considerations might possibly apply. The $AaDO_2$ decrease in hypoxia could be due to changes of diffusion and in hyperoxia as well as during air breathing there could be alterations of the venous admixture.

A66-80464
TEAM VERSUS INDIVIDUAL TRAINING, TRAINING TASK FIDELITY, AND TASK ORGANIZATION EFFECTS ON TRANSFER PERFORMANCE BY THREE-MAN TEAMS.
George E. Briggs and James C. Naylor (Ohio State U., Columbus).
Journal of Applied Psychology, vol. 49, Dec. 1965, p. 387–392. 5 refs.
Contract N61339-1327.

Transfer performance of teams was measured in a simulated radar-controlled aerial intercept task. Superior performance occurred after training on an independently organized task (as compared to that after training which required verbal interaction among controllers), and superior performance occurred in an independently organized transfer task. However, these two variables interacted such that performance on an interaction condition of the transfer task was equivalent to that on an independently organized task if prior training was under the independent task organization. Training task fidelity influenced performance only on the interaction transfer task, with superior performance following a high-fidelity training situation in which controllers could acquire the same skills to be required in transfer for communication to interceptor pilots.

A66-80465
COLOR CODING IN FORMATTED DISPLAYS.
Sidney L. Smith, Barbara B. Farquhar (Mitre Corp., Bedford, Mass.), and Donald W. Thomas (Tufts U., Bedford, Mass.).
Journal of Applied Psychology, vol. 49, Dec. 1965, p. 393–398. 6 refs.
Contract AF 19(628)2390.

An experiment was designed to assess and compare the effects of symbolic, numeric and color coding in formated displays. Twelve subjects viewed displays in which two-digit entries were arranged in tabular matrix format. Displays differed in density, structure, and auxiliary coding. Subjects performed row-comparison and item-counting tasks, providing time and error measures. Auxiliary color coding resulted in better performance than superscript or underline codes for both tasks. Color coding was relatively more effective for item counting than for row comparison where the display format was related to the task. The value of a display code appears to be dependent upon other joint interaction of the format in which it is displayed and on the task to which it is applied.

A66-80466
SURVIVAL RESEARCH IN GROUP ISOLATION STUDIES.
John A. Hammes and R. Travis Osborne (Georgia U., Athens).
Journal of Applied Psychology, vol. 49, Dec. 1965, p. 418–421. 5 refs.
Contract OCD-OS-62-226.

The development of a nationwide fallout shelter system has initiated research on the physiological, psychological, and sociological aspects of group isolation. The most austere occupancy tests have been conducted at the University of Georgia. Results indicate that healthy men, women, and children can endure 2 weeks isolated confinement under conditions of severe austerity without suffering deleterious physiological or psychological effects.

A66-80467
VALIDITY OF PEER NOMINATIONS IN PREDICTING A DISTANT PERFORMANCE CRITERION.
E. P. Hollander (New York, State U., Buffalo).
Journal of Applied Psychology, vol. 49, Dec. 1965, p. 434–438. 17 refs.
Contracts ONR 760(06) and 816(12).

This paper reports the follow-up phase of a study of peer nominations begun in 1955 at the Naval OCS in Newport, Rhode Island. Over 700 trainees completed several peer nomination forms at various stages of training, one in particular on "success as a future Naval Officer" (FO). Subsequently, 639 trainees were identified who had gone on to duty as officers for about 3 yrs. The average grade they secured on a key portion of the fitness report ratings assigned by their direct superior officers was used as a performance criterion; it had a split-half reliability of .90. In the prediction of this criterion, the FO peer nomination score from the 3rd week of training gave a validity of .40 which was as high as that for later FO scores and which was only slightly diminished after academic grades and popularity were partialed. The findings support the use of early peer nominations as a valid supplemental measure in predicting performance after training.

A66-80468
EFFECTS OF AGE ON VISUAL DISCRIMINATION PERFORMANCE [EINFLUSS DES ALTERS AUF DIE LEISTUNGEN DER VISUELLEN UNTERSCHEIDUNG].
Damian Kovac (Slovak Acad. of Sci., Inst. for Expt. Psychol., Bratislava, Czechoslovakia).
Studia Psychologica, vol. 7, 1965, p. 187–213. 14 refs. In German.

Subjects in four age groups (15–16 years, 30–35 years, 55–60 years, and 70 years and over) were given six tests of visual performance: 1) choice of optimum illumination for reading, 2) reproduction of various angle according to given standards, 3) mid-point determination, 4) horizontal–vertical T illusion, 5) estimation of the number of separate symbols in a briefly exposed multiple symbol array, and 6) a variant of the Bourdon test. Both sex and age factors influenced the visual performance although not in a linear fashion. The best performance was achieved by the 30 to 35 year old group.

A66-80469
HEART RATE MEASUREMENT AND THE CORRELATION OF INDICES OF AROUSAL.
Edward J. Malmstrom, Edward Opton, Jr., and Richard S. Lazarus (Calif., U., Dept. of Psychol., Berkeley).
Psychosomatic Medicine, vol. 27, Nov.–Dec. 1965, p. 546–556. 18 refs.
Grant Natl. Inst. of Mental Health MH-2136.

Twenty-two subjects watched a stressor motion picture film, which was expected to stimulate autonomic arousal, and 22 control subjects saw a benign film. Heart rate and skin conductance were recorded. When analyzed by previously used methods, skin conductance changes over time showed a close correspondence to film content, while heart rate did not. A new method of sampling heart rate records, the method of mean cyclic maxima, gave results closely paralleling those of skin conductance. This method appears to be a major improvement over previous approaches to heart-rate measurement in that it produces greater correspondence to both skin conductance and to the known characteristics of the motion picture stimulus.

A66-80470
THE EFFECT OF LASER RADIATION ON THE RETINAL VASCULATURE: ANIMAL AND CLINICAL STUDIES.
Francis A. L'Espereance, Jr. (Columbia-Presbyterian Med. Center, Inst. of Ophthalmol., New York City, N. Y.)
(AMA, 114th Ann. Meeting, New York City, Jun. 20–24, 1965).
Archives of Ophthalmology, vol. 74, Dec. 1965, p. 752–759. 12 refs.

Experimental evidence indicates that the effect of laser radiation on the retinal vasculature depends upon the proximity of the pigment epithelium or melanocytes to the blood vessel, the rate of blood flow, the amount of reduced hemoglobin present, and the intensity of the incident beam. Elevated areas of neovascularization and large retinal angiomata were not effectively treated during the one-year study. Most microaneurysms, a small percentage of the flat areas of neovascularization, and retinal angiomata less than two disc diameters in size were obliterated by the coagulation effect of laser radiation.

A66-80471
EFFECTS OF DRUGS ON SPONTANEOUS SLOW POTENTIAL OSCILLATIONS OF THE CEREBRAL CORTEX.
Stata Norton and Robert E. Jewett (Kan. U. Med. Center, Dept. of Pharmacol., Kansas City).
Journal of Pharmacology and Experimental Therapeutics, vol. 149, Sep. 1965, p. 301–310. 24 refs.
Grant Natl. Inst. of Mental Health MH 07278.

In cats, except for the 8–12 c.p.m. waves, which were not quantified, all slow waves, including periodic shifts with activated sleep, were blocked by amphetamine and chlorpromazine but not by sedative doses of BW 58-271 (2-methyl 2-benzyl-amino pyrrolo-(2,3-d) pyrimidine) or thiopental. Motor behavior in response to an environmental stimulus (handling the cats) was not depressed by amphetamine but was markedly reduced by chlorpromazine, BW 58-271 or thiopental. After amphetamine the electroencephalogram showed a continuous desynchronized, low voltage pattern when the cats were undisturbed, while following chlorpromazine the EEG stayed in a synchronized light sleep pattern. Evidence that the origin of the cortical slow waves and shifts during sleep patterns may be either limbic or reticular is discussed. The clear difference between the effects of chlorpromazine and anesthetic agents tends to support the limbic control of activated sleep.

A66-80472
THE CONCEPT OF SUSCEPTIBILITY TO HEARING LOSS.
W. Dixon Ward (Minn. U., Dept. of Otolaryngol., Hearing Res. Lab., Minneapolis).
Journal of Occupational Medicine, vol. 7, Dec. 1965, p. 595–607. 29 refs.

Susceptibility to acoustic trauma is a trait distributed normally, not dichotomously. Although a "general susceptibility" to lower-frequency sounds has been demonstrated, this general factor is weak, which implies the existence of several distinct susceptibilities. If susceptibility is to be measured by means of a fatigue test, we must use the same physical stimulus for all observers. The most efficient exposure stimulus is a broad band of noise with considerably more energy in the low frequencies than in the high ones. It is not true that equal amounts of temporary threshold shift in 2 persons imply equal susceptibility unless the subjects' resting thresholds at the frequency of shift are also equal. Nor is it true that the existence of a slight hearing loss necessarily means that the ear is more susceptible than average. The two ears of a given observer may differ substantially in susceptibility, and the susceptibility may vary appreciably from test to test. However, this variability is not subject to control by manipulation of the physiological condition of the employee, as far as we know now. Therefore, the only certain way to reduce loss of hearing from noise is to require ear protection.

A66-80473
CHANGING AN ESTABLISHED CONCEPT: A COMPARISON OF THE ABILITY OF YOUNG, MIDDLE-AGED AND OLD SUBJECTS.
N. E. Wetherick (Liverpool U., Med. Res. Council Unit for Res. on Occupational Aspects of Ageing, Dept. of Psychol., Liverpool, Great Britain).
Gerontologia, vol. 11, 1965, p. 82–95.

The ability of subjects of different ages to change an established concept showed that in the 4 tasks employed the subject learned one concept and then had to shift to another. In 2 of them the instances in the pre-shift series seemed to show that one concept was correct but the apparently correct concept either included an element that was not in fact necessary or excluded one that was. Old subjects showed a failure to make proper use of negative instances. At a certain stage of development in childhood "reversal" shifts begin to be made more quickly than "non-reversal" shifts. The two remaining tasks examined the possibility that a change in the opposite direction might be observable in old age. That is that old subjects might make a "non-reversal" shift more quickly than a "reversal". This was not found to be the case with the old subjects employed in this experiment though they did not find a "reversal" shift as much less difficult than a "non-reversal" as the young subjects did. It is possible that the change may be apparent in still older or in less intelligent subjects. All 4 tasks showed evidence of a disinclination in old subjects to change an established concept even where it was demonstrably wrong.

A66-80474
ACQUISITION AND RETENTION OF NYSTAGMIC HABITUATION IN CATS WITH DISTRIBUTED ACCELERATION EXPERIENCE.
James H. Brown (U. S. Army Med. Res. Lab., Fort Knox, Ky.)
Journal of Comparative and Physiological Psychology, vol. 60, Dec. 1965, p. 340–343. 14 refs.

Fifty cats were exposed to a long series of angular accelerations with experimental sessions separated by intervals of 1–14 days. A highly significant nystagmus response decline (habituation) resulted from this repeated exposure. While the acquisition of nystagmic habituation was not influenced by different distributions of acceleration experience, retention was systematically affected.

A66-80475
BLOOD-PRESSURE AND HEART-RATE CHANGES IN DOGS DURING HYPOTHALAMIC SELF-STIMULATION.
Jorge Perez-Cruet (Johns Hopkins U., School of Med., Pavlovian Lab., Baltimore, Md.), Roger W. McIntire, and Stanley S. Pliskoff (Md. U., College Park).
Journal of Comparative and Physiological Psychology, vol. 60, Dec. 1965, p. 373–381. 17 refs.
IBM Corp. supported research.
NASA Grant NsG-520; Grants PHS HE-06945-02 and FR-00004; Contract DA-49-193-MD-2288.

Four subjects with rewarding hypothalamic placements were trained to self-stimulate when a light was turned on inside a soundproof room. During consecutive periods of lights off with no self-stimulation available, and of lights on with self-stimulation available, blood pressure and heart rate were recorded. Hypothalamic self-stimulation (HSS) was accompanied by increases in systolic and diastolic blood pressures and average HR, mediated via the sympathetic nervous system and obliterate by adrenergic blocking agents. Under curare the BP response to manual hypothalamic stimulation was not changed but the HR response was diminished, indicating that muscular movements contribute little to BP changes during HSS.

A66-80476
SOME OBSERVATIONS ON SLEEP-LIKE BEHAVIOUR AND AROUSAL PRODUCED BY ELECTRIC STIMULATION OF THE MEDIAL THALAMUS IN RABBITS.
Bogdan Sadowski (Polish Acad. of Sci., Inst. of Work Physiol., Warsaw).
Acta biologiae experimentalis, vol. 25, 1965, p. 219–232. 42 refs.

In freely moving rabbits bearing chronically implanted cortical and subcortical electrodes, the medial thalamus was stimulated electrically, and electroencephalograms were taken. Stimulation of the medial thalamus with single impulses produced spindles in the sensorimotor cortex, consisting of 8–15/sec. waves. The spindles were best pronounced in a period of synchronization of the EEG tracing characterized by spontaneous spindling. From a behavioral point of view, sleep-like patterns ensued accompanied by a deep synchronization of the tracing. Low frequency stimulation of the medial thalamus (5 c.p.s.) produced a recruiting response in the cortex. With weak stimuli, an inhibition of motor activity and sleep-like behavior developed. Middle (30 c.p.s.) and high (100–300 c.p.s.) frequency stimulation of the medial thalamus produced an EEG and behavioral arousal. Functional properties of the nonspecific thalamic system and its role in sleep mechanisms are discussed.

A66-80477
THE IMPORTANCE OF SPLEEN IN THE REGULATION OF BONE AND CALCIUM METABOLISM.
A. Rosenfeldova and R. Rosenfeld (Palacký U., Med. Fac., Inst. of Physiol., Olomouc, Czechoslovakia).
Acta Universitatis palackianae olomucensis facultatis medicae, vol. 36, 1964, p. 101–108. 30 refs.

The changes in the degree of the relative postdenervation atrophy of the bone and changes in weight and composition of the bone were taken as an indicator of the changes in the bone metabolism in studies of the influence of the spleen on the regulation of the bone metabolism in female rats. A splenectomy influenced the bone metabolism: it decreased the relative postdenervation atrophy of the bone, diminished the weight increase of the bone and increased its mineralization. These changes were not caused by the operation itself but by the change of the functional condition of the spleen as shown by the results with the transplantation of the spleen. The differences in changes of the relative postdenervation bone atrophy in splenectomized, splenectomized and castrated, only castrated rats, in splenectomized animals to whom parathormon was administered, and in rats with intact spleen to whom parathormon was administered, show that the spleen interferes with the bone metabolism indirectly. The spleen activates parathormon by binding and inactivating a part of the steroids, influencing Ca metabolism. After splenectomy the effect of steroid prevails over that of parathormon. The spleen thus interferes with the bone metabolism indirectly through its homeostatic effect on the metabolism of steroids.

A66-80478
AN APPRAISAL OF DIGITAL DISPLAYS WITH PARTICULAR REFERENCE TO ALTIMETER DESIGN.
J. M. Rolfe (Roy. Air Force Inst. of Aviation Med., Farnborough, Hants, Great Britain).
Ergonomics, vol. 8, Oct. 1965, p. 425–434. 18 refs.

The paper examines critically the experimental evidence currently available, which relates to the display of height information using digital indicators. After reviewing data for both static and dynamic experiments the conclusion is drawn that there is a need for much more research into the information transmission characteristics of digital displays. The term digital display is used to describe devices which present information in direct numerical form, rather than require the interpolation of a pointer's position on a scale, and which allow the value displayed to be varied as a function of an input signal in terms of rate and direction.

A66-80479
AGE AND CHOICE BETWEEN RESPONSES IN A SELF-PACE REPETITIVE TASK.
P. M. A. Rabbitt and M. Rogers (Natl. Inst. of Mental Health, Sect. on Aging, Bethesda, Md.)
Ergonomics, vol. 8, Oct. 1965, p. 435–444. 17 refs.

When young subjects select between two responses of similar amplitudes, and in the same direction, they can overlap identification of one of two signals with the initial movement of a reach appropriate to either. They thus respond more quickly when selecting between responses of similar amplitudes than when selecting between responses of very different amplitudes. Older subjects are less able to overlap movement and choice time and so benefit less from a choice between similar as against dissimilar responses. Young subjects respond faster when cycles of responses during the task are alternated than when they are repeated. This tendency appears to be related to guessing strategies earlier described as the "negative recency effect" or "gambler's fallacy". The latencies of young subjects' responses appear to be directly dependent on the latencies of immediately preceding responses rather than on the response rate for the sequence as a whole. Latencies of old subjects' responses are affected by both factors. Implifications for the design of consoles are discussed.

A66-80480
THE EFFECTS OF PHYSICAL TRAINING IN A TEMPERATE AND HOT CLIMATE ON THE PHYSIOLOGICAL RESPONSES TO HEAT STRESS.
J. R. Allan (Army Operational Res. Estab., West Byfleet, Surrey, Great Britain).
Ergonomics, vol. 8, Oct. 1965, p. 445–453. 12 refs.

The effects of vigorous physical training in a hot climate were assessed and compared with those produced by identical physical training under cooler ambient conditions. Both types of training resulted in a lowering of physiological strain during a standardized heat exposure. The effect was greater for those trained in the hot climate. The results are discussed in relation to other artificial acclimatization techniques.

A66-80481
TRACKING PERFORMANCE UNDER RANDOM ACCELERATION: EFFECTS OF CONTROL DYNAMICS.
Gunnar Torle (Swedish Aircraft Co., Stockholm).
Ergonomics, vol. 8, Oct. 1965, p. 481–486.

Trials were conducted in a moving simulator (one degree of freedom) in order to study the effect on manual tracking performance of backlash and friction in the control stick and on an arm-rest. The results show that backlash and friction should be avoided and that an arm-rest gives a significant reduction in tracking errors when the pilot is subjected to gust accelerations.

A66-80482
GUIDED PRACTICE IN DIRECT AND REVERSED SERIAL TRACKING.
A. W. Macrae and D. H. Holding (Leeds U., Dept. of Psychol., Great Britain).
Ergonomics, vol. 8, Oct. 1965, p. 487–492. 9 refs.

A discrete tracking task was arranged in which movements of a lever extinguished a series of stimulus lights, using either compatible or incompatible display-control relationships. Movement of the lever could be controlled by the subject, or made automatic in order to provide guidance. Six groups of subjects were given nine, one or no guided runs before beginning normal practice on either the direct or reversed form of the task. As expected, the reversed task was more difficult than the direct version. On both forms of the task guidance formed effective pretraining, although nine trials of guidance were not nine times as effective as one such trial. Guidance tended to have a greater effect upon the reversed form of task, as would be expected were its main function to prevent the commission of errors.

A66-80483
RETINAL RIVALRY, VASOMOTOR TONE AND SENSORY STIMULATION.
Eeva Jalavisto (Helsinki, U., Inst. of Physiol., Finland).
Annales Academiae scientiarum fennicae, Series A, V. Medica, 117, 1965, 13 p. 14 refs.
Signe och Ane Gyllenberg's Stiftelse supported research.

The phenomenon of binocular, so called retinal rivalry was studied in three subjects under standard conditions with light-adapted eyes and during sensory (acoustic, proprioceptive and labyrinthine) stimulation. A number of similar experiments were performed after dark-adaptation during 6 to 15 minutes. The competing figures were two squares, one red and one blue, viewed in a stereoscope. The frequency of oscillation tended to slow down with prolongation of the observation time. The duration of red showed pronounced periodicity in 71 percent of the experiments. These phenomena were particularly striking in the dark-adaptation experiments, in which the oscillation frequencies were very slow. Only proprioceptive stimulation (weight lifting) had a slight tendency to increase the oscillation frequency and shorten the period length of red dominance. Acoustic stimulation (noise or music) were without effect. During part of the experiments finger plethysmograms were recorded in order to compare the periodicity of vasomotor tone with the periodicity of the retinal rivalry phenomenon. Although certain similarities in period length were noted, no conclusive evidence of correlation between the two phenomena was obtained.

A66-80484
ON HYPOTHERMIA AND TORPIDITY IN THE NIGHTJAR (CAPRIMULGUS EUROPAEUS L.).
V. A. Pelponen (Helsinki, U., Finland).
Annales Academiae scientiarum fennicae, Ser. A, IV. Biologica, 87, 1965, 15 p. 15 refs.

A male nightjar (Caprimulgus europaeus) was caught in August, with the purpose of testing its ability to sink into torpidity during the succeeding months. Fasting experiments were performed indoors at room temperature, in a cellar, and outdoors. The loss of body weight was great during the first three fast days, after which, on average, 21 percent of the initial weight was lost. After this the weight loss was considerably reduced, which was attributed to a reduction in the basal metabolic rate. The daily fluctuation of the body temperature during fasting was recorded. The body temperature curves reveal an innate rhythm, with successive peaks and troughs within 24 hours. Even during fasting the body temperature rose just before sunrise (average 37.4° C.) and at about sunset (average 38.3° C.) to a level sufficient for activity, and fell twice a day, namely after midnight and at noon, to a hypothermic level, which on the third fast day ranged from 30.4° to 31.7° C. During the subsequent fast days, the daily hypothermia was deepened both at night and daytime, and on the fifth and sixth days reached to level (19.3° to 23.0° C.) indicating torpidity twice within 24 hours. From this state the nightjar awoke spontaneously, in spite of a low ambient temperature (for instance + 1° C.). The nightjar was able to fly immediately after awakening. When wakening indoors at room temperature, the bird accelerated its breathing, by making vigorous pumping movements with its throat. Sinking into torpidity required more time (four to five hours) than awakening (one to three hours). In captivity, weight loss is an important prerequisite for torpidity.

A66-80485
CONCEPTUAL ORIENTATIONS OF CONTEMPORARY SMALL GROUP THEORY.
John Delamater, Charles G. McClintock (U. of Calif., Santa Barbara), and Gordon Becker (Gen. Elec. Co., Santa Barbara, Calif.)
Psychological Bulletin, vol. 64, Dec. 1965, p. 402–412. 61 refs.
Contract AF 49(638)-794.

In an attempt to study some of the conceptual and content parameters of contemporary small group orientations, two classificatory systems were developed and applied to a sample of empirical hypotheses derived from six such orientations. The results of this analysis provide data on the similarities and differences between these points of view on three dimensions: (a) the size of the social unit(s), (b) the social process level(s) with which they deal, and (c) the substantive content of the variables which they employ.

A66-80486
THE "BREAK-OFF" PHENOMENON: A PRECIPITANT OF ANXIETY IN JET AVIATORS.
John A. Sours (Naval School of Aviation Med., Dept. of Psychiat. and Neurol., Pensacola, Fla.)
(Aerospace Med. Assoc., 36th Ann. Meeting, New York, N. Y., Apr. 26, 1965).
Archives of General Psychiatry, vol. 13, Nov. 1965, p. 447–456. 53 refs.

During a six-month interval, all designated naval and Marine jet aviators referred for neuropsychiatric consultation were questioned in regard to the "break-off" phenomenon. Evaluations were done at the US Naval School of Aviation, Pensacola, Fla., and included open-ended psychiatric interviews, aviation research questionnaires, and standard psychological batteries. In this manner 37 jet aviators were evaluated; they could be divided into two groups on the basis of significant psychopathology. It is found that there is a greater incidence of "break-off" experiences among aviators with positive psychiatric findings. The "break-off" phenomenon is shown to be a precipitant of acute anxiety attacks with phobic and psychophysiological manifestations, which leads to a fear of flying reaction. The "break-off" phenomenon is not necessarily related to greater contact with high altitude solitary flying. Representative case histories are presented to illustrate the personality and psychodynamic factors thought to be associated with adverse reactions to the "break-off" phenomenon. The mechanisms of phobic anxiety in high altitude solitary flying are discussed.

A66-80487
CARDIOPULMONARY EFFECTS OF SUBACUTE HYDRAZINE POISONING IN RHESUS MONKEYS.
Ralph O. Hayden and Raymond H. Murray (Aerospace Med. Res. Labs.; and Ind. U., Cardiopulmonary Res. Lab., Wright-Patterson AFB, Ohio).
Industrial Medicine and Surgery, vol. 34, Dec. 1965, p. 925–933. 27 refs.

Seven healthy male monkeys (Macaca mulatta) of varying weights and ages were subjected to right and left heart catheterization and expired air analysis before and after treatment with intraperitoneal injections of hydrazine. The clinical condition of the hydrazine-poisoned animals varied considerably, from normal to comatose. Blood pressure and heart rate changes in the treated animals were found not to be statistically significant. Minute respiratory volume index and oxygen consumption index were consistently lower in the treated animals; the latter was statistically significant at the 0.05 level. The livers of the poisoned animals showed the most striking pathologic changes and revealed variable pale yellow-tan discoloration, slight enlargement, and necrosis.

A66-80488
A REAPPRAISAL OF THE CIRCULATORY EFFECTS OF THE VALSALVA MANEUVER.
Daniel J. Stone, Alan F. Lyon, and Alvin S. Teirstein (V. A. Hosp., Cardiopulmonary Lab. and Med. Serv., Bronx, N. Y.)
American Journal of Medicine, vol. 39, Dec. 1965, p. 923–933. 14 refs.

A study was made of the responses of the pulmonary and systematic vascular circulations to the classic Valsalva Maneuver in twenty-one subjects. From an analysis of the data, it has been possible to demonstrate that the effect of intrathoracic pressure on both circulations is essentially the same. During the early phases of straining, this relationship is entirely a direct and additive one (i.e., linear). The subsequent departures from linearity such as the collapse in pulse pressure, the secondary rise and the overshoot after straining have been interpreted as manifestations of the added variable of change in blood flow. Although reflex changes in arteriolar tone and heart rate certainly occur, their role would appear to be of lesser importance than previously suggested.

A66-80489
EVOKED CORTICAL RESPONSE ENHANCEMENT AND ATTENTION IN MAN. A STUDY OF RESPONSES TO AUDITORY AND SHOCK STIMULI.
J. H. Satterfield (Washington U., School of Med., Dept. of Psychiat. St. Louis, Mo.)
Electroencephalography and Clinical Neurophysiology, vol. 19, Nov. 1965, p. 470–475. 13 refs.
Grants PHS 05806, MH04808, MH5804, MH7081.

In 47 consecutive normal subjects the average evoked cortical response to both click and shock stimuli was measured when the subject was attending to one while ignoring the other stimulus. The amplitude of the evoked response to both click and shock was enhanced when the subject attended to the stimulus, whereas the response to which he was not attending tended to be suppressed. These changes were statistically significant at the $P < 0.001$ level. In five subjects the peripheral nerve response and the cortical response to shock were simultaneously recorded. In no case could the enhancement of the average cortical response with attention be accounted for by similar augmentation of the average peripheral nerve response.

A66-80490
EFFECTS OF CARDIAC AND RESPIRATORY CYCLES ON AVERAGED VISUAL EVOKED RESPONSES.
Enoch Callaway III and Monte Buchsbaum (Langley Porter Neuropsychiat. Inst., San Francisco, Calif.)
Electroencephalography and Clinical Neurophysiology, vol. 19, Nov. 1965, p. 476–480. 13 refs.
Contract Nonr 2931(00; and Grants Calif. Dept. of Mental Health 62-1-33 and 62-1-24; and PHS 1-GS-53 and FR00122-03.

Pairs of averaged electroencephalogram responses from eight volunteers evoked by visual stimuli given at inspiration correlated more highly than did pairs with one evoked by stimulating at inspiration and the other evoked by stimulating at expiration. A comparison of averaged responses evoked by stimulating at the electrocardiogram Q wave and at 250 msec after the Q wave similarly showed pairs of averaged evoked responses to be most similar when evoked by stimulating at the same phase of the cardiac cycle. These findings lead to the conclusion that both cardiac and respiratory cycles are capable of contributing to variability in averaged visual evoked responses.

A66-80491
CHANGES IN EVOKED BRAIN OXYGEN DURING SENSORY STIMULATION AND CONDITIONING.
R. P. Travis, Jr., and L. C. Clark, Jr. (Ala. U. Med. Center, Depts. of Psychiat., and Surg., Birmingham).
Electroencephalography and Clinical Neurophysiology, vol. 19, Nov. 1965, p. 484–491. 24 refs.
Grants MH-08820; HE-03109; and HE-06353.

Platinum electrodes chronically implanted in the thalamic, amygdaloid, tegmental and caudate areas of three cats were used to record the oxygen currents (aO_2) in response to novel and repetitious sensory stimuli and during conditioning and extinction. The oxygen availability in these circulatory beds of the brain was consistently changed by mild sensory stimulation and dramatically changed by conditioning procedures. The results are discussed in terms of neurogenic, hormonal and metabolic phenomena in the brain cells and circulation.

A66-80492
CIRCADIAN SLEEP AND WAKING PATTERNS IN THE LABORATORY CAT.
M. B. Sterman, T. Knauss, D. Lehman, and C. D. Clemente (Sepulveda Veterans Admin. Hosp., Calif.; and Calif. U., Brain Res. Inst. and Dept. of Anat., Los Angeles).
Electroencephalography and Clinical Neurophysiology, vol. 19, Nov. 1965, p. 509–517. 14 refs.
Grant PHS MH 10083.

Eight adult cats were observed for repeated 23 hour periods spent in an experimental chamber under stable environmental conditions. Behavior, electroencephalogram, subcortical electrical activity, and somatic muscle discharge were continuously monitored during these observations. Four basic behavioral-electrophysiological patterns were defined: (a) awake, activated; (b) drowsy, slow wave; (c) asleep, spindle burst; and (d) asleep, activated. Each minute of recording was classified according to its dominant pattern. Several quantitative measures were obtained, which were highly consistent both for a given animal and among the animals observed. These were: (1) the percentage occurrence of each of the patterns during a 23 hour period. The group means were: awake, 28%; drowsy, 14.3%; spindle burst sleep, 42.2%; and activated sleep, 15.5%. The percent of total sleep time for activated sleep was 27.5%. (2) Pattern percentage in relation to time: a general periodicity in the occurrence of sleeping and waking patterns indicated reciprocal peaks related to specific time period. During the peak occurrence of the sleep patterns, a sleep EEG cycle of 25.8 ± 7.1 min. was determined.

A66-80493
THE EFFECT OF IMIPRAMINE, DESMETHYLIMIPRAMINE AND CHLOROPROMAZINE ON THE SLEEP-WAKEFULNESS CYCLE OF THE CAT.
Yasuo Hishikawa, Kenji Nakai, Hidenobu Ida, and Ziro Kaneko (Osaka U. Med. School, Dept. of Neuropsychiat., Osaka, Japan).
Electroencephalography and Clinical Neurophysiology, vol. 19, Nov. 1965, p. 518–521. 15 refs.

The effects of imipramine, desmethylimipramine and chlorpromazine upon the sleep–wakefulness cycle were studied in 5 adult cats, with doses of 2 and 4 mg./kg. Imipramine and desmethylimipramine at either dosage had an inhibitory effect upon the REM period of sleep. Imipramine at both dosages and desmethylimipramine at the dose of 4 mg./kg. had a hypnotic effect, prolonging the time spent in sleep and decreasing the number of awakenings. Chlorpromazine at both dosages had a hypnotic effect, and at the dose of 4 mg./kg. had an inhibitory effect upon the REM period, which was however, less pronounced than that of the other two drugs.

A66-80494
STEADY POTENTIAL SHIFTS IN THE RAT DURING DESYNCHRONIZED SLEEP.
Robert H. Wurtz (Washington U. School of Med., Depts. of Neurol. and Physiol., St. Louis, Mo.)
Electroencephalography and Clinical Neurophysiology, vol. 19, Nov. 1965, p. 521–523. 9 refs.
Grants NIH MH 10293-01, NB 04513-02, and 5T1NB-5240.

Upon passing from slow wave to desynchronized sleep (rapid eye movement state) a steady potential shift was identified in the rat brain. In polarity this shift was similar to the one observed during transition from slow wave sleep to wakefulness. Both shifts were surface-negative in direction with reference to an extra-cerebral electrode and were similar to shifts reported for cat and rabbit. The shift on entry into desynchronized sleep was opposite in polarity from that reported in a previous study of the rat.

A66-80495
SPECIES-RELATED CHARACTERISTICS OF HEAT PRODUCTION FOLLOWING HYPOTHERMIA IN RODENTS [VIDOVYE OSOBENNOSTI TERMOGENEZA POSLE GIPOTERMII U GRYZUNOV].
L. A. Isaakian, D. A. Rozhaiia, and L. S. Maslennikova (USSR, Acad. of Sci., I. P. Pavlov Inst. of Physiol., Lab. of Ecol. Physiol., Sect. of Physiol. of Gas Exchange, Leningrad).
Zhurnal Evoliutsionnoi Biokhimii i Fiziologii, vol. 1, Sep.–Oct. 1965, p. 419–424. 14 refs. In Russian.

An attempt was made to evaluate the thermogenetic capacity in some rodents—albino rats (Rattus norvegicus, Berkenh.), golden hamsters (Mesocricetus auratus Wath.), albino mice (Mus musculus L.), and field mice (Stenocranius gregalis Pall.)—during rewarming after hypothermia, induced by Zlaja's method. Comparative characteristics of heat production in animals in a state of lethargic hypothermia and spontaneous awakening were found to correlate to specific characteristics of the species under nomothermal conditions. Recovery of body temperature following hypothermia proceeded more or less similarly, but with different energy expenditure. Mesocricetus auratus showed higher rates of heat production, more pronounced thermal shivering and greater resistance to cooling, as compared to albino rats, or other species. Attitude to spontaneous awakening has been found to differ in the animals under consideration, being also determined by environmental temperature during recovery, as well as by degree of hypothermia.

A66-80496
CHARACTERISTICS OF REFLEX REGULATION OF HEMODYNAMIC CHANGES UNDER THE ACTION OF TRANSVERSELY DIRECTED ACCELERATION FORCES [OSOBENNOSTI REFLEKTORNOI REGULIATSII GEMODINAMICHESKIKH SDVIGOV PRI DEISTVII POPERECHNO NAPRAVLENNYKH SIL USKORENIIA].

E. B. Shul'zhenko (USSR, Acad. Med. Sci., Inst. of Normal and Pathol. Physiol., Lab. of Gen. and Exptl. Cardiol., Moscow).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 60, Oct. 1965, p. 36–39. 8 refs. In Russian.

During the action of transversely directed acceleration forces of 9 g continuing for one minute anesthetized dogs were found to have reflex changes in the cardiovascular system. While the hemodynamic changes took place two phases were noted: a phase of functional disorder and a phase of compensation. The latter was observed during the action of overload and was strikingly manifest in the period after completion of rotation. The degree of disturbance in the first phase and the appearance of compensatory hyperfunctions depend on the integrity of the system of reflex self-regulation of the blood circulation. The carotid sinuses are an important link in the chain of compensatory mechanisms of blood circulation regulation during the action of transversely directed acceleration forces.

A66-80497
THE CAUSE OF DECREASE IN EXCHANGE INTENSITY OF THE BRAIN PHOSPHOLIPIDS IN CASES OF OXYGEN DEFICIENCY [K VOPROSU O PRICHINAKH SNIZHENIIA INTENSIVNOSTI OBMENA FOSFOLIPIDOV MOZGA PRI KISLOPODNOM GOLODANII ORGANIZMA].
S. V. Gasteva and D. A. Chetverikov (USSR, Acad. of Sci., I. P. Pavlov Inst. of Physiol., Moscow).
Doklady Akademii Nauk SSSR, vol. 165, Nov. 21, 1965, p. 714–716. 6 refs. In Russian.

The mortality rate was higher in rats subjected to low ambient pressure, while their body temperature was maintained at normal level, than in animals at low pressure subjected to hypothermia. The reason for that may be the protective effect of hypothermia during phases of oxygen deficiency, caused by low oxygen pressure. The decrease in body temperature lowers the metabolic rate and the oxygen requirements of the tissues, demonstrated by the lower rate of phospho-lipid exchange in the brain tissues.

A66-80498
SPECIFICITY OF INDIVIDUAL DIFFERENCES IN ARM MOVEMENT FATIGUE WITHIN TWO LEVELS OF WORK LOAD.
Richard B. Alderman (Calif., U., Berkeley).
Research Quarterly, vol. 36, Oct. 1965, p. 227–232. 5 refs.

Fifty subjects were given fatiguing tests at two work loads on a horizontal arm-crank friction ergometer. The initial speed was 120 r.p.m.; the test continued for 10 min. Both fatigue curves were S-shaped—the rate of work dropped off slowly at first, then went through a rapid drop-off phase followed by a slow drop-off phase that approached an asymptotic steady state. The mathematical form was a two-component exponential equation which fitted the observed data very closely. Using a 2-kg. work load, there was 22 percent decrement at the end of the test. Using a 3.45 kg. work load (1 week later) the decrement was 48 percent. Test-retest reliability of individual differences in drop-off was moderately high (r = .86 and .85 for the two work loads). However, the correlation between drop-offs for the two work loads was only r = .61 and even after correction for attenuation was only .71. Thus only 50 percent of the individual difference variance in fatigability was common to the two work loads, while 50 percent was specific to a particular work load.

A66-80499
EFFECT OF EATING AT VARIOUS TIMES ON SUBSEQUENT PERFORMANCES IN THE 2-MILE RUN.
Gene M. Asprey, Louis E. Alley, and W. W. Tuttle (Iowa U., Iowa City).
Research Quarterly, vol. 36, Oct. 1965, p. 233–236. 6 refs.
Cereal Inst., Inc., Chicago supported research.

For each of three time intervals (1/2 hr., 1 hr., and 2 hr.) between eating and running and for a control run (no eating for at least 3 hr. before running) eight subjects each ran eight trials for the 2-mile run. The criterion score was the mean of eight trials for each time interval and for the control run. The analysis of the data indicates that, according to the F ratio, the eating of a small meal 1/2 hr., 1 hr., or 2 hr. before running has no adverse effect on the running times for the 2-mile run.

A66-80500
FIGURAL AFTER-EFFECTS RESULTING FROM GROSS ACTION PATTERNS: THE AMOUNT OF EXPOSURE TO THE INSPECTION TASK AND THE DURATION OF THE AFTER-EFFECTS.
Bryant J. Cratty (Calif., U., Los Angeles).
Research Quarterly, vol. 36, Oct. 1965, p. 237–242. 17 refs.

One hundred and twenty male university students guided themselves, while blindfolded, through curved and straight pathways. Of these 120, 40 subjects moved eight times through curved half-circle pathways, a second 40 traversed them twelve times, while a final 40 moved sixteen times through them. Based upon the percent who reported opposite curvature in a straight test pathway traversed immediately afterward, an intermediate amount of exposure (12 traversals) in the inspection task (the curved pathways) resulted in slightly more sustained after-effects. Theoretical implications relative to Helson's Adaptation Theory are discussed.

A66-80501
THE EFFECTS OF PRE-EXERCISE CONDITIONS ON HEART RATE AND OXYGEN UPTAKE DURING EXERCISE AND RECOVERY.
Harold B. Falls (Ark., U., Fayetteville) and Jacob E. Weibers (Purdue U., Lafayette, Ind.).
Research Quarterly, vol. 36, Oct. 1965, p. 243–252. 47 refs.

The effects of four pre-exercise conditions—cold shower, hot shower, exercise warm-up and rest—on heart rate and oxygen uptake. Five subjects rode a bicycle ergometer at 1080 kgm./min. for five min. Heart rate and O_2 uptake during exercise and recovery were measured. Exercise heart rate and recovery oxygen uptake were found to be significantly lower after a cold shower than after the other conditions. There was a significant interaction between subjects and pre-exercise conditions on recovery heart rate.

A66-80502
RELIABILITY OF FITNESS STRENGTH TESTS.
Lynn W. McCraw (Tex., U., Austin) and Byron N. McClenney (San Antonio Coll., Tex.).
Research Quarterly, vol. 36, Oct. 1965, p. 289–295. 8 refs.

Three fitness tests—push-ups, sit-ups, and pull-ups—were administered on four separate days to elementary and junior high school boys to determine the relative reliabilities of using a single trial, better of two trials, and average of two trials. A trend analysis of the data revealed significant improvement during the four trials, and scores increased significantly from trial to trial on push-ups. Neither the better of two trials of the average of two trials was found to be any more reliable than a single trial.

A66-80503
EFFECTS OF REST PERIODS OF VARIOUS LENGTHS ON THE CONSISTENCY OF MAXIMAL PERFORMANCE ON MUSCULAR ENDURANCE TEST.
William H. Solley (Western Ky. State Coll., Bowling Green) and Bryan J. Whipp (Fla., U., Gainesville).
Research Quarterly, vol. 36, Oct. 1965, p. 327–336. 11 refs.

Thirty-four college men were administered the maximum-dip test during eight consecutive, regularly scheduled physical education class periods. The maximum number of dips possible was measured for continuous, all-out effort and for effort with 5, 7, or 10 sec. of rest between each two dips. Each of these four testing conditions was repeated on the next testing day after original measurement. Coefficients of correlation were computed between maximum-dip performances in the four exercise programs. The degree of relationship became increasingly smaller as the rest period increased in length. More than half of the predictive values of continuous, maximum effort was lost in the program with 10 sec. of rest. Considerable variability was observed in the degree of gain in total dips as rest periods of varying lengths were interjected. The nature of the work load is an important factor in interpreting endurance studies.

A66-80504
EFFECTS OF HYPOXIA ON VENTILATION AND CARDIAC OUTPUT.
Robert F. Grover (Col., U. Med. Center, Dept. of Med., Cardiovascular Pulmonary Lab., Denver).
(N. Y. Acad. of Sci., Conf. on Respiratory Failure, Feb. 11–12, 1964).
Annals of the New York Academy of Sciences, vol. 121, Art. 3, Mar. 24, 1965, p. 662–672; discussion, p. 672–673. 16 refs.
Grants Natl. Heart Inst. H-1208 and HE-06895.

The effects of subacute or chronic hypoxia in normal man living at high altitude are examined. The following aspects are included: (1) cardiac output in chronic hypoxia, (2) resting ventilation during subacute hypoxia, (3) ventilation during exercise in chronic hypoxia, and (4) ventilation-perfusion relationships in chronic hypoxia. Results obtained in each of these categories are given and discussed briefly.

A66-80505
EFFECT OF MECHANICAL VENTILATION ON THE CIRCULATION.
A. Crampton Smith (Oxford U., Great Britain).
(N. Y. Acad. of Sci., Conf. on Respiratory Failure, Feb. 11–12, 1964).
Annals of the New York Academy of Sciences, vol. 121, Art. 3, Mar. 24, 1965, p. 733–745. 11 refs.

Studies of the effects of mechanical artificial respiration on the circulation are reviewed, together with suggestions of modifying undesirable effects. It is suggested that the usual therapeutic compromise has to be made between what is best for the circulation and what is best for ventilation. It would seem that a duration of about 1.3 sec. is most suitable. For any given duration of inspiration, changes of tracheal positive pressure waveform do not

seem to matter very much; but if a subatmospheric pressure is used during expiration, ventilation may have to be increased to compensate for the increased physiological dead space. Work now in progress at Oxford (England) is also reviewed. The latter involves the effects of adding CO_2 to inspired air in patients with abnormal circulatory reflexes. The administration of CO_2 caused a rise in blood pressure. Physiological and clinical applications of this procedure are continuing to be investigated.

A66-80506
THE REACTION OF THE HUMAN LUNG TO ENRICHED OXYGEN ATMOSPHERE.
Philip C. Pratt (Ohio State U. Coll. of Med., Depts. of Pathol.; and Ohio Tuberculosis Hosp., Columbus).
(N. Y. Acad. of Sci., Conf. on Respiratory Failure, Feb. 11–12, 1964).
Annals of the New York Academy of Sciences, vol. 121, Art. 3, Mar. 24, 1965. p. 809–820; discussion, p. 821–822. 18 refs.

A review of several consecutive series of autopsies in adults and children showed that a recognizable change in pulmonary morphology is present in most patients who have had oxygen therapy for one or more days immediately prior to death. The lesion includes congestion of capillaries and increased thickness of alveolar septa; it is interpreted as resulting from pulmonary capillary proliferation. Reasons are presented for interpreting this morphological reaction to oxygen rather than a result of irritation, patchy atelectasis, or post-mortem change. Care must be taken in experimental work, especially with mice, to eliminate the possibility that gross changes might be of the post-mortem variety.

A66-80507
EFFECT OF OXYGEN BREATHING AT ONE ATMOSPHERE ON THE SURFACE ACTIVITY OF LUNG EXTRACTS IN DOGS.
P. R. B. Caldwell, S. T. Giammona, W. L. Lee, Jr., and S. Bondurant (Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio; and Ind., U. Med. Center, Dept. of Med., Indianapolis).
(N. Y. Acad. of Sci., Conf. on Respiratory Failure, Feb. 11–12, 1964).
Annals of the New York Academy of Sciences, vol. 121, Art. 3, Mar. 24, 1965, p. 823–827; discussion, p. 827–828.
Contract AF 33(616)8378; and Grants PHS HE08240, H4080, H6308.

Pure-bred beagles of both sexes were divided into two groups and placed in an environmental chamber where the control group breathed room air and the test group breathed 98% oxygen. One group of test animals breathed oxygen until all subjects died, whereas the others were removed after different periods of exposure and then sacrificed. In all cases lung extracts were prepared within 2 hr. after death. Results indicated that: (1) prolonged breathing of 98% oxygen at one atmosphere is fatal to the dog after an average of 67 hr. exposure, and (2) there is a loss of surface activity of lung extracts associated with severe pulmonary damage after 54 hr. of exposure under these conditions.

A66-80508
EFFECTS OF SODIUM LACTATE ON OXYGEN TOXICITY IN THE RAT.
Philip Felig and William L. Lee, Jr. (Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).
(N. Y. Acad. of Sci., Conf. on Respiratory Failure, Feb. 11–12, 1964).
Annals of the New York Academy of Sciences, vol. 121, Art. 3, Mar. 24, 1965, p. 829–835. 19 refs.
NASA Contract R-87.

Sodium lactate increases survival when administered daily to rats exposed to 98 percent oxygen at 1 atmosphere pressure. It is suggested that the mechanism of lactate protection may be related to alterations in the redox state of pyridine nucleotides.

A66-80509
LACK OF SUGGESTION EFFECTS ON PERCEPTUAL ISOLATION (SENSORY DEPRIVATION) PHENOMENA.
Ronald R. Short and Stuart Oskamp (Claremont Graduate School, Dept. of Psychol., Calif.)
(Western Psychol. Assoc., Portland, Ore., Apr. 17, 1964).
Journal of Nervous and Mental Disease, vol. 141, Aug. 1965, p. 190–194. 9 refs.

Twenty-four male subjects, 12 volunteers and 12 non-volunteers, were exposed to 1 hour of sensory isolation. Half of the subjects were given instructions and experimental procedures which created a high-suggestion condition; the other half received the usual sensory deprivation instructions (low-suggestion). Only 42% of the subjects reported unusual sensations. No significant suggestion effect was found, and volunteers were no more likely to experience sensations than non-volunteers. The hypothesis that sensations occur during periods of relative alertness was significantly supported by an analysis of eye movements and the blocking of alpha rhythm for the subjects who experienced visual imagery.

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