NASA SP-7011(50)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

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NASA SP-7011(50)

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 April, 1968.

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. MAY 1968

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:

a. NASA entries identified by their *STAR* accession numbers (N68-10000 series);
b. AIAA entries identified by their *IAA* accession numbers (A68-10000 series); and
c. LC entries identified by a number in the A68-80000 series.

Many of the abstracts included in this publication have been reproduced from those appearing in *STAR* and *IAA*. This procedure, adopted in the interests of economy and speed, has introduced some variation in size, style, and intensity of type.

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National Aeronautics and Space Administration
Code USS-AD
Washington, D.C. 20546.

Collections of NASA documents are currently on file in the organizations listed on the inside of the back cover.

(continued)

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All cited documents are available from the AIAA Technical Information Service as follows: Paper copies are available at $3.00 per document up to a maximum of 20 pages. The charge for each additional page is $0.25. Microfiche are available at the rate of $0.50 per microfiche for documents identified by the symbol # following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum air-mail postage to foreign countries is $1.00.

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For further details please consult the *Introductions* to *STAR* and *IAA*, respectively.

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Other organizations can purchase copies of the bibliography from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

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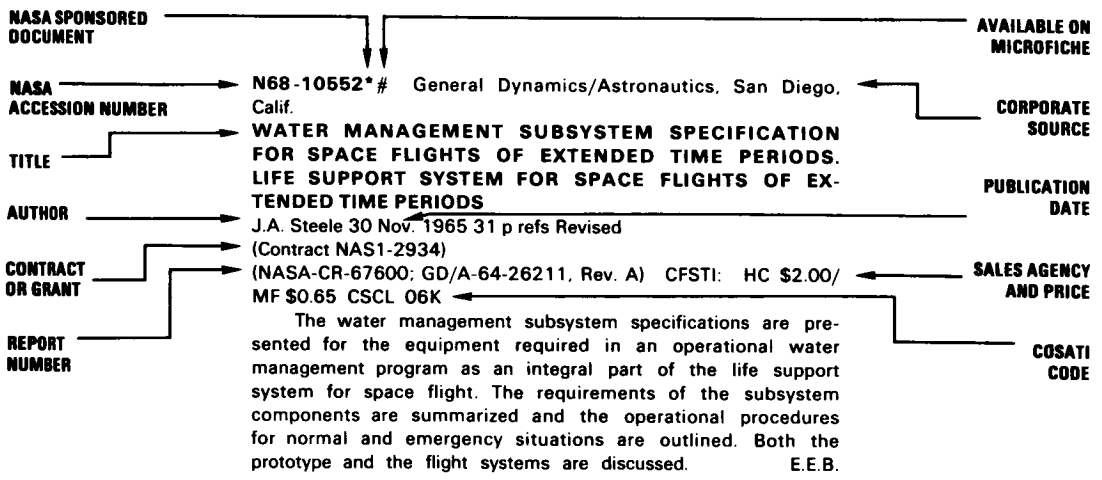
TYPICAL CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography MAY 1968

STAR ENTRIES

N68-16107*# Baylor Univ., Houston, Tex. Lab. of Experimental Pathology.

LIGHT AND ELECTRON MICROSCOPIC STUDY OF PRIMATE (MACACA MULATTA) LIVER AFTER LARGE DOSES OF HIGH-ENERGY (2.3 BEV) PROTONS

J. J. Ghidoni, M. M. Campbell, and H. Thomas [1967] 22 p refs

(Grant NGR-44-003-018)

(NASA-CR-92688) CFSTI: HC $3.00/MF $0.65 CSCL 06R

Morphological data are presented on a series of experiments in which the livers of seven primates were exposed to high-energy protons which penetrated the whole animal. Data were collected at intervals of 15 minutes, 6, 12, 18, 24, 36, and 48 hours after irradiation with 2.3 Bev protons. The results of the electron microscopic studies performed on the irradiated primate liver at these time intervals are discussed. The progressive increase in hepatic lipid which was first noted at 15 minutes and persisted until 24 hours, after which it leveled off and decreased sharply, is considered a significant finding. Small cytoplasmic clefts, the number of dark cells in the post-irradiation tissue, and mitochondrial alterations are also mentioned. Pictures are presented to illustrate the various findings which are considered. B.S.D.

N68-16109*# Public Health Service, Cincinnati, Ohio.

ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, Oct. 1–Dec. 31, 1967

Robert Angelotti Jan. 1968 36 p refs

(NASA Order R-36-015-001)

(NASA-CR-92720; QPR-11) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Techniques are described for measuring the dry heat resistance of *B. subtilis* var. *niger* spores in and on various materials. The D and z values are presented for these spores in the various test systems, in which the D value is the rate of death of an organism at a given temperature, and the z value is a measure of the change in rate of destruction with temperature. The systems tested included spores located on steel and paper strips, spores between stainless steel washers mated together under 150 in.-lbs and 12 in.-lbs. of torque, and spores encapsulated in methylmethacrylate and epoxy plastics. An explanation of the differences in heat resistance as related to the materials in or on which spores are located is offered. The results indicate that the dry heat resistance of *B. subtilis* var. *niger* are influenced by the initial moisture content of the spores, the rate of spore desiccation during heating, and the equilibrium relative humidity of the system.. B.S.D.

N68-16115*# California Univ., Los Angeles. Space Biology Lab.

EFFECTS OF LOW LEVEL, LOW FREQUENCY ELECTRIC FIELDS ON HUMAN REACTION TIME

James R. Hamer [1967] 13 p refs

(Grant NsG-237)

(NASA-CR-92700) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Details are given on the experimental apparatus and the procedures used in the testing of human reaction time (RT) at different electromagnetic field frequencies. Reaction times were measured at different frequencies but with a constant field strength and a sinusoidal electric field to ensure that changes in reaction time were the result of the different applied frequencies. The procedures adopted as controls for individual differences, and to assure experimental sensitivity are presented in detail. The testing of the subjects at various intervals is described. The collected data were analyzed to show the effect of variability in RT performance on the results of the experiment. Findings show that low level, low frequency electric fields can affect human RT performance. The experimental design used emphasized that the effects are frequency sensitive and not due merely to the presence of the field. B.S.D.

N68-16130*# National Aeronautics and Space Administration, Washington, D. C.

DISTINCTIONS OF AUDITORY ANALYZER FUNCTIONS DURING PROLONGED EXPOSURE OF MAN TO CHANGED GAS ENVIRONMENT [OSOBENNOSTI FUNKTSII SLUKHOVOGO ANALIZATORA PRI DLITEL'NOM PREBYVANII CHELOVEKA V USLOVIYAKH IZMENENNOY GAZOVOY SREDY]

Ye. M. Yuganov, Yu. V. Krylov, and V. S. Kuznetsov Dec. 1967 5 p refs Transl. into ENGLISH from RUSSIAN Presented at the 18 Congr. of the Intern. Astronautical Federation, Belgrade, 25–30 Sep. 1967

(NASA-TT-11396) CFSTI: HC $3.00/MF $0.65 CSCL 06S

The auditory analyzer function of man was studied during prolonged exposures to barometric pressures of 308 mm Hg with normal partial oxygen pressure; and effects of an atmosphere containing up to 2% carbon dioxide as well as those of a helium–oxygen mixture were investigated. Both dynamic audiometry and reverse auditory adaptation time failed to reveal deviations greater than the usual physiological fluctuations. At an auditory threshold fluctuation under 10 to 15 db there was stable adaptation to new conditions, but with 20 to 25 db there appeared to be a depletion of adaptation mechanisms. It was concluded, however, that the human auditory analyzer had significant resistance during prolonged exposure to artificial atmospheres with altered gas environments. M.W.R.

N68-16163*# National Aeronautics and Space Administration, Washington, D.C.

FURTHER INVESTIGATIONS OF THE COMPLEX EFFECT OF IONIZED RADIATION AND ACCELERATIONS ON THE ORGANISM AS RELATED TO SPACE FLIGHTS [DAL'NEYSHIYE ISSLEDOVANIYA KOMPLEKSNOGO VOZDEYSTVIYA NA ORGANIZM IONIZIRUYUSHCHEGO IZLUCHENIYA I USKORENIY V SVYAZI S KOSMICHESKIMI POLETAMI]

V. V. Antipov, B. I. Davydov, E. F. Panchenko, and P. P. Saksonov Dec. 1967 11 p refs Transl. into ENGLISH from Russian Presented at the 18th Congr. of the Intern. Astronautical Federation, Belgrade, 25–30 Sep. 1967

(NASA-TT-11397) CFSTI: HC $3.00/MF $0.65 CSCL 06R

Permissible irradiation doses during exposure to space flight factors, are evaluated, with emphasis placed on the role of recovery processes in the irradiated organism's reaction to critical accelerations. Data obtained from animals exposed to various doses revealed that there are common patterns in the reactions of irradiated animals to extreme accelerations and repeated irradiation. Experimental data were extrapolated to obtain man's tolerance for extreme accelerations at different irradiation doses. In evaluating the extrapolation, it was determined that at doses of 50–90 rem (roentgen equivalent, man) human tolerance of accelerations after exposure to such doses will apparently not differ appreciably from that of healthy individuals for a period of 200 days after irradiation. B.S.D.

N68-16183*# Weber Aircraft Corp., Burbank, Calif.

THE DEVELOPMENT OF A UNI-DIRECTIONAL LIGHT-WEIGHT ENERGY ABSORBING NET COUCH-RESTRAINT SYSTEM FOR USE IN THE APOLLO OR FOLLOW-ON PROJECTS Final Report, Oct. 1964–Aug. 1966

David L. Hohansen 19 Aug. 1966 185 p refs

(Contract NAS9-3497)

(NASA-CR-65941; DR-5893) CFSTI: HC $3.00/MF $0.65 CSCL 05E

This report summarizes the technical tasks performed during this period in the design, development, testing and fabrication of a prototype system which would be interchangeable with the existing hard couch system in the Apollo spacecraft. The program was divided into two phases identified as a development phase and a fabrication phase. The development phase was proportioned to take advantage of the state-of-the-art techniques in the fibre and fabric processing industry. These techniques were utilized to develop a body support insert concept which would attenuate a 50-g impact force to 20-g as felt by an anthropomorphic dummy. Three fabrication techniques, each prepared by a different supplier, were analyzed and evaluation tests performed. As a result the twisted cord filament wound construction concept, utilizing undrawn nylon fibers, was selected for the prototype couch system. Phase II—Fabrication and Test of the Couch System—was provided first, to incorporate modifications resulting from the Phase I tests; second, to perform additional tests; and third, to design and fabricate a three man couch system capable of being installed in the Apollo Command Module. Author

N68-16189# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.

IN-FLIGHT PHYSIOLOGICAL MONITORING OF STUDENT PILOTS

C. E. Melton and Marlene Wicks Aug. 1967 13 p refs

(AM-67-15) CFSTI: HC $3.00/MF $0.65

Records of heart rate (ECG), lateral eye movements (EOG) and vocal interchange between student and instructor were taken on magnetic tape during all of every flight throughout a conventional private pilot training syllabus. Six men (33–45 years of age) and two women (29 and 28 years of age) were studied. Heart rates were higher on solo (112 bpm) than on dual flights (108 bpm) and higher on check flights than on solos (120 bpm). Heart rate increased at takeoff on solo flights but did not change or decrease on dual flights. Resulting heart rate was a predictor of the type of flight to be undertaken, being higher before solo than before dual flights and highest before check flights. Over the entire syllabus in-tight heart rates showed increases corresponding to the two main goals of the student, i.e., first solo and the check flight, with a plateau between the two events. Low airspeed maneuvers gave rise to the highest heart rates for every subject. Frequency of eye movements was higher on solo than on dual flights and was characteristic for each subject. Heart rates of these student pilots were as high as or in some cases higher than those required for X-15, lifting body, high-performance jet, and carrier-based combat pilots, and, indeed, astronauts. Author

N68-16190*# Techtran Corp., Glen Burnie, Md.

LIFE IN SPACE—NEW ADVANCES IN SPACE BIOLOGY [LEBEN IM WELTRAUM—NEUE ERGEBNISSE DER EXOBIOLOGIE]

Feb. 1968 7 p Transl. into ENGLISH from German

(Contract NASw-1695)

(NASA-TT-F-11540) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Recent results of scientific research in space have not only given new force to the old question of traces of life on celestial bodies, but have also led to studies of how living organisms are influenced by the conditions of space. This paper contains an interview with the Chairman of the Study Group for Biophysical Space Research at Frankfurt/Main, Germany, Dr. H. Bucker, concerning the present state of knowledge in this field. Author

N68-16237*# Department of the Army, Fort Detrick, Md.

EVALUATION OF TWO NASA BIOLOGICAL ISOLATION GARMENTS

H. Gerald Guyton and Charles E. Mick 29 Dec. 1967 11 p refs *Its* Protect. Branch Rept. of Test No. 3–68

(NASA-CR-92809) CFSTI: HC $3.00/MF $0.65 CSCL 06Q

Two Biological Isolation Garments (BIG) were evaluated using aerosols of *B. subtilis* var *niger* spores. This garment is one-piece suit fabricated from permeable cloth and contains a zippered closure extending diagonally from the crotch across the left chest and curving over the left ear to the top of the head. A protective mask with a full-width visor is enclosed within the suit except for dual aerosol canisters which can be attached or detached from the exterior. A one-piece suit of cotton underwear is worn under the garment. The BIG will be donned by a returning lunar astronaut immediately after his exit from the space capsule in order to isolate him and thereby restrain any lunar microorganisms on his body from contaminating the earth's atmosphere. Design specifications for the BIG require a minimum restraining capability of 98% of particles having a diameter of 0.45μ. Two test methods were employed to evaluate the BIG. Author

N68-16241# Applied Psychological Services, Wayne, Pa.

DIGITAL SIMULATION OF CREW PERFORMANCE. VALIDATION OF A DIGITAL SIMULATION MODEL FOR CREW PERFORMANCE SIMULATION

Arthur I. Siegel, J. Jay Wolf, and Richard S. Lanterman Sep. 1967 59 p refs

(Contract N00014-66-C-0280)

(PRR-2-68; AD-663291)

The validation and utilization of a psychosocially-oriented digital simulation model is described. A realistic 21-day mission is presented, followed by the results of the application of the stochastic, mathematical model to this mission. The accuracy and reasonableness with which the predictive technique corresponded

with actual performance data are shown for variables such as crew size and composition, work loads, crew efficiency, morale, proficiency, and task failures. The internal coherency of certain predictions is discussed and the applicability of the technique supported. Author (TAB)

N68-16274*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Naval School of Aviation Medicine, Pensacola, Fla.

CARDIAC OUTPUT AND REGIONAL BLOOD FLOW IN CONSCIOUS RATS EXPOSED TO ACUTE HYPOXIA

N. S. Nejad, Thomas N. Fast, and Eric Ogden 15 Nov. 1967 17 p refs Prepared jointly with Naval School of Aviation Med.

(NASA-TM-X-60839; NAMI-1026) CFSTI: HC $3.00/MF $0.65 CSCL 06C

The effects of hypoxia on cardiac output and fractional distribution of regional blood flow were measured in unrestrained and unanesthetized Sprague-Dawley rats. Cardiac output was determined by thermodilution techniques, while blood distribution was determined by Rb^{86} Cl and iodoantipyrine I^{131} tracers. The animals were exposed to 18–24 hours after cannulation to atmospheres of air and of 7 to 10% oxygen in nitrogen. Cardiac output was higher in the hypoxic environments. Fractional distribution to brain, heart, and adrenal was increased, while that to the kidney and spleen was decreased in reduced O_2 environments. Author

N68-16307# Martin Co., Denver, Colo.

TECHNOLOGY FEASIBILITY SPACECRAFT (TFS). VOLUME 4: STERILIZATION AND BIOASSAY Final Report

R. McKinney Feb. 1968 49 p refs

(R-68-2, V. 4)

Bioassay techniques, ultraclean handling, and terminal heat sterilization work on a feasibility, full-scale, semifunctional model spacecraft are discussed. The model is a thermal equivalent of a typical planetary lander vehicle. Study aims were to obtain data on the degree of biological contamination during manufacturing and test sequences. Results are given for Swab, Radac, and coupon sampling bioassay studies. Partial results are given for the ultraclean handling and terminal heat sterilization studies. These efforts were curtailed due to budget and schedule limitations. Study results show that major contamination comes from human contact and handling, with only a minor amount from air; maufacturing cleaning processes are highly lethal for biota, producing a significant short term reduction in biota count; the total microbial burden at the end of this program was 1×10^7 microorganisms, well below the required level for entering terminal sterilization. The statistical analysis techniques followed in processing the bioassay data are also included. E.C.

N68-16353*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Biotechnology Organization.

EVALUATION TESTING OF ZERO GRAVITY HUMIDITY CONTROL SYSTEM

Thomas M. Olcott and Richard A. Lamparter 25 Oct. 1967 110 p

(Contract NAS1-5622)

(NASA-CR-66543) CFSTI: HC $3.00/MF $0.65 CSCL 05E

This report describes a test and evaluation program to demonstrate the feasibility and establish optimum design criteria for a humidity control system with a hydrophobic/hydrophilic cone zero gravity water separator. The test program demonstrated water separator performance at 40, 70 and 100 CFM at inlet humidities up to 0.191 lbs H_2O/lb. air and a water removal rates up to 0.012 lbs. H_2O/lb. air. The report defines the methodology and provides the reduced test program data to establish optimum design/performance criteria for zero gravity humidity control systems utilizing a hydrophobic/hydrophilic cone water separator. Author

N68-16389*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

[BIOMECHANICS WITHIN THE FIELD OF CARDIOVASCULAR PHYSIOLOGY] Semiannual Progress Report, 1 Jul.–31 Dec. 1967

Max Anliker 31 Dec. 1967 14 p refs

(Grant NGR-05-020-223)

(NASA-CR-92999; SAPR-1) CFSTI: HC $3.00/MF $0.65 CSCL 06P

Investigations on the effects of various parameters and properties of the cardiovascular system on the transmission characteristics of sounds and pressure pulses are reported. Determinations are made of the elastic properties of arteries and veins and the changes of these properties under physical and physiological stresses that may for example be produced by trauma, prolonged weightlessness, or acceleration. Studies are made of the mechanical behavior of the circulatory system and its control mechanisms, and methods are developed for measuring the changes in the elastic properties of blood vessels in man that do not require the penetration of the skin. Included are summaries of work accomplished in (1) the effects of pressure on dispersion and attenuation of waves in the aorta, (2) new techniques for studying the elastic behavior of the heart and large arteries and veins, (3) intravascular transmission characteristics of artificially induced heart sounds, and (4) transmission characteristics of axial waves in blood vessels. C.T.C.

N68-16397# Applied Psychological Services, Wayne, Pa. Science Center.

RECENT REVISIONS TO THE DIGITAL SIMULATION MODEL FOR SIMULATING TWO-OPERATOR MAN-MACHINE INTERACTION

Arthur I. Siegel and J. Jay Wolf Nov. 1967 53 p refs

(Contract N00014-66-C0184)

(AD-663158)

The logic and application of a previously developed digital computer model for simulating the actions of one or two operators as they interact within a hardware system in order to achieve the goals of a mission are described. Then, the logic is expanded to include an operator level of aspiration variable. A number of other recent modifications to the model are also pointed out. The results of computer runs employing the level of aspiration variable are compared with runs in which the variable is not involved. Author (TAB)

N68-16402# Directorate of Aerospace Safety, Norton AFB, Calif. Aero Medical Safety Div.

AIRCRAFT ACCIDENT INJURIES: A REVIEW OF OVER 2,000 CASES

H. G. Moseley 1967 24 p Presented at the 28th Ann. Meeting of the Aero Med. Assoc., Denver, 6–8 May 1967

(M-12-57; AD-663760)

During the calendar years 1953 and 1955, over 8,000 personnel were involved in major USAF aircraft accidents. Eighteen and seven-tenths per cent of these occupants received fatal injuries and 5.2% received major injuries. However, 76.1% received minor or no injury. Most fatalities were due to multiple traumatic lesions. Most major nonfatal lesions were fractures, especially of the vertebrae. However, burns and surface wounds were frequent. The head and the distal third of the extremities received the majority of injuries and were associated with flailing of these unsecured body portions during deceleration. Concerning deceleration, when impact forces were moderate or negligible, there were few injuries; when impact was severe, injury was frequent and often fatal; when

it was extreme, fatal results were the rule. In all accidents there was increased injury if the seat tore loose or if the seat belt was not used. If the occupant was in a seat facing the rear of the aircraft, he was less liable to be injured than if he faced forward. This was especially true in low impact accidents where the seat was more liable to remain moored to the floor. Author (TAB)

N68-16419*# Ohio State Univ., Research Foundation, Columbus. Environmental Medicine Lab.

CARDIOVASCULAR EFFECTS OF VIBRATION Semiannual Report, Jul. 1–Dec. 31, 1967

Lester B. Roberts 6 Feb. 1968 116 p refs

(Grant NGR-36-008-041)

(NASA-CR-92887; Rept.-4) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Electrocardiograms were obtained from each of six male subjects during vibration, and recorded on magnetic tape. The data are being given careful clinical evaluation. Selected portions of the data from two subjects have been transcribed as X, Y, and Z axis orthogonal strip chart recordings. Portions of the recorded data were averaged using computer techniques previously described. These transcribed and averaged data, together with pertinent observations, are presented. Another digital computer program used for averaging electrocardiogram signals is also described. L.S.

N68-16452# Joint Publications Research Service, Washington, D. C.

AUTOMATIC DECIPHERING OF BALLISTOGRAMS WITH USE OF COMPUTERS

G. I. Sidorenko and G. A. Afanas'yev 21 Feb. 1968 10 p refs Transl. into ENGLISH from Kardiologiya (Moscow), no. 12, Dec. 1967 p 117–123

(JPRS-44460) CFSTI: HC $3.00/MF $0.65

The use of computer data processing methods and the applications of random processes and information theories are proposed for analyzing ballistocardiograms (BCG). The effects of periodic signal magnitude and random noise on the signal-to-noise ratio, and the possibility of masking the BCG signal, are discussed. An autocorrelation analysis method is described in which the most important characteristic of the BCG can be otained. Data from the BCG analysis of healthy persons are illustrated to show that the initial oscillation corresponds to the sum of the correlation functions of the signal and the noise. It is also shown that the autocorrelation function of the BCG may be used to estimate the mean values of the periodic signal in terms of its basic harmonic, the variability of the signal in terms of dispersion, and perhaps the properties of inertness of circulatory self-regulation. It is pointed out that the autocorrelation function offers significantly more information than the oscillography, since it is based on an analysis of the statistical properties of random processes. M.G.J.

N68-16473# Joint Publications Research Service, Washington, D. C.

SPACE CARDIOLOGY AND SOVIET ADVANCES IN CARDIAC SURGERY

21 Feb. 1968 9 p refs Transl. into ENGLISH from Kardiologiya (Moscow), no. 11, Nov. 1967 p 13–18

(JPRS-44463) CFSTI: HC $3.00/MF $0.65

The reactions of the cardiovascular system in the different stages of space flight are examined from the viewpoint that the body is a system which performs two types of regulation: achievement of a balance with the external environment, or cortical regulation; and maintenance of homeostasis, or autonomic regulation. Experimental and actual flight data are discussed in relation to the effects observed during the prelaunch state, the powered phase of the flight, orbital flight, and extravehicular activity performance. It is recommended that the clinical aspects of space cardiology include (1) study of disturbances which may arise in space flight due to weightlessness and other critical factors; (2) establishment of criteria for selecting cosmonauts and training them in accordance with the condition of their cardiovascular system; (3) study of problems relating to the diagnosis and treatment of diseases and disorders that may arise during prolonged flight; and (4) use of clinical data to interpret the results of examinations during space flight. M.G.J.

N68-16502# Oregon State Univ., Corvallis.

THE ROLE OF NATURALLY OCCURRING QUINONES IN PHOTOSYNTHESIS Yearly Progress Report, 1 Sep. 1966–1 Sep. 1967

Norman I. Bishop 1 Sep. 1967 9 p refs

(Contract AT(45-1)-1783)

(RLO-1783-13) CFSTI: HC $3.00/MF $0.65

Progress is reported in studies on the effects of uv radiation on photoreactions of green algae and chloroplasts and quinones isolated from Scenedesmus. Results indicated that the site of uv inhibition is prior to the site of plastoquisnone action in the electron transport chain. Vitamin K substances were isolated from the blue-green algae *Anacystis nidulans*, which possesses only plastoquinone A and two vitamin K type compounds. NSA

N68-16517*# National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY Continuing Bibliography With Indexes, During December 1967

Jan. 1968 130 p refs

(NASA-SP-7011(45) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N68-16538# School of Aerospace Medicine, Brooks AFB, Tex.

B-52D MOBILE FLIGHT SIMULATOR FLASHBLINDNESS EXPERIMENT, JULY 1966–MARCH 1967

James E. Hamilton Sep. 1967 15 p refs

(SAM-TR-67-67; AD-663230)

Thirty-five B-52 pilots were used in a study to obtain quantitative performance data on the effect of flashblindness on aircraft control and to measure visual recovery time from flashblindness during a series of flights in the B-52D mobile aircraft simulator. A Honeywell Strobonar model 65-C flashlamp was mounted in front of the pilot in order to produce flashblindness under simulated nighttime cockpit conditions. Data on aircraft attitude or recovery time were analyzed at four 6-second intervals and at recovery time after the flash. The effect of flashblindness on aircraft control was measured by the comparison of control (nonflashed) and experimental (flashed) flights. The variables analyzed were bank error (deviation from 30 degrees), indicated airspeed error (deviation from 270 knots), pitch error (deviation from 0 degrees), altitude error (deviation from 6 km. (20,000 ft.)), and recovery time (seconds). Author (TAB)

N68-16564# Nuclear Utility Services, Inc., Washington, D. C. Environmental Safeguards Div.

DOSE CALCULATION MODELS FOR RE-ENTERING NUCLEAR ROCKET DEBRIS

Albert W. De Agazio Jan. 1967 51 p refs Revised
(Contract SNPC-6)
(NUS-229, Rev.) CFSTI: HC $3.00/MF $0.65 CSCL 06R

Estimation of the biological hazards resulting from nuclear rocket engine flight failures is complicated by the more or less random nature of the deposition of engine debris into the biosphere. The probability of indirect exposure through ingestion is directly related to the likelihood of the debris falling on cultivated land. The external dose functions and external and internal dose probability functions are derived in this report. External whole body gamma and beta dose relationships are derived for receptors who are mobile; i.e., who are not fixed in a given location for the entire exposure period. The probability of receiving at least a given external dose, the fraction of the population receiving at least a given dose and the overall population dose are also derived for external gamma radiation exposures. The functions for determining the probability of a receptor being struck by a particle that sticks to the skin and the number of people so affected are derived to allow estimation of the hazard from localized beta doses to the skin. Internal dose probability functions are derived for both ingestion and inhalation. These relations consider cultural influences such as diet, agricultural production, and population density. Comparisons are made to fallout from nuclear weapon testing and subsequent appearance of ^{90}Sr and ^{137}Cs in food in the United States. NSA

N68-16565*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CHEMICAL FOOD SYNTHESIS SYSTEMS FOR SPACECRAFT
E. Gene Lyman [1967] 24 p refs Presented at the Closed Ecol. Session, Ann. Meeting of the Am. Inst. of Chem. Eng., N. Y., 28 Nov. 1967
(NASA-TM-X-60861) CFSTI: HC $3.00/MF $0.65 CSCL 06H

The life support system requirements for long duration manned space missions were examined. Hybrid systems that use both biological and chemical processes for food synthesis from metabolic wastes may be feasible and competitive with systems that use stored food. A typical, conceptual, configuration of a closed life support system is described. Specific processes for the synthesis of formaldehyde, glycerol, carbohydrates, and ethanol are discussed. Work currently under way to develop technology suitable for synthesis of such materials is briefly described. Author

N68-16577# Litton Systems, Inc., Woodland Hills, Calif. Guidance and Control Systems Div.
INTEGRATED COCKPIT RESEARCH PROGRAM, VOLUME 1 Final Report
John V. Murphy, Donald J. Pizzicara, James J. Belcher, Robert L. Hamson, and Raymond E. Bernberg Jan. 1967 148 p refs
(Contract Nonr-4951(00))
(AD-662185)

The program was designed to develop a methodology for avionic system design application to aircraft in an advanced time period. Emphasis was placed on two major activities. One was concerned with identifying the requirements for the operator/avionic system in the future time period, and a second activity was concerned with identifying the technological state-of-the-art that would be available in the advanced time period to meet those requirements. Successive aspects of the study were concerned with synthesizing an avionic system, completing a cost/effectiveness evaluation, and the preparation of a cockpit mockup. Volume I describes a 27-step process that can be applied to any aircraft system early in the developmental cycle. Author (TAB)

N68-16584# Joint Publications Research Service, Washington, D. C.
CYBERNETICS IN BIOLOGY AND MEDICINE
V. Parin, Ye. Geller, A. Malinovskiy, and V. Svintsitskiy 20 Feb. 1968 13 p Transl. into ENGLISH from Kommunist (Moscow), no. 1, Jan. 1967 p 69–79
(JPRS-44432) CFSTI: HC $3.00/MF $0.65

The basic concepts of cybernetics are reviewed, and the way in which the control process takes place is examined. The development of biocybernetics is discussed in terms of the application of theoretical and mathematical methods to the specifics of biological phenomena. Two approaches to biological modeling are examined: actual biological modeling of a process for the purpose of checking the correctness of the concepts against it; and bionic modeling of the same process for the purpose of subsequently developing a technical system capable of fulfilling similar functions. Basic research trends in biocybernetics are surveyed, and several examples of experimental studies are presented. The growing importance of medical cybernetics is emphasized. The point is made that the general principles of cybernetics permit a more profund and precise analysis of unknown phenomena, and create a more sophisticated, synthetic pattern of the evolutionary process and of the structure of organisms. M.G.J.

N68-16594*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EVALUATION OF A CLOSED-CIRCUIT TELEVISION DISPLAY IN LANDING OPERATIONS WITH A HELICOPTER
William Gracey, Robert W. Sommer, and Don F. Tibbs Washington Feb. 1968 20 p refs
(NASA-TN-D-4313) CFSTI: HC $3.00/MF $0.65 CSCL 05H

An instrument display consisting of a television monitor; vertical-type torquemeter was evaluated in simulated IFR (Instrument Flight Rules) approaches with a helicopter. The evaluation was made with three lenses having focal lengths of 12.5, 25, and 50 mm. The restricted-view tests with binocular vision showed that a view as small as 22.6° horizontal and 18.5° vertical has a detrimental effect on the control of longitudinal position at touchdown. The tests with monocular vision showed that the control difficulties increase with the loss of depth perception. The tests of the television display showed that the difficulties in controlling attitude and position increased as the helicopter approached the ground. The determination of position and position-rate information was made difficult because of the restricted views of the lenses, the image magnification and the low resolution and lack of depth perception of the televised scene. The tests demonstrated that, with the television display augmented by height information, the pilots were able to execute low-speed, steep approaches with an angular view as small as 22.6° by 18.5° and an image magnification as small as about 0.35. Author

N68-16595# School of Aerospace Medicine, Brooks AFB, Tex.
FURTHER RESEARCH INTO THE EFFECT OF IONIZING RADIATION COMBINED WITH G-LOADING DURING SPACE FLIGHT [DAL'NEYSHIE ISSLEDOVANIYA KOMPLEKSNOGO VOYDEYSTVIYA NA ORGANIYM IONIYIRUYUSHGHEGO IZLUCHENIYA I USKORENIY V SVYAYI S KOOMICHESKIMI POLETAMI]
V. V. Antipov, B. I. Davydov, E. F. Panchenkova, and P. P. Saksonov Sep. 1967 20 p refs Transl. into ENGLISH from Russian Presented at 18th Congr. Intern. Astronautical Federation, Belgrade, 25–30 Sep. 1967
(SAM-TT-R-941-1267; AD-663197) CFSTI: HC $3.00/MF $0.65

Material is revealed representing further development in the research into the responsiveness of an irradiated organism to various spaceflight factors. In particular, an attempt was made to evaluate the role of processes arising within the irradiated organism as it responds to chronic G-loading. Principles concerning the feasibility of extrapolating our experimental results to man are outlined as well as the manner in which orientational data was collected on the maximum possible exposure (MPE) as evaluated in the light of criteria for acceleration tolerance. TAB

N68-16617*# California Univ., Berkeley. Dept. of Nutritional Sciences.

DEVELOPMENT OF A SEMIPURIFIED DIET FOR THE ADULT POCKET MOUSE (PEROGNATHUS)

Gene A. Spiller and Rosemarie Ostwald [1967] 17 p refs

(Grant NGR-05-003-118)

(NASA-CR-92835) CFSTI: HC $3.00/MF $0.65 CSCL 06C

A semipurified diet has been developed for the pocket mouse *(Perognathus longimembris* and *P. penicillatus),* small desert rodents that do not drink water. The key difference between this diet and a standard semipurified mouse diet is the mineral composition. The ratio of K/Na and Mg/Ca is high and the inorganic phosphates are replaced by the calcium, magnesium and sodium salts of glycerophosphates. The adequacy of this diet has been shown by the maintenance of over 100 pocket mice for 6 months without weight loss, with a normal behavioral pattern and in apparent good health. Carcass composition and the size and microscopic appearance of organs were the same for animals on this diet as compared with animals fed their customary mixed seed diet. Author

N68-16622# Brookhaven National Lab., Upton, N. Y.

THE CELLULAR BASIS OF ACUTE RADIATION DEATH IN THE MAMMAL

Victor P. Bond 8 Feb. 1967 15 p refs Sponsored by AEC *Its* Lecture Ser. No. 63

(BNL-50064(T-465) CFSTI: HC $3.00/MF $0.65

The effects of radiation delivered to the entire body are described, and conditions under which such exposure of human beings may be encountered were outlined. It was demonstrated that the complicated clinical picture seen as the result of such exposure has its genesis primarily in the depletion of cellular elements in the peripheral blood. It was further shown that the time course and dose relationships seen can be explained satisfactorily on the basis of the kinetics of the cell populations involved and the known cellular radiobiology that pertains to these cell populations. Additional implications of the cellular approach are described, and some practical applications are given, e.g., in devising rational therapy and in dealing with some of the radiation problems potentially affecting space travel. Throughout, emphasis was placed on the fact that the body is normally in a state of dynamic cellular equilibrium, in some small measure like an airplane in flight. Some perturbations of the systems can be adjusted to or corrected for. Severe or serious perturbation, however, results in disease or even death if equilibrium is not reestablished in time. Radiation is but one of the many harmful agents that can upset the cellular equilibrium and lead to serious illness and death. Author (NSA)

N68-16626*# Weber Aircraft Corp., Burbank, Calif.

UNIDIRECTIONAL LIGHTWEIGHT ENERGY ABSORBING NET COUCH RESTRAINT SYSTEM FOR USE IN APOLLO OR FOLLOW-ON PROJECTS, PHASE 1 AND 2 Final Material Report

David L. Johansen Sep. 1966 57 p ref

(Contract NAS9-3497)

(NASA-CR-65939; DR-5895) CFSTI: HC $3.00/MF $0.65 CSCL 05E

Three different body support concepts were fabricated. Each was statically and dynamically tested on a boilerplate couch structure and evaluated on its ability to satisfy the requirements of the program. The scope of these requirements included couch occupant comfort and weight distribution, articulation capability and system response characteristics to spacecraft launch, and landing impact load conditions. In the course of developing these systems, tests were performed on selected synthetic fibers which appeared to posses the required high impact plastic hysteretic characteristics. The materials selected for test were partially drawn nylon yarn, fully drawn nylon yarns, formic acid and treated nylon yarns, and heat shrunk dacron yarns. This book summarizes the data collected during the experiments performed on various material samples and indicates the results of each phase of the test performed. C.T.C.

N68-16640*# National Aeronautics and Space Administration, Washington, D. C.

INVESTIGATION OF LONG-TERM EFFECT OF A REDUCED PRESSURE OXYGEN ATMOSPHERE ON ANIMALS AND MAN [ISSLEDOVANIYE DLITEL'NOGO VOZDEYSTVIYA NA ZHIVOTNYKH I CHEKOVEKA KISLORODNOY ATMOSFERY S PONSIZHENNYM DAVLENIYEM]

A. M. Genin, S. G. Zharov, Ye. Ya. Kaplan, V. V. Ogleznev and V. I. Solov'yev Dec. 1967 10 p refs Transl. into ENGLISH from RUSSIAN Presented at the 18th Congr. of the Intern. Astronautical Federation, Belgrade, 25–30 Sep. 1967

(NASA-TT-F-11400) CSCL 06S

The effect of a 15- to 30-day confinement in a gas medium with a high oxygen content and a pressure corresponding to between 7,000 and 10,000 m was studied on both animals and human beings. A total of 1,000 white mice, 500 rats, and 8 rabbits were subjected to stays at various lengths under various simulated altitudes in atmospheres containing between 87 and 98% oxygen. Significant changes in behavior or reflex action were not evidenced following 30-day stays in 87% oxygen atmosphere at altitudes corresponding to 7,000 m; and, although there were no morphological changes in internal organs, there were temporary lung collapses in some of the animals. At a simulated altitude of 11,500 m moderate hypoxia set in and there was increased activity in vital organs as well as longer duration of motor reflexes. Again, there were no clearly expressed morphological changes. Mnetal and physical work capabilities of five humans did not change significantly following 30-day stay in 90 to 94% oxygen at pressures corresponding to 7,000 and 10,000 m, although there was evidence of general sluggishness. M.W.R.

N68-16641*# National Aeronautics and Space Administration, Washington, D. C.

BIOENGINEERING PROBLEMS OF HABITABILITY OF SPACE CRAFT AND PLANETARY STATIONS [BIOLOGO-TEKHNICHESKIYE VOPROSY OBITAYEMOSTI KOSMICHES-KIKH KORABLEY I PLANETNYKH STANTSIY]

B. A. Adamovich and Yu. G. Nefedov Dec. 1967 5 p refs Transl. into ENGLISH from Russian Presented at the 18th Congr. of the Intern. Astronautical Federation, Belgrade, 25 30 Sep. 1967

(NASA-TT-11398) CFSTI: HC $3.00/MF $0.65 CSCL 05E

Safety conditions, favorable cabin environments, and overall life support systems are among the bioengineering problems related to maintaining life aboard spacecraft and planetary stations. Oxygen supply, water, and nutrients for astronauts are considered; and emphasis is placed on the need for considerable experimentation before the actual life support system can be selected. M.W.R.

N68-16643*# National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF PROLONGED (62-DAY) HYPOKINESIS ON THE HUMAN ORGANISM [VLIYANIYE 62-SUTOCHNOY GIPOKINEZII NA ORGANIZM CHELOVEKA]

T. V. Benevolenskaya, M. M. Korotayev, T. N. Krupina, I. A. Maslov, G. P. Mikhaylovskiy et al Dec. 1967 5 p Transl. into ENGLISH from RUSSIAN Presented at the 18th Congr. of the Intern. Astronautical Federation, Belgrade, 25–30 Sep. 1967

(NASA-TT-F-11399) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Effects of a 62-day period of bed confinement on six generally healthy young men between the ages of 23 and 36 are described. All subjects were permitted movements in the horizontal position, and three of the men were engaged in a special program of daily exercise. Disturbances were noted in all of the systems and organs

of all the men, although difficulties varied among the systems and the men. The most marked disturbances were noted in men who exhibited some difficulties prior to the initiation of the experiment; for example, two nosebleeds occurred in subjects with a slight dryness of the nasal mucous membrane, angina occurred in a subject with chronic tonsillitis, and psychological changes were more pronounced in men who had previous peculiar behavior patterns. M.W.R.

N68-16644*# National Aeronautics and Space Administration, Washington, D. C.

PRESENT STATUS AND TRENDS IN INVESTIGATION OF THE HUMAN CARDIOVASCULAR SYSTEM IN SPACE FLIGHTS

I. T. Akulinichev, V. A. Degtyarev, and D. G. Maksimov Dec. 1967 7 p refs Transl. into ENGLISH from Russian Astronautical Federation, Belgrade, 25–30 Sep. 1967

(NASA-TT-F-11395) CFSTI: HC $3.00/MF $0.65 CSCL 06S

An overview of studies dealing with the testing and responses of the cardiovascular system during space flights is presented. Various results of functional tests are noted, and the importance of such tests on a regularly scheduled basis and in conjunction with central nervous system and work capacity tests is stressed. It is suggested that standardization of both test methods and information processing be implemented, and that efforts made in relation to space medicine would have applicability to clinical practice. M.W.R.

N68-16676# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE PNEUMOCARDIOPHONE [PNEVMOKARDIOFON]

R. M. Bayevskiy, V. A. Ivanov, A. V. Monakhov, and A. V. Monakhov 28 Jul. 1967 11 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (Moscow), v. 52, no. 10, 1966 p 1273–1275

(FTD-HT-67-484; AD-662800)

A simple system for continuously monitoring pulse and respiration rates over long periods of time is described. A record can be made with any single-channel recorder: The output can also be connected with an amplifier-speaker system or displayed on an oscillograph. Signals from a respiration sensor in which make-and-break is accomplished by expansion and contraction of the rib cage, and cardiac biocurrents, are used as input signals. Silver electrodes 18–20 mm in diameter are held over the fifth intercostal space along the medial axillary line by an elastic harness to which the respiration sensor is also attached. The basic idea of the system is the single-channel recording of two parameters. This is done by shaping cardiac biopotentials corresponding to the R rhythm into square pulses whose duration or amplitude is determined by the respiration sensor. Respiration signals are thus read from the duration or amplitude of the pulse signals. In the pulse duration modulation setup, the R-wave peak is formed into a square pulse lasting 100–150 msec during exhalation (contact closed) and 200–300 msec during inhalation (contact open). These pulses can also be used to generate an acoustic signal. TAB

N68-16677# Bolt, Beranek, and Newman, Inc., Van Nuys, Calif.

GROWTH OF NOISINESS FOR TONES AND BANDS OF NOISE AT DIFFERENT FREQUENCIES

John E. Parnell, David C. Nagel, and Hugh J. Parry Dec. 1967 91 p refs

(Contract FA-65-WA-1180)

(FAA-DS-67-21) CFSTI: HC $3.00/MF $0.65

Judgment tests have been conducted to measure the growth of noisiness for tones and narrow bands of noise under various listening conditions. The growth of noisiness for a 1 kHz tone and an octave band of noise centered at 1 kHz were measured using both the method of adjustment and a magnitude estimation method. Equal noisiness contours were determined for selected listening conditions in order to measure the growth of noisiness at frequencies other than 1 kHz. The growth of noisiness was found to depend strongly on test method with the magnitude estimation tests giving significantly larger values for doubling or halving of perceived noisiness. Equal noisiness contours are shown for pure tones in a free field, one-third octave bands of noise in a free field and one-third octave bands of noise in a diffuse field. Also, comparisons of equal noise contours for one-second and four-second stimulus durations and for loudness and noisiness instructions are given. No significant differences were found for these comparisons. Further, it was concluded that the specific value used for the growth of noisiness did not significantly affect the calculation of the relative PNL values for many different spectra. Author

N68-16719*# Aerojet-General Corp., Azusa, Calif.

INTERCHANGE OF GROUP C BETA HEMOLYTIC STREPTOCOCCI AMONG DOGS AND MONKEYS CONFINED IN DYNAMIC FLOW ATMOSPHERIC SYSTEMS

James G. King, 3 Wright-Patterson AFB, Ohio AMRL Sep. 1967 17 p refs Sponsored in part by NASA

(Contract AF 33(657)-11305)

(NASA-CR-92662; AMRL-TR-66-182; AD-663217) CFSTI: HC $3.00/MF $0.65

Serial throat and rectal bacteriological samples were taken from closely confined animals in dynamic flow atmospheric chambers during toxicology experiments at both altitude and ambient conditions to measure the extent of bacterial interchange in environments similar to those in space cabins. Dogs and monkeys were exposed for prolonged periods to 0.2 mg/cu m ozone in air at 740 mm Hg, to 100% oxygen at 260 mm Hg, and to ambient conditions. The incidence of isolation of Lancefield group C beta hemolytic streptococci increased from 25 to 91%. Because of this increased rate of isolation of serologically uniform beta hemolytic streptococci, transfer of this organism between animals is postulated. The effects of confinement on bacterial interchange in this particular set of atmospheres are discussed. Author (TAB)

N68-16751# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DOSIMETRY AND PROTECTION FROM IONIZING RADIATION

B. P. Golubev 1 May 1967 305 p refs Transl. into ENGLISH of the book "Dozimetriya i Zashchita ot Ioniziruyushchikh Izlucheniy" Moscow, Gosenergoizdat., 1963 p 1–336

(FTD-MT-64-291; AD-663372)

Consideration is given to different methods of ionizing radiation dosimetry and simplified methods for design of shielding for gamma radiation, for neutron radiation and for design of shielding in a nuclear reactor. TAB

N68-16753# Federal Aviation Agency, Oklahoma City, Okla. Dept. of Transportation.

ADAPTATION TO VESTIBULAR DISORIENTATION. 6: EYE-MOVEMENT AND SUBJECTIVE TURNING RESPONSES TO VARIED DURATIONS OF ANGULAR ACCELERATION

Fred E. Guedry and William E. Collins May 1967 12 p refs

(AM-67-7)

Turning sensations and eye movement responses during angular accelerations may show adaptation effects of significance to understanding vestibular reactions during certain aircraft maneuvers. In this study, a direct relationship found between duration of acceleration and (a) decline of response during acceleration, (b) rate of decline of response after acceleration, and (c) magnitude of secondary reaction, is regarded as an indication of a central process which limits a prolonged vestibular primary reaction. The process is manifested by its influence on relatively basic reflex reactions (nystagmus) in the cat, and is more prominently manifested in man by its influence on sensory perception. Author

N68-16799# Federal Aviation Agency, Oklahoma City, Okla. Dept. of Transportation.

ADAPTATION TO VESTIBULAR DISORIENTATION. 8: "CORIOLIS" VESTIBULAR STIMULATION AND THE INFLUENCE OF DIFFERENT VISUAL SURROUNDS

William E. Collins Aug. 1967 15 p refs

(AM-67-19)

The direction, extent and intensity of the illusions produced by Coriolis vestibular stimulation were investigated with subjects (a) in total darkness, (b) viewing simulated wing-tip lights and a rotating beacon in an otherwise totally dark room, and (c) viewing the simulated aircraft lights through a window in a luminous "cabin" in an otherwise totally dark room. During 72°/sec rotation about the yaw-axis, lateral head movements of 30° produced mean verbal estimates of apparent "diving" and "climbing" sensations between 33.8°–87.2°. Intensity ratings of the sensation of apparent displacement were greatest for the simulated aircraft lights condition, and the relative intensity of sensation between one type of head movement as compared with another appeared to be affected by the visual surrounds. Author

N68-16818# Lockheed Missiles and Space Co., Sunnyvale, Calif.

WEIGHTLESS SIMULATION USING WATER IMMERSION TECHNIQUES: AN ANNOTATED BIBLIOGRAPHY

J. H. Duddy, comp., O. T. Kallos, comp., V. D. Caswell, comp., and A. T. Vogt, comp. Dec. 1967 112 p refs Rean-Revised

(LMSC-5-24-65-3, Rev. 2)

This compilation contains 215 selected references pertaining to behavioral and biomedical research involving human subjects. The references are organized under three topics: (1) physiological studies, including acceleration stress tolerance and physiological responses to simulated weightlessness, (2) human engineering studies of man's performance capabilities under neutral buoyancy conditions simulating weightlessness, and (3) techniques and personal equipment requirements for weater immersion studies. The references are arranged alphabetically by author, or by title if appropriate, under each of the three topics. An author index is included as an aid in locating the contributions of specific investigators. The references cited were drawn from the literature published or privately distributed during the period from January 1951 through December 1967. Author

N68-16821# Universidad Nacional de Trujillo (Peru). Departamento de Fisiologia.

THE OLE OF CATECHOLAMINES AND SEROTONIN IN THE PROCESS OF ADAPTATION TO HIGH ALTITUDE

A. Medina, L. Utano, and G. Olaya [1967] 6 p refs

(Grant AF-AFOSR-888-66)

(AFOSR-67-2735; AD-662631) CFSTI: HC $3.00/MF $0.65

The effects of hypoxia (12.85% O2 in N2) on the pulmonary artery pressure of dogs were studied, as well as the variations in the level of serotonin in the blood of the same artery. Hypoxia produced pulmonary hypertension in the 7 dogs studied, and at the same time an increase in the level of serotonin in the blood of the pulmonary artery was produced. This result is expounded in relation to a reflex vasoconstriction which is mediated by serotonin. Author (TAB)

N68-16830*# National Aeronautics and Space Administration, Washington, D. C.

CHANGES IN THE TOLERANCE OF MAN TO TRANSVERSE ACCELERATIONS

A. R. Kotovskaya, R. A. Vartbaronov, and S. F. Simpura Dec. 1967 13 p refs Transl. into ENGLISH of the Rept. "Izmeneniye Perenosimosti Chelovekom Poperechnykh Peregruzok Posle Gipodinamii Razlichnoy Orodolzhitel'nosti" Presented at the 18th Congr. of the Intern. Astronautical Federation, Belgrade 25–30 Sep. 1967

(NASA-TT-F-11401) CFSTI: HC $3.00/MF $0.65 CSCL 06S

A summary is presented of investigations on human tolerance to transverse accelerations after hypodynamia under conditions of a strict bed regime with a duration of 3.7, 20, and 60 days. The experiments were conducted on 20 healthy individuals who had been subjected to a special clinical examination. Tolerance was evaluated on the basis of the maximum magnitude of acceleration acting in a chest-back direction at an angle of 80° and 65°. The principal criterion of tolerance under the influence of accelerations at an angle of 80° was the appearance of relative bradycardia, and less frequently visual and respiratory disorders. At an angle of 65° it was primarily visual disorders. The collected data on the tolerance to accelerations and physiological reactions were statistically processed by the differences method using the linear unidirectional regression technique. The indices of the physiological reactions of the subjects were compared as a result of the imparting of accelerations of different magnitude with respect to their absolute values and with the initial levels taken into account. The results are shown and discussed. R.N.A.

N68-16895# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

RESULTS OF INVESTIGATION OF THE EFFECT OF COSMIC RADIATION AND OTHER FACTORS OF COSMIC FLIGHT ON LYSOGENIC BACTERIA AND HUMAN CELL CULTURES [ITOGI ISSLEDOVANIYA VLIYANIYA KOSMICHESKOY RADIATSII I DRUGIKH FAKTOROV KOSMICHESKOGO POLETA NA LIZOGENNYYE BAKTERII I KLETKI CHELOVEKA V KUL'TURE]

N. N. Zhukov-Verezhnikov and I. N. Mayskiy 24 Jul. 1967 9 p Transl. into ENGLISH from Akad. Nauk SSSR. Izv. Ser. Biol. (USSR), no. 4, 1966 p 592–593

(Contract AF 33(657)-16409)

(FTD-HT-67-200; AD-663360)

Single-layer cultures of normal human cells (fibroblasts and amniotic cells) and human cancer cells (Hela strain), together with cultures of lysogenic bacteria (E. coli K-12), have been consistently used as radiation indicators on Soviet spacecraft. Results of these experiments show that repeated exposure of a culture of Hela cells to spaceflight factors on the Vostok-4 and Vostok-6 flights produced changes in experimental cells as compared with laboratory controls and with Hela cells exposed on one spaceflight only. A longer latent period of recovery of growth capacity and other characteristics were noted in twice-flown cultures. In addition, the coefficient of proliferation for Hela cells exposed on both Vostok-4 and Vostok-6 was one-half that for intact controls and for Hela cells exposed to spaceflight only once. These data suggest that spaceflight factors have a direct dependence of biological effect on length of spaceflight exposure has not been established in experiments with the other radiation indicator, the lysogenic bacteria E. coli K-12. It is interesting to note that when the same Hela cells used on Vostok-4 and Vostok-6 were also exposed on Voskhod-1, a well-defined drop in the proliferation coefficient was observed in comparison with intact cultures. Other reliable differences were also found between intact controls and thrice-exposed cultures. However, no reliable differences could be detected between thrice-exposed Hela cells and a control strain used only on Vostok-6. It is suggested that the biological effect of spaceflight may be the result of the combined influence of radiation, vibration, and weightlessness. TAB

N68-16896*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.

RESEARCH ON COMPUTATIONAL AND DISPLAY REQUIREMENTS FOR HUMAN CONTROL OF SPACE VEHICLE BOOSTERS. PART 1: THEORY AND RESULTS Final Report, 22 Jun.–22 Oct. 1966

J. D. Gilchrist and R. Livingston Nov. 1966 120 p refs

(Contract NAS8-20023)

(NASA-CR-61554; Rept.-12513-FR2, Pt. 1) CFSTI: HC $3.00/MF $0.65 CSCL 05H

The theory, experimental results, and conclusions are presented of a study of man–computer near-optimal guidance and control techniques. The Reusable Orbital Transport, a two-stage launch vehicle with appreciable aerodynamic lift capability in the first stage, was used, and a comparative evaluation for onboard application of near-optimal trajectory prediction techniques was made. The Predictive Model Guidance Scheme (PMGS) and the Nominal Guidance Scheme (NGS) were simulated on a real-time basis with a pilot actively engaged in the guidance function. The PMGS was simulated for the second stage only, and NGS was studied for purposes of comparison. It was concluded that the PMGS is more accurate, flexible, and fuel-optimal, and has a lower pilot work load, and that the NGS has lower computer and display requirements. N.E.N.

N68-16911*# National Aeronautics and Space Administration, Washington, D. C.

INVESTIGATION OF VISUAL WORK CAPACITY IN SPACE FLIGHT [ISSLEDOVANIYEYRITEL'NOY RABOTOSPOSOBNOSTI I KOSMICHESKOM POLETE]

Ye. A. Ivanov, V. A. Popov, and L. S. Khachaturyants Jan. 1968 7 p Transl. into ENGLISH from Russian Presented at the 18th Congr. of the Intern. Astronautical Federation, Belgrade 25–30 Sep. 1967

(NASA-TT-F-11404) CFSTI: HC$3.00/MF$0.65 CSCL 05E

Experiments and investigations are briefly discussed which were conducted prior to actual space flight to determine the effects of the space environment, especially weightlessness, on the functions of vision. A detailed description is given of tests and test methods used onboard the Voskhod spacecraft to determine the sharpness of vision, visual work capacity, and perception of colors of astronauts. Evidence shows that the sharpness of vision during an orbital flight is higher than average standards, but this only pertains to objects that extend linearly. The visual work capacity is considerably reduced during space flight due to the fact that weightlessness disrupts not only the overall coordination of motion but also the coordination of the group of eyeball moving muscles. A large reduction in the subjective brightness of colors observed by the astronauts was noted; however, this phenomenon is still unexplainable. R.N.A.

N68-16938# Polytechnic Inst. of Brooklyn, N. Y. Microwave Research Inst.

EFFECTS OF MICROWAVE RADIATION ON THE EYE

L. Birenbaum, I. Kaplan, S. W. Rosenthal, H. Schmidt, and M. M. Zaret *In its* Microwave Res. Inst. Programs Nov. 1967 (See N68-16927 07-10) p 50–53 refs

(Contract DA-MD-49-193-65-6142)

The effects of exposure to 70 GHz microwave power on the eyes of rabbits were studied by observing the cataractogenic threshold curves for pulsed and continuous wave power. Tentative results established a power level of 610 milliwatts for 30 minutes as sufficient to cause the development of corneal opacities and, in one case, the initiation of corneal vascularization. G.G.

N68-16974# Polytechnic Inst. of Brooklyn, N. Y. Microwave Research Inst.

A PROBE TO MONITOR ELECTROANESTHESIA CURRENT DENSITY

S. Deutsch *In its* Microwave Res. Inst. Programs Nov. 1967 p 173–175 (See N68-16927 07-10)

(Grant NSF GU-1557)

Details are given, and drawings are shown for an electronic probe that monitors electroanesthesia current density while inserted into the brain of an animal or human patient. The probe measures magnitude and direction of currents forced through the brain via generator electrodes with the help of a balancing potentiometer. G.G.

N68-17038# Federal Aviation Administration, Oklahoma City, Okla. Office of Aviation Medicine.

REACTION TIME AS A FUNCTION OF FLASH LUMINANCE AND DURATION

Mark F. Lewis and Henry W. Mertens Nov. 1967 9 p refs

(AM-67-24) CFSTI: HC$3.00/MF$0.65

As a consequence of the high speeds of modern aircraft, pilots must respond quickly to signal lights from the ground or other aircraft during night flight. The present study was concerned with the relation of reaction time to flash luminance and duration. Reaction time was a decreasing, negatively accelerated function of flash luminance. Flash duration had no clear effect upon reaction time. Author

N68-17039 Federal Aviation Administration, Oklahoma City, Okla. Office of Aviation Medicine.

EVALUATION OF A BIOCIDAL TURBINE-FUEL ADDITIVE

Charles R. Crane and Donald C. Sanders Aug. 1967 10 p refs

(AM-67-21) CFSTI: HC$3.00/MF$0.65

Growth of microorganisms in water-contaminated, kerosene-type fuels is a widespread problem in aviation. One approach to the solution of this problem is the introduction into fuel of a chemical additive which could stop or retard growth of microbes. Evaluation of the effectiveness of such an additive was conducted in the laboratory under conditions which approximated field operations. Organisms of known identity and isolates from contaminated fuel, when cultured in aqueous nutrient media, responded variably to the additive; however, most fungi and bacteria were severely inhibited by 1,000–5,000 ppm. In simulated fuel cells containing turbine fuel and an aqueous solution of inorganic salts, all fungi were killed within four days at 270 ppm additive. Tests also showed that while microbes remain viable in dry fuel, they require a discrete water phase for multiplication. Author

N68-17046# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.

CHARACTERISTICS OF BREATHING APPARATUS USED IN HEALTH PHYSICS [CARACTERISTIQUES DE L'APPAREIL RESPIRATOIRE UTILISABLES EN RADIOPROTECTION]

Francois Perissin-Pirasset Jun. 1967 66 p refs In FRENCH

(CEA-R-3234)

The present state of knowledge makes it possible to envisage the calculation of doses absorbed by various parts of the respiration apparatus following inhalation of radioactive dusts contained in aerosols. After recalling certain anatomical and histological considerations, various curves showing the deposition of dusts in the three parts of the breathing apparatus are presented including the nasopharynx, the trachea and windpipe, and the pulmonary parenchyma. The dusts can be classified in three groups of biological solubility according to the rates of elimination of the particles from the organs. A synthesis of these data is given in elimination diagrams. In order to calculate the doses it is necessary furthermore to know certain anatomical and physiological characteristics of a standard man. Author (NSA)

N68-17066# Federal Aviation Agency, Oklahoma City, Okla. Dept. of Transportation.

PERCEIVED DEPTH BETWEEN FAMILIAR OBJECTS

Walter C. Gogel and Henry W. Mertens Aug. 1967 7 p refs

(AM-67-20)

The hypothesis was examined that the essential factor in the size cue to depth from familiar objects is the perceived size S'' per unit of retinal size θ of each of the objects, with the object having the largest value of S'/θ appearing to be the more distant object. Five familiar objects were simulated. The objects were presented in pairs and the Os indicated their perceived width (S'),

the perceived distance (D') of each from himself, and the perceived depth (d') between the objects in each pair. In agreement with the above hypothesis, the results indicate that the perceived depth between the objects was a monotonic function of the difference between the values of S'/θ. The average values of d' and D' were similar to the simulated values for distance up to approximately three feet from the observer. For greater distances the error in the average d' and D' values increased with an increase in the simulated distances. The results support the notion that the familiar size cue to depth can occur between objects of dissimilar shape whenever those objects have perceived sizes. Author

N68-17067 Douglas Aircraft Co., Inc., Santa Monica, Calif. Nuclear Technology and Subsystems Branch.
POPULATION EXPOSURE PROBABILITY MODEL FOR RANDOM RE-ENTRY OF A NUCLEAR SATELLITE
C. R. Easton, R. W. Langley, and G. H. Anno Sep. 1967 19 p refs
(Douglas Paper-4736; Rept.-1599-1-DP204)

A satellite carrying radioactive material in a near-Earth orbit has a finite probability of re-entering before the radioactivity has decayed to a harmless level. If the re-entry is unplanned, it is normally impossible to predict the impact point to a useful degree of accuracy. This paper deals with such cases. The probability distribution function for latitude of impact is derived for a general case. This function is then combined with an injury probability model and a population distribution model to compute probabilities of injury. The results are correlated as the dependence of probability of injury on latitude and orbital inclination angle. It is shown that probability of injury peaks for an orbital inclination of 30° to 60°. Author

N68-17086*# State Univ. of New York at Buffalo. Center for Theoretical Biology.
[MULTIDISCIPLINARY RESEARCH IN THEORETICAL BIOLOGY] Annual Report, Jan.–Dec. 31, 1967
James F. Danielli 31 Dec. 1967 134 p
(Grant NGR-33-015-016)
(NASA-CR-93002) CFSTI: HC $3.00/MF $0.65 CSCL 06C

The Center for Theoretical Biology and its organization are briefly described, and the activities of the center and its members are outlined. Summarized reports are presented in the following fields of research: Quantum biochemistry, macromolecules, biophysical systems, monomolecular film studies, membranes, receptors, cell physiology, and the central nervous system and sensory communication. N.E.N.

N68-17112*# National Aeronautics and Space Administration, Washington, D. C.
CHANGES IN INDICES OF EXTERNAL RESPIRATION, GAS EXCHANGE AND ENERGY EXPENDITURES IN WEIGHTLESSNESS
I. I. Kas'yan, G. F. Makarov, and B. V. Blinov Dec. 1967 10 p refs Transl. into ENGLISH of the book "Izmeneniye Pokazateley Vneshnego Dykhaniya, Gazoobmena i Energotrat v Usloviyakh Nevesomosti" (USSR) p 1–12 Presented at 18th Congr. of the Intern. Astron. Federation, Belgrade, 25–30 Sep. 1967
(NASA-TT-11406) CFSTI: HC $3.00/MF $0.65 CSCL 06P

Data are presented on the functional state of external respiration, gas metabolism, and energetic expenditures of man during brief weightlessness simulated by parabolic flight in a laboratory aircraft. Experiments were made on a total of 58 flights with participation of 55 subjects ranging in age from 22 to 46 years. The following data were recorded: respiration rate, vital capacity of the lungs, pulmonary ventilation, and exhaled air samples. C.T.C.

N68-17116*# Midwest Research Inst., Kansas City, Mo.
MEDICAL APPLICATIONS OF AEROSPACE SCIENCE AND TECHNOLOGY Quarterly Report, Nov. 1, 1967–Jan. 31, 1968
David Bendersky 31 Jan. 1968 63 p refs
(Contract NASr-63(13); MRI Proj. 3077-E)
(NASA-CR-92977; QR-3) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Efforts to transfer applicable science and technology from the space program to the nonaerospace medical field are described. Special medical problems are defined by the research staffs at participating medical and bioengineering schools, and the results are presented of literature searches and contacts with NASA centers and contractors to identify the aerospace-generated technology which offers potential solutions to these problems. Brief technical data are presented on a lamp for measuring oxygen concentration in water vapor; nondestructive testing of bone; an EEG telemetry helmet; a temperature telemetry system; an automated microsyringe; subminiature biotelemetry unit for remote physiological investigations; graphic blood pressure measuring system; digital computer processing of X-ray photos. Also included are technology transfer reports on actual and potential transfers including electrocardiogram electrodes, muscle accelerometer, respirometer helmet, impedance cardiograph, electroencephalogram helmet, sterile operating rooms, bone elasticity measurement, eyelid closure measurement, and a system for delivering medication to the respiratory tract. M.G.J.

N68-17130# Royal Aircraft Establishment, Farnborough (England).
A NEW TONOMETER FOR EQUILIBRATING BLOOD WITH DIFFERENT GAS PRESSURES QUICKLY [EIN NEUES TONOMETER ZUR RASCHEN AQUILIBRIERUNG VON BLUT MIT VERSCHIEDENEN GASDRUCKEN]
Detlef Laue Oct. 1967 6 p refs Transl. into ENGLISH from Arch. Ges. Physiol. (Berlin), v. 254, no. 2, 1951 p 142–143
(RAE-LIB-TRANS-1255) CFSTI: HC $3.00/MF $0.65

A new type of tonometer is described for equilibrating 4 cm^3 of blood with physilogical gases within 10 minutes. Author

N68-17144# Advisory Group for Aerospace Research and Development, Paris (France).
PRINCIPLES OF BIODYNAMICS. SECTION A. PROLONGED ACCELERATION: LINEAR AND RADIAL
[1967] 87 p refs
CFSTI: HC $3.00/MF $0.65

The principles of prolonged linear and radial acceleration as related to aerospace biodynamics are presented. The four sections include acceleration terminology, an introduction to the physics and physiology of acceleration, the dynamics of rotation applied to centrifuges, and a summary of human tolerance to prolonged acceleration. R.N.A.

N68-17148*# California Univ., Berkeley. Dept. of Nutritional Sciences.
NUTRITIONAL REQUIREMENTS AND BREEDING BEHAVIOR OF *PEROGNATHUS* Semiannual Progress Report, 1 Jul.–31 Dec. 1967
Rosemarie Ostwald 31 Dec. 1967 14 p
(Grant NGR-05-003-118)
(NASA-CR-92980) CFSTI: HC $3.00/MF $0.65 CSCL 06C

The adequacy of a semi-purified diet was tested. Organ weights, carcass composition, serum electrolytes and organ histology was found to be the same in groups of *P.Pe.* fed a semi-synthetic diet compared to those fed their usual diet of mixed seeds. The diet was found adequate to maintain weight and normal behavior in a group of Kangaroo rats, another species of desert rodents that do not require water. Laboratory-bred *P.Pe.* required supplementation

with moisture containing foods of both the seed and the semi-purified diet for adequate growth. Study of the hematology of *P.Pe.* fed the semi-purified diet suggested that this diet may not be fully adequate to maintain normal hematopoiesis. Protein and amino acid requirements of *P.Pe.* were studied. A relatively narrow range of 20–25% was found to be required for soy protein in the semi-purified diet. Breeding behavior was further studied. Author

N68-17156*# National Aeronautics and Space Administration, Washington, D. C.
SPACECRAFT ENVIRONMENT AND TOLERANCE TO HYPOXIA
N. A. Agadzhanyan, I. N. Zakharova, L. V. Kalyuzhnyy, and A. V. Sergiyenko Dec. 1967 12 p Transl. into ENGLISH of the book "Usloviya Obitaniya v Germokabinakh, Perenosimost' Gipoksii" (USSR) Presented at the 8th Congr. of the Intern. Astron. Federation, Belgrade, 25–30 Sep. 1967
(NASA-TT-F-11405) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Experiments are described in which the EEG were studied on rabbits under conditions of hypoxia. Biopotentials were recorded from the visual region of the cortex of the lateral field of hypothalamus, dorsal hippocampus, and reticular formation of the midbrain. A conditioned alimentary reflex was produced in each animal, and the animals were subjected to increases in altitude. It was noted that at 3,000 m, there is an alleviation of the conditioned reflexes, and at an altitude of 6,000 m, the alimentary reflexes disappear but the defense reflexes remain. A quantitative evaluation of the EEG changes indicates that at a rate of 25 m/sec there is a reliable decrease of the delta wave energy. It was concluded that gradual acclimatization increases tolerance to high altitudes, and that tolerance depends on environmental conditions, time of day, and seasonal changes. N.E.N.

N68-17162*# LTV Aerospace Corp., Dallas, Tex. Astronautics Div.
UNMANNED THERMAL PERFORMANCE EVALUATION OF A GEMINI EXTRAVEHICULAR SPACE SUIT. VOLUME 1: TEST REPORT GEMINI BRAVO TEST SERIES SPACE ENVIRONMENT SIMULATOR TEST
R. J. Copeland, E. G. Lipnicky, and F. H. Goodnight 15 Jul. 1965 364 p ref
(Contract NAS9-3414)
(NASA-CR-65935; Rept.-00.683, V. 1) CFSTI: HC $3.00/MF $0.65 CSCL 06K

The Gemini suit tested was a G-2C suit modified to the configuration of the extravehicular suit (integrated thermal and micrometeoroid protective materials). The helmet was uninsulated and fitted with a sunshade which lowers over the helmet visor. The visor was coated on the exterior surface with a low emittance coating to help maintain the visor above fogging temperatures. Suit insulation extends to the soles of the boots and insulated gloves were provided. The 25-foot Gemini extravehicular umbilical which supplies oxygen, power, and communication lines was used during simulated orbits. The suit was worn by a 15th percentile size thermal dummy throughout the tests. The tests were performed in a 10-foot diameter horizontal test chamber capable of simulating the vacuum and thermal environments of space. Author

N68-17171*# LTV Aerospace Corp., Dallas, Tex. Astronautics Div.
SPACE ENVIRONMENT SIMULATOR TEST PROGRAM. VOLUME 2: UNMANNED THERMAL PERFORMANCE EVALUATION OF A GEMINI EXTRAVEHICULAR SPACE SUIT Test Report, May 1965
R. J. Copeland, E. G. Lipnicky, and F. H. Goodnight 15 Jul. 1965 704 p
(Contract NAS9-3414)
(NASA-CR-65936; Rept.-00.683, V. 2) CFSTI: HC $3.00/MF $0.65 CSCL 06K

Plots of temperature data measured during the Gemini Bravo series of space suit tests are presented. The tests were designed to experimentally evaluate the thermal performance and design adequacy of the extravehicular suit for operations in space. Also evaluated was the comfort of the suit inside a spacecraft with the hatches open. Two prototype suits were subjected to a series of simulated space environmental extremes and to simulated actual orbits. Included are evaluations of the effects of suit contact with spacecraft surfaces and the effects of different visor configurations. C.T.C.

N68-17173*# Weber Aircraft Corp., Burbank, Calif.
APOLLO STOWABLE NET COUCH, PHASE 3 Final Report
W. E. Cooper 9 Mar. 1967 74 p
(Contract NAS9-3497)
(NASA-CR-65940; DR-5935) CFSTI: HC $3.00/MF $0.65 CSCL 05E

The three-man stowable couch configurations, the functional design, and the stress analysis are summarized. The couch articulation, restraints, and suspension structure are briefly described along with the disassembly and stowage. The most critical structural areas in the system are considered to be the intersection of the Y–Y beam to the stabilizer beam and the couch hip joint. Actual mock-ups of the disassembly are reviewed, and the essentials of a development and qualification program are outlined. Drawings of the couch, and discussions of the loads, stress, and weight analyses, and operating procedures are included. N.E.N.

N68-17175*# General Electric Co., King of Prussia, Pa.
REGENERABLE ADSORBENT STUDY
Larry C. Spece, F. P. Rudek, T. F. Green, and R. A. Miller [1967] 123 p refs
(Contract NAS1-6574)
(NASA-CR-66529) CFSTI: HC $3.00/MF $0.65 CSCL 06K

Details are given on the performance of a thin film solid regenerable adsorbent, e.g. (determine CO_2 adsorption rates, efficiencies, sizing criteria, and other pertinent system design parameters). The investigations were carried out for a range of environmental conditions which covered the normal operating levels for a typical flight system. The tests were organized into three and four variable factorial designs, and the data were treated by standard statistical techniques. This type sorber panel is most appropriate for coadsorption of H_2O and CO_2, or for use with a conventional predryer in which CO_2 is desorbed to space. The limitng resistance to CO_2 adsorption is evidently the boundary gas film at the surface of the sieve panel and not within the sieve itself. Equilibrium capacity was nearly 25 percent less than that reported by the manufacturer for pellet beds. A simplified model was formulated and verified experimentally for the thin film sorber plate. A system weight was derived with this model and the test results which compared favorably with packed bed-type systems. Development of panels with more efficient heat transfer characteristics is possible, and should be completed before a prototype system design is undertaken. Author

N68-17179*# General Dynamics/Convair, San Diego, Calif.
STUDY OF ZERO GRAVITY CAPABILITIES OF LIFE SUPPORT SYSTEM COMPONENTS AND PROCESSES Final Technical Report, Dec. 28, 1966–Dec. 28, 1967
16 Feb. 1968 167 p refs
(Contract NAS1-6939)
(NASA-CR-66534; GDC-DBD67-004) CFSTI: HC $3.00/MF $0.65 CSCL 06K

A study was conducted to define a program of determining the zero gravity capabilities of the life support components and processes contained in the Integrated Life Support System (ILSS). The study included the identification, and evaluation of

gravity-sensitivities inherent in the ILSS components and processes; the investigation of methods for experimentally evaluating those critical items for which zero-gravity performance could not be adequately determined by analytical techniques; and the formulation of criteria for assessing the gravity-sensitivity of alternate life support system processes. It was concluded that greatest benefit could be realized from experimentation to validate and support the analytical problem areas of heat transfer and liquid transport. Testing of the ILSS processes of liquid-mixing and flame propagation was felt to be of less value as future life support system designs are expected to appreciably reduce or eliminate the importance of their gravity-sensitivities. A particularly pertinent conclusion is that the majority of processes in the ILSS are of such a nature that their gravity sensitivities can be satisfactorily assessed by analyses; reducing the need for special component testing. Author

N68-17219# Brookhaven National Lab., Upton, N. Y.
LIGHT INDUCED REACTIONS IN CHROMATIUM CHROMATOPHORES UNDER CONTROLLED REDOX CONDITIONS
M. A. Cusanovich (Calif. Univ., La Jolla), R. G. Bartsch (Calif. Univ., La Jolla), and J. M. Olson 1967 19 p refs Presented at the Conf. on Comp. Biochem. and Biophys. of Photosynthesis, Hakone, Japan, 12–15 Aug. 1967
(BNL-11684; CONF-670816-2) CFSTI: HC $3.00/MF $0.65

Light-induced reactions of cytochromes in Chromatium were studied in relation to bacterial photosynthesis. It was found that many of the reactions of the Chromatium could be duplicated with chromatophores and that individual reaction components could be more easily studied than was feasible with the whole cell. NSA

N68-17228# Florida Univ., Gainesville. Dept. of Pathology.
THE TOXICOLOGY OF NICKEL CARBONYL
F. William Sunderman, Jr. 1 Jul. 1967 10 p refs
(Contract AT(40-1)-3461)
(ORO-3461-9; AT(40-1)-3461-9) CFSTI: HC $3.00/MF $0.65

Summaries are presented of investigations concerned with ultrastructural and histochemical studies of the alveolar reaction to nickel carbonyl; inhibition of cortisone induction of hepatic tryptophan oxygenase by nickel carbonyl; nickel carbonyl inhibition of phenobarbital induction of hepatic cytochrome P-450; effect of nickel carbonyl upon hepatic and pulmonary aminopyrine demethylase; nickel carbonyl inhibition of RNA polymerase activity in hepatic nuclei; metabolism of ^{63}Ni-labeled carbonyl, measurement of serum nickel; studies of carcinogenesis following parenteral injection of nickel carbonyl; measurement of Cu and Tl in biological materials by atomic absorption spectrometry; electrophoretic fractionation of serum proteins in hepatic diseases; and analysis of blood ethanol by gas chromatography. NSA

N68-17247*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
REMOTE SENSING IMPLICATIONS OF CHANGES IN PHYSIOLOGIC STRUCTURE AND FUNCTION OF TREE SEEDLINGS UNDER MOISTURE STRESS
Frederick P. Weber and Charles E. Olson, Jr. (Mich. Univ.) 30 Sep. 1967 67 p refs
(NASA Order R-09-038-002)
(NASA-CR-93175; APR-1) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Changes in reflection and emission characteristics of coniferous and broadleaved foliage on tree seedlings subjected to varying degrees of moisture stress were studied under greenhouse conditions. Moisture stress in the foliage was measured by a Scholander hydrostatic pressure chamber. A heater source probe and detector, inserted into the active xylem, measured the rate that water was translocated upward in trees. An infrared filtered radiometer measured changes in thermal response under various solar energy inputs. The level of water stress during leaf formation was found to exert a greater influence on foliar reflectance than the level of water stress at the time the reflectance measurements were made. Pine foliage affected by moisture shortage underwent structural changes as a result of physiologic stress. However, these changes did not alter the spectral signature of foliage enough to permit pre-visual detection of moisture stress. Water loss did not affect reflectance directly except in the region of the infrared water absorption bands R.N.A.

N68-17295*# National Aeronautics and Space Administration, Washington, D. C.
BIBLIOGRAPHY ON AEROSPACE MEDICINE AND BIOASTRONAUTICS, 1967
L. I. Boreva, comp. and E. M. Panova, comp. Feb. 1968 34 p refs Transl. into ENGLISH of the Russian Doc. "Ukazatel'literatury Aviakosmicheskaya Meditsina i Bioastronavtika 1967" Moscow, 1967 47 p Presented at the 18th Congr. of the Intern. Astron. Federation, Belgrade, 25–30 Sep. 1967
(NASA-TT-F-11403) CFSTI: HC $3.00/MF $0.65 CSCL 06S

An annotated bibliography concerned with aerospace medicine and bioastronautics is presented. Cited are such areas as general physiology, the physiology of the cardiovascular system, vestibular reactions, envirionmental and stress factors, hypodynamia, hypoxia, irradiation and radiation, toxicology, in-flight medical examinations, life support systems, and biochemistry. C.T.C.

N68-17341*# State Univ. of New York, Buffalo.
A GENERAL MODEL FOR MOTIVATIONAL ANALYSES OF EXCHANGE RELATIONSHIPS
Raymond G. Hunt [1967] 21 p
(Grant NGR-33-015-061)
(NASA-CR-93189) CFSTI: HC $3.00/MF $0.65 CSCL 05J

A conceptually simple, abstract model of motivational phenomena applicable across a wide variety of concrete events is developed. The rewards and incentives, motives and personality, and the exchange relations and power are discussed. The application is made to the buyer–seller, comsumer–supplier relations, and particular attention is given to the NASA–contractor dyad. N.E.N.

N68-17366*# Army Natick Labs., Mass.
POTENTIAL USE OF EXTRATERRESTRIAL RESOURCES IN LIFE SUPPORT SYSTEMS
Robert O. Matthern *In* NASA. Marshall Space Flight Center 5th Ann. Meeting. Working Group on Extraterrest. Resources 3 Mar. 1967 p 187–189 refs (See N68-17350 08-30)

Extraterrestrial resources include those of geological origin, the atmosphere, solar and cosmic radiation, and possibly life. The uses of potential resources are discussed with respect to the functions of life support systems to provide food, water, atmosphere, optimum temperature, energy, and a means of waste disposal. Author

N68-17369*# Air Force Systems Command, Wright-Patterson AFB, Ohio.
SPACE CABIN TOXICOLOGY
Anthony A. Thomas *In* NASA. Marshall Space Flight Center 5th Ann. Meeting. Working Group on Extraterrest. Resources 3 Mar. 1967 p 207–217 refs (See N68-17350 08-30)

Experiments to acquire toxicological information on various animals in an inhalation exposure facility are discussed. Details are given on the facility and the experiments exposing the animals to extended periods in cabin atmospheres, to pulmonary irritants and systemic poisons, and to volatile contaminants generated by cabin

materials. It was determined that continuous exposure can lead to summation-of-interest type of toxic effect, that the atmospheric environment influences the outcome of toxic damage, and that cabin materials must be screened to insure crew health and performance.
N.E.N.

N68-17370*# AiResearch Mfg. Co., Los Angeles, Calif.
METABOLIC DEMAND DURING MAN'S LUNAR ACTIVITY IN SPACE SUITS
E. C. Wortz *In* NASA. Marshall Space Flight Center 5th Ann. Meeting Working Group on Extraterrest. Resources 3 Mar. 1967 p 219–222 refs (See N68-17350 08-30)

Experiments were performed under reduced gravity simulation with the subjects walking and conducting upper torso work and calisthenics. It was found that metabolic rates during walking will be lower on the lunar surface than on the earth but that they will be higher for upper-torso work. Upper-torso tasks may be impossible to perform without restraints. The calisthenics produced no change in metabolic rate.
N.E.N.

N68-17378*# California Univ., Berkeley. Forestry Remote Sensing Lab.
THE DEVELOPMENT OF SPECTRO-SIGNATURE INDICATORS OF ROOT DISEASE ON LARGE FOREST AREAS Annual Progress Report
John F. Wear 30 Sep. 1967 27 p refs
(NASA Order R-09-038-002)
(NASA-CR-93186) CFSTI: HC $3.00/MF $0.65 CSCL 02F

Remote sensing research was continued in an effort to discriminate between healthy and *Poria weirii* infected Douglas-fir trees. Promising results were obtained this year in the thermal infrared band of the electromagnetic spectrum. Spectrometric tests conducted in the visible and near infrared bands indicate that properly selected black-and-white film-filter combinations have a high probability for separating healthy trees both from diseased trees without visible crown symptoms and from diseased trees with visible crown symptoms. Foliage samples were analyzed from 45 trees, representing three tree condition classes, three stand-age classes, and three seasons of collection.
Author

N68-17380* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
NONFLAMMABLE CLOTHING DEVELOPMENT PROGRAM
Matthew I. Radnofsky [1967] 37 p
(NASA-TM-X-60897) CFSTI: $3.00 CSCL 06Q

The flame resistant substitute materials program for manned spacecraft was undertaken to accomplish the following: (1) Find flameproof or nonflammable materials for spacecraft to eliminate combustibles from the crew-bay compartments. (2) Find a direct substitute for materials in the spacecraft which are fire-prone. (3) Improve the characteristics of the substitute materials by development and testing in actual use. (4) Establish a specification for material application based on all qualifying evaluations. The materials concerned are those which are primarily associated with the personal crew provisions of the astronauts, or the nonmetallic materials within the habitable areas of their spacecraft. The purpose of the program is to evaluate and develop the latest fibrous, plastic, and elastomeric materials for spacecraft cabin or space environment applications. The facilities used laboratory personnel are capable of testing and evaluating specific physical and functional performance characteristics of materials before, during, and after exposure to simulated-space and lunar-environment or spacecraft cabin conditions.
Author

N68-17408*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
THE USE OF MULTISPECTRAL SENSING TECHNIQUES TO DETECT PONDEROSA PINE TREES UNDER STRESS FROM INSECT OR PATHOGENIC ORGANISMS
R. C. Heller, R. C. Aldrich, W. F. McCambridge, and F. P. Weber 30 Sep. 1967 73 p refs
(NASA Order R-09-038-002)
(NASA-CR-93173; APR-2) CFSTI: HC $3.00/MF $0.65 CSCL 02F

Both ground and airborne operations were conducted to identify the likeliest sensors available to foresters to detect early tree stress. Aerial photography (color and false color) was taken at five periods (October 1966, May, June, July and August 1967) over six infestation centers to capture the changes in foliage coloration. Optical-mechanical scanning imagery was obtained in three wavelengths (2.0–2.6, 4.5–5.5, and 8.0–14.0 microns) over a three-day period in June 1967. Better ground instrumentation was developed this season for measuring sap flow, emitted foliage temperature, and meteorological conditions. A promising new device (Scholander bomb) measured highly significant differences in needle moisture tension between healthy and stressed foliage. Foliage discoloration rates of all 204 infested trees were established by comparison with Munsell cards. Ground Munsell notations of infested foliage were very similar to Munsell notations of the tree images in color aerial transparencies; however, Munsell notations on 35 mm. ground photography showed less agreement with either of the above.
Author

N68-17465# Air Force Systems Command, Wright-Patterson AFB, Ohio.
HANDLING QUALITIES AND PILOT WORKLOAD
C. B. Westbrook, R. O. Anderson, and P. E. Pietrzak *In* AGARD Stability and Control, Pt. 2 Sep. 1966 p 625–648 refs (See N68-17460 08-02)

This paper has the objective of defining the relationship between handling qualities and pilot stress and workload. The reasons underlying the importance of pilot work-load measurement are discussed and ways to analyze or treat pilot vehicle systems are reviewed. The various measures of pilot workload that have been used or considered are discussed and some new data on the possible use of pupil dilation as a measure of stress are presented.
Author

N68-17466# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
PHYSIOLOGICAL AND PSYCHOLOGICAL MEASUREMENTS OF PILOT WORKLOAD
F. G. Cumming and K. G. Corkindale *In* AGARD Stability and Control, Pt. 2 Sep. 1966 p 649–657 refs (See N68-17460 08-02)

The various methods used in measuring a pilot's workload and their limitations are discussed. These include measurement of the operator's performance, assessment of operator behavior, the operator's subjective assessment of the task, an observer's assessment of the operator's performance, measurement of the operator's response to addition tasks performed concurrently with his primary task, and the operator's psycho-physiological response in the task situation. Physiological measurements of pilot workload are shown to be capable of providing useful data in situations where other methods of assessment are likely to be either dangerous or impracticable. If only one measure is to be used then heart rate recording has the advantages of ease of recording and apparent sensitivity to changes in task loading. However, with a single measure the methodological finding of the need to use each subject as his own control must be adopted. Several physiological measurements should be taken so that relatively small differences in workload can be detected.
R.N.A.

N68-17467# Systems Technology, Inc., Hawthorne, Calif.
EFFECTS OF TASK VARIABLES ON PILOT MODELS FOR MANUALLY CONTROLLED VEHICLES
D. T. McRuer and H. R. Jex *In* AGARD Stability and Control, Pt. 2 Sep. 1966 p 659–701 refs (See N68-17460 08-02)

Some recent developments in analytical pilot models for manually controlled vehicles are summarized, with emphasis on the effects of task variables on the types of models required and on the model parameters. Validated analytical pilot models are shown to be available for a wide range of task variables. Different forms of pilot models, such as compensatory, pursuit, and periodic, are needed to handle the wide range of problems. The extra blocks in these models should not be overlooked in interpreting simulator and flight test data. A crossover model and refinements to the model are described which offer great simplifications in the modeling of compensatory tasks. With these simple models remarkably good estimates can be made of pilot equalization, gain, time delay, performance, and rating decrements. Multiloop tasks lead to models similar to those for single loop tasks, and most of the adaptation rules seem to be equally valid. An adaptive feedback selection hypothesis is presented which appears to be a powerful rule for selecting the most useful display quantities from an array of possibilities. A pilot's rating decrements can be related to his adopted model parameters to better optimize the pilot-vehicle system.
R.N.A.

N68-17468# North American Aviation, Inc., Columbus, Ohio.
PILOT INDUCED INSTABILITY
Ralph C. A'Harrah and Raymond F. Sienert *In* AGARD Stability and Control, Pt. 2 Sep. 1966 p 703–722 refs (See N68-17460 08-02)

A simulator derived criteria for predicting pilot induced instability tendencies was successfully applied to 43 flight cases on 7 different aircraft. The criteria is considered suitable for general application, and, because of the fundamental parameters involved, is appropriate as a design guide in the preliminary design phase. Flight test application of the criteria should allow determination of the aircraft's pilot induced instability tendencies with a minimum of risk and a high confidence level.
Author

N68-17472# North American Aviation, Inc., Los Angeles, Calif.
FACTORS AFFECTING PILOT LANDING TECHNIQUES
K. J. Dyda and N. M. Lefritz In AGARD Stability and Control, Pt. 2 Sep. 1966 p 813–830 refs (See N68-17460 08-02)

Simulator tests of supersonic transports were conducted to determine factors affecting pilot technique in approach and landing. Aircraft characteristics, instrument displays, and atmospheric environment were varied. Pilot knowledge of the conditions being evaluated was another variable. The simulator was validated against in-flight data prior to the tests. The data collected included pilot opinion rating, pilot/aircraft performance, and pilot workload measures. Results show that pilots concentrate on establishing a higher desired level of performance in controlling the vertical flight path in an approach and landing more than on the lateral path. Pilot ratings reflect the ability to obtain this desired degree of performance. Improving the pilot's performance capability in the lateral axis did not alter his workload or pilot opinion rating. A pilot's knowledge of the variables being studied and order of presentation can lead to erroneous pilot opinion rating, performance, and workload measures, as well as poor correlation among them. Pilot ratings consistently correlated with column workload for the landing task.
R.N.A.

N68-17545# Defence Research Board, Ottawa (Ontario).
CONJUGATE BILATERAL FUNCTIONING OF THE VESTIBULAR APPARATUS (HOGYES-BEKHTEREV PRINCIPLE OF INTERCENTRAL EQUILIBRATION)
G. I. Gorgiladze Jan. 1968 11 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (Moscow), v. 52, no. 6, 1966 p 669–676 (T-490-R)

Electrocorticograms (ECoG) were taken on 33 adult cats to study the vestibular excitation occurring when the labyrinth is cathodically or anodically polarized. The results of polarization of one and two labyrinths with direct current is discussed, along with an explanation of why the stream of impulses, when both labyrinths are cathodically excited, fail to show its activating effect on the ECoG. To investigate the blocking of the vestibular excitation outside the reticular formation, a study was made of labyrinth polarization reactions of single neutrons in the vestibular nuclei of the medulla oblongata. It was determined that the activity of the right and left vestibular nuclei upon polarization of one labyrinth are reciprocal in character, and the ECoG activation reaction occurs every time the equilibrium between the right and left vestibular nuclei is disturbed. It is concluded that the effect of the vestibular apparatus on the cortex depends on disruption of the dynamic equilibrim that exists, between the vestibular nuclei of the two sides.
B.S.D.

N68-17574# Advisory Group for Aerospace Research and Development, Paris (France).
ELECTROENCEPHALOGRAPHY IN AEROSPACE MEDICINE
P. M. van Wulfften Palthe (Natl. Aeromed. Center, Soesterberg, Netherlands) 1967 189 p refs
(AGARDograph-110) CFSTI: HC $3.00/MF $0.65

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6. ELECTROENCEPHALOGRAPHIC EXAMINATION IN THE FRAMEWORK OF FITNESS EXAMINATIONS FOR THE AVIATION FLYING PERSONNEL A. J. M. Raboutet and G. Soussen p 75–91 refs (See N68-17580 08-04)

7. FLICKER AS A HELICOPTER PILOT PROBLEM: USE OF PHOTIC STIMULATION AND EEG AS SCREENING TECHNIQUES L. C. Johnson p 93–109 refs (See N68-17581 08-04)

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12. ELECTROENCEPHALOGRAPHS OF AVIATORS IN RELATION TO AIRCRAFT ACCIDENTS AND ATTRITION FROM FLIGHT TRAINING H. W. Ades p 191–193 (See N68-17586 08-04)

N68-17575# Royal Air Force, Farnborough (England). Central Medical Establishment.
THE USE OF ELECTROENCEPHALOGRAM (EEG) IN AVIATION MEDICINE
P. J. O'Connor *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 1–12 (See N68-17574 08-04)

A routine electroencephalogram (EEG) is recommended for all aviation candidates to disqualify men with grossly epileptic records and to have a means of comparing tracings in the event of a brain disorder that subsequantly occurs in the service. The EEG was found particularly useful in the diagnosis of disturbances in consciousness and, less frequently, of other disturbances in brain function and structure. Common causes of consciousness disturbance are discussed, including syncope, epilepsy, excess G force lack of oxygen, carbon monoxide poisoning, hypoglycemia, decompression, cerebral catastrophes, and psychological disorders. M.W.R.

N68-17576# Toronto Univ. (Ontario)
THE USE AND ABUSE OF THE EEG IN AIRCREW SELECTION
John W. Scott *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 13–23 refs (See N68-17574 08-04)

The Royal Canadian Air Force's policy of giving electroencephalograms to all aircrew candidates is noted, and a long-term study is being made to determine the correlation of irregularities in EEG patterns with subsequent success in flight training and actual flying. Major objectives of using the EEG are to recognize men who are liable to suffer brief periods of unconsciousness, to monitor cerebral insufficiency produced by physiological stresses, and to assess the capabilities of pilots being returned to duty following illnesses and injuries involving the nervous system. While the EEG has provided a useful clinical tool in detecting epilepsy and organic cerebral lesions and monitoring cerebral function during stress, it does not help in identifying the personality and emotional traits that produce good pilots. M.W.R.

N68-17577# Derbyshire Royal Infirmary, Derby (England).
THE USE AND ABUSE OF ELECTROENCEPHALOGRAPHY IN CLINICAL MEDICINE
W. B. Matthews *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 25–32 refs (See N68-17574 08-04)

A common-sense approach to the use of electroencephalography in clinical medicine is stressed; as is the need for experimental efforts, cooperative programs between physiologist and clinician, and the need for more trained personnel. Questions asked of the EEG are discussed, including those concerned with epilepsy, temporal lobectomies, intracranial space lesions, and insanity. M.W.R.

N68-17578# Compagnie Nationale Air France, Paris (France)
MEANING AND VALUE OF ELECTROENCEPHALOGRAPHY IN AERONAUTICAL MEDICINE
C. Blanc, E. Lafontaine, and R. Laplane *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 33–61 refs (See N68-17574 08-04)

Results are reported of ten years' experience covering 8,000 electroencephalographic recordings made on subjects belonging to the Air France Cabin Staff. Criteria of the conventional EEG tracings were analyzed by the use of a longitudinal classification distinguishing the "evolutive tracings" and the "stationary tracings". In about 100 monographic studies, evolutive correlations appear between the psycho-affective and psychophysiological factors, and the electrical disturbances. Major EEG anomalies (generalized paroxysms, left temporal foci, photo-sensitivity) are transitorily observed in the course of anxiety neurosis, neurotic depressions, and psychosomatic syndromes. The extent of disorders in the hypnotic function is shown in the genesis of the occasional disturbances in EEG tracings with normal subjects. Certain electrical patterns observed on recruitment tracings seem to have an anticipatory value, a predictive significance necessitating an exploration of the personality by a psychiatric examination. The importance of the EEG with subjects presenting antecedents of cranial traumatisms without clinical after-effects, is also stressed. Author

N68-17579# Compagnie Nationale Air France, Paris (France).
PRINCIPLES AND METHODS OF APPLICATION OF ELECTROENCEPHALOGRAPHY IN AVIATION MEDICINE
C. Blanc, E. Lafontaine, and R. Laplane *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 63–73 refs (See N68-17574 08-04)

Of 10,000 electroencephalogram recordings made over the past 10 years, 8,000 were of cabin staff, 950 of pilots, and 1,050 of ground staff personnel. Subclinical disturbances observed in 35% of the cabin staff and 20% of the pilots appear to be correlated with psychological, psychiatric, or psychophysiological factors in many instances rather than with potential epilepsies. The need for an EEG reference tracing at the time other selection tests are given aircrew personnel is stressed and discussed in terms of policy of Air France. The occurrence of EEG anomalies in pilots in considered the bases for refection, since the meaning of such anomalies cannot always be determined. M.W.R.

N68-17580# Centre d'Enseignement et de Recherches de Medicine Aeronautique, Paris (France).
ELECTROENCEPHALOGRAPHIC EXAMINATION IN THE FRAMEWORK OF FITNESS EXAMINATIONS FOR THE AVIATION FLYING PERSONNEL [L'EXAMEN ELECTROENCEPHALOGRAPHIQUE DANS LE CADRE DE LA VISITE D'APTITUDE DU PERSONNEL NAVIGANT DE L'AVIATION]
A. J. M. Raboutet and G. Soussen *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 75–91 refs In FRENCH; ENGLISH summary (See N68-17574 08-04)

More than 6700 electroencephalograms made on flying personnel during the past 15 years indicate that tracings can be interpreted in three groups. Group I consists of usual or normal tracings, and comprises 80% of the total EEG's performed. Group II, with 17.5%, consists of borderline traces; and Group III, with 2.5%, represents abnormal tracings with posterior theta-delta rhythms and "spike-wave" complex. Those in the third group must be subjected to a very complete clinical and psychological examination in order to reveal the roles of fatigue, nervous tension, or recent mild infectious diseases that might cause EEG abnormalities. The role of the EEG as a complementary test is stressed, although it is noted that in 1% of the cases the mere presence of abnormal signs is sufficient to lead to a verdict of unfitness for flying duties. M.W.R.

N68-17581# Navy Medical Neuropsychiatric Research Unit, San Diego, Calif.
FLICKER AS A HELICOPTER PILOT PROBLEM: USE OF PHOTIC STIMULATION AND EEG AS SCREENING TECHNIQUES
Laverne C. Johnson *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 93–109 refs (See N68-17574 08-04)

Flicker vertigo during flight was reported as a problem for approximately one-fourth of the 102 pilots examined. Generally, flicker was described as only annoying or distracting; but, in one instance, a near accident was attributed to flicker. For the experienced helicopter pilot, photic stimulation did not appear to be a useful device to detect those who would show abnormal EEG activity during flicker. Photic stimulation, however, did identify pilots who had subjective feelings of discomfort during the flickering

light; and in one-fourth of the sample, degree of alertness was markedly affected during flicker. Neither baseline EEG data nor induced photic changes in the EEG pattern showed a clearcut relationship to flight performance or to cognitive motor functioning in the laboratory. The complex problem of the relationship of normal and paroxsymal EEG activity to motor-cognitive functioning is discussed. Author

N68-17582# National Aeromedical Center, Soesterberg (Netherlands).

THE INFLUENCE OF FLICKER ON THE LEVEL OF CONSCIOUSNESS

G. J. Puister *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 111-121 ref (See N68-17574 08-04)

A lowering of the level of consciousness caused by flicker could not be proved by using the Bourdon-Wiersma Stipple Test in a small population of young healthy subjects. The influence of hyperventialtion in sensitive subjects of a comparable group could be measured with the stipple test and shown to be related to fluctuations in the level of consciousness by an electroencephalogram. However, it is pointed out that an identical EEG can have a different meaning. Author

N68-17583# National Aeromedical Center, Soesterberg (Netherlands)

THE ELECTROENCEPHALOGRAM IN THE SELECTION OF FLYING PERSONNEL

G. J. Puister *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 123-133 refs (See N68-17574 08-04)

The EEG of the large majority of well-known civil pilots showed a monorhythmic alpha. A small majority had a flat, reduced voltage or a polyrythmic EEG without alpha activity. Their professional performance was almost always considered as "substandard". Flight engineers, on the other hand, had an EEG which showed almost no monorthythmic alpah. The large majoirty who had a similar EEG were considered better than the others. In the case of trainee pilots, an immaturity factor is probably responsible for their lower standard of professional performance as well as for the fact that their EEG's show no alpha activity. The psychological analyses of the personality structure of flight engineers would seem to indicate a correlation between the predominance of a polyrhythmic EEG and outstanding technical ability (mechanical comprehension tests). The EEG may constitute a factor in the selection of aircrew. A flat or polyrhythmic EEG is an unfavorable sign in the case of a future pilot, and EEG which shows no alpha activity is an advantage when predicting the career of a flight engineer. Author

N68-17584# Naval Air Development Center, Johnsville, Pa.

ELECTROENCEPHALOGRAPHIC CHANGES IN HUMAN SUBJECTS DURING BLACKOUT PRODUCED BY POSITIVE ACCELERATION

R. D. Squires, R. E. Jensen, W. C. Sipple, and J. J. Gordon *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 135-152 refs (See N68-17574 08-04)

Analysis of the taped EEG signals from 13 men was accomplished by a 14-channel, continuous frequency analyzer using bandpass filters, with voltage outputs rectified and passed through a smoothing filter in order to obtain a direct current voltage proportional to the amplitude of the frequency band passed by each filter. Frequency analysis showed characteristic changes during visual greyout and blackout. The increase in beta frequencies from 16 to 36 c/s showed the same general amplitude pattern as the acceleration profile. The lower beta frequencies, 16 to 19 c/s, had a tendency to level out or to decrease during each blackout coincident with an increase in the lower frequency components. The alpha frequencies, 8 to 13 c/s, often appeared during greyout and blackout, but sometimes disappeared during very deep blackout when bursts of high amplitude and low frequency components appeared. The best index of the level of consciousness appears to be the inverse relationship between the depth of blackout and the amplitude of EEG frequencies in the range of 5 c/s. Author

N68-17585# National Aeromedical Center, Soesterberg (Netherlands).

ELECTROENCEPHALOGRAPH AND FLUCTUATIONS IN THE LEVEL OF CONSCIOUSNESS

P. M. van Wulfften Palthe *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 153-190 refs (See N68-17574 08-04)

Isolation, silence, and restriction of mobility were imposed upon 48 subjects of different ages and occupations who were tested during a three-hour stay in a cylinder or decompression chamber. The EEG, eye movements, EKG, and respiration were recorded throughout the testing period. Vegetative functions showed a slight but constant lowering of performance, and the subjects exhibited large variations in their levels of consciousness. Studies were also made of 40 pilots and trainee pilots who were placed in an ejector seat in a cockpit simulator; and the same variations in consciousness appeared when the men were isolated. About 18% of the subjects slept for short periods, while the majority showed EEG signs of various stages of sleep from the beginning of the testing. It is concluded that electroencephalography on flying pilots is a cumbersome procedure for use as a warning system, and that the principles of galvanic skin resistance offers more promise. Music and familiar human voices were suggested as the alerting stimuli. M.W.R.

N68-17586# Naval School of Aviation Medicine, Pensacola, Fla.

ELECTROENCEPHALOGRAPHS OF AVIATORS IN RELATION TO AIRCRAFT ACCIDENTS AND ATTRITION FROM FLIGHT TRAINING

Harlow W. Ades *In* AGARD Electroencephalog. in Aerospace Med. 1967 p 191-193 (See N68-17574 08-04)

Electroencephalograms of more than 7500 naval aviator students indicate correlations that appear to relate cerebral physiology to success or failure in flight training. The 352 student aviators involved in 578 accidents while in control of an aircraft, exhibited somewhat greater EEG abnormality than a control group; and those involved in fatal accidents showed a markedly higher incidence of EEG abnormality. Incidence of EEG abnormality for students involved in two to six accidents is similar to that of those involved in fatal accidents. This summary notes that there are some indications that EEG types which go with success in training do not always correlate well with accident-free flying careers. M.W.R.

N68-17587# Human Factors Research, Inc., Santa Barbara, Calif.

GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: A SIMULATOR TEST OF A TEAM METHOD OF REPORTING TARGET LOCATIONS

James J. McGrath, William K. Earl, and William E. Osterhoff Oct. 1967 36 p refs

(Contract Nonr-4218(00))

(TR-751-12; AD-663549)

In low-altitude air reconnaissance, the pilot must acquire targets, describe and identify them, and report their locations. This experiment was conducted to determine whether the last job, reporting target locations, could be performed by someone other than the pilot. A simulator study was conducted in which the accuracy of target-location reports by single pilots was compared with the accuracy of reports made by plotters who were tracking the progress of the aircraft by means of voice reports from the pilot. The results showed that pilot/plotter teams could report target locations as accurately as single pilots. Pilots on the teams spent much less time looking at their charts than pilots working alone, however, the former had to spend a large portion of their time talking and listening to the plotter. It was concluded that plotters

in voice communication with pilots could track an aircrafts progress and give real-time reports of target locations. The procedure gains head-up time for the pilot, but increases the pilots communication burden. Author (TAB)

N68-17590*# Naval Air Development Center, Johnsville, Pa. Aerospace Crew Equipment Dept

PHYSIOLOGICAL EFFECTS OF DIFFERENT OXYGEN FLOW RATES AND AMBIENT TEMPERATURES ON PRESSURE-SUITED SUBJECTS PERFORMING WORK AT ALTITUDE

Louis J. SantaMaria, David J. Horrigan, Jr., and Meredith H. Radliff 22 Dec. 1967 13 p refs

(NASA Order T-59457)

(NASA-CR-93256; NADC-AC-6708; AD-663907) CFSTI: HC $3.00/MF $0.65 CSCL 06P

In a series of tests conducted at different ambient temperatures, the physiological effects of various levels of flow rate of ventilating O2 were investigated. Pressure-suited subjects underwent moderate work stress on a bicycle ergometer in an altitude chamber maintained at 5 PSIA. The temperature and relative humidity of the ventilating O2 were maintained constant at 55F and 90-95%, respectively; the duration of the runs was fixed at 2 hours. Within the limits of the ambient temperatures and ventilating flow rates employed in this study, only slight advantages were gained by increasing flow rate, as observed in terms of the physiological measurements made in this study. Author (TAB)

N68-17636# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.

AN INEXPENSIVE HEAD RESTRAINT SYSTEM FOR LONG TERM INTRAVENOUS ADMINISTRATION OF DRUGS IN THE MONKEY

James G. Trost, William Talley, and Glayde D. Whitney Dec. 1967 13 p ref

(ARL-TR-67-27; AD-663447)

A head restraint system allowing intravenous administration and self-administration of compounds in monkeys under conditions of minimal restraint is described. The system has functioned well even with large male Macaques and requires no handling of the subjects for administration of drugs. Additional advantages of the present system, its ease of fabrication, light weight, and low cost are discussed. Author (TAB)

N68-17682# Library of Congress, Washington, D. C. Aerospace Technology Div.

ELECTROSLEEP AND ELECTROANESTHESIA—THEORY AND CLINICAL EXPERIENCE

Arsen Iwanovsky and Christopher H. Dodge *In its* Foreign Sci. Bull., Vol. 4, No. 2 Feb. 1968 p 1-64 refs (See N68-17681 08-34)

Electrosleep and electroanesthesia in Soviet practice are discussed, and details are given on a broad range of electroneural techniques used alone or in combination with other conventional approaches in an extremely wide variety of surgical, neurological, and quasi-neurological situations. Some examples of electronic circuitry are presented to show how a therapeutic electrosleep effect may be obtained from any pulse generator having an output voltage form close to the required parameters. West German experiments on electrosleep are reported, and the theoretical and practical aspects of the method are reviewed. Documentation based on Soviet and East European clinical experience is given. Efforts of several researchers to improve upon existing techniques and to introduce new applications into the clinic and even the classroom (hypnopedia) are noted. It is pointed out that both techniques are generally regarded with skepticism in the United States, although some active theoretical research is being conducted. A reference bibliography is included. M.G.J.

N68-17684# Library of Congress, Washington, D. C. Aerospace Technology Div.

DIAGNOSTIC USE OF THE FLUORESCENT-ANTIBODY METHOD IN THE USSR

Lee Perkins *In its* Foreign Sci. Bull., Vol. 4, No. 2 Feb. 1968 p 85-101 refs (See N68-17681 08-34)

The applications of the fluorescent-antibody method are primarily medical, taxonomical, and immunological. The method has been used in the diagnosis of bacterial, rickettsial, and viral diseases. It is especially useful in the diagnosis of influenza, smallpox, mumps, polio, rabies, tickborne encephalitis, fowl plague, hog cholera, meningitis, bacterial and viral dysentery, staphylo-coccal infection, Shigella dysentery, Q-fever, and other illnesses. It is also a useful tool in the study of microbial and other antigens, cell-virus interaction, antibiotic sensitivity, biosynthesis, and taxonomy. Fluorescein and related chemicals and specialized equipment have been developed to improve the technique, lower costs, and broaden its applicability. Author

N68-17730# Yale Univ., New Haven, Conn. School of Medicine.

EFFECTS OF 1,1-DIMETHYLHYDRAZINE (UDMH) ON EVOKED CEREBRAL NEUROELECTRIC RESPONSES Final Report, Jun. 1966-Mar. 1967

W. R. Goff, Truett Allison, Y. Matsumiya, M. B. Sterman (Calif. Univ., Los Angeles), and M. D. Fairchild (Calif. Univ., Los Angeles) Wright-Patterson AFB, Ohio AMRL Sep. 1967 17 p refs Prepared for California Univ.

(Contract AF 33(615)-2822; Grant PHS-M-05286)

(AMRL-TR-67-67; AD-663764)

The neural mechanisms of UDMH intoxication were studied by analyzing changes in cortical, subcortical, and cerebellar neuroelectric potentials evoked by peripheral nerve stimulation. Results showed that the negative component of the primary somatosensory cortical evoked potential was markedly potentiated by UDMH intoxication while the positive component of this response together with the response from the specific somatic sensory thalamic relay and from the cerebellum were unaffected. The potentiation almost always occurred in the absence of other evoked or spontaneous neuroelectric changes and preceded epileptiform seizure by several minutes. Thus it was usually the sole predictor of seizure. Motor paralysis markedly prolonged seizure onset. These results indicate the UDMH intoxication increases intracortical excitability acting primarily at axo-denritic synapses to block inhibitory post-synaptic potentials. The resulting positive sensory-motor feedback is an important element in the production of seizures. Author (TAB)

N68-17734*# California Univ., Davis.

PERIPHERAL VOLUME MEASUREMENTS AS INDICES OF PERIPHERAL CIRCULATORY FACTORS IN THE CARDIO-VASCULAR ORTHOSTATIC RESPONSE Final Report

Loren D. Carlson [1967] 183 p refs

(Grant NGR-05-004-026)

(NASA-CR-93247) CFSTI: HC $3.00/MF $0.65 CSCL 06P

Three techniques of measuring changes in limb volume were evaluated: (1) limb circumference changes by a resistance transducer, (2) limb volume change by capacitance measurement, and (3) limb volume change by impedance measurement. None of the techniques seem qualified for in-flight use. Each must be used with great care in controlled laboratory experiments. Data obtained from their use with tilt table or negative pressure devices were tentative due to the possibilities of artifact. A bedrest study was conducted to evaluate the cardiovascular function following bedrest. Metabolic balance, basal and work metabolisms, fluid spaces, body composition, strength, renal function, and blood and urine composition were measured. Heart rate and blood pressure served as reference and comparative values for other tests. Both heart rates and blood pressures were higher in the evening than in the morning and neither differed in response to tilt at the two times.

Negative pressure tests showed changes in heart rate and blood pressure that were similar to the tilt tests, but to a lesser degree. Leg volume increases were greater following bedrest. R.N.A.

N68-17742# Joint Publications Research Service, Washington, D. C.

SPACE BIOLOGY AND MEDICINE, VOLUME 1, NUMBER 5, 1967

9 Feb. 1968 171 p refs Transl. into ENGLISH from Komich. Biol. i Med. (Moscow), v. 1, no. 5, 1967 p 1-96
(JPRS-44299) CFSTI: HC$3.00/MF$0.65

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11. FUNCTIONAL CHANGES IN THE NERVOUS SYSTEM AND FUNCTIONING AND CERTAIN ANALYZERS IN RESPONSE TO THE COMBINED EFFECT OF HYPOKINESIA AND RADIAL ACCELERATION T. W. Krupina, A. Ya. Tizul, N. M. Boglevskaya, B. P. Baranova, E. I. Matsnev et al p 91-99 refs (See N68-17753 08-04)

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N68-17743# Joint Publications Research Service, Washington, D. C.

COURSE OF DEVELOPMENT OF SOVIET SPACE BIOLOGY AND MEDICINE

V. V. Parin and O. G. Gazenko *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 1-9 (See N68-17742 08-04)

Primary stages of development of Soviet space biology and medicine are reviewed. Emphasized are two major stages in development during which (1) methodological principles were devised and observational data on human responses to prolonged space flight were compiled; and (2) qualitative studies of humans and animals were made to assess physiological responses to zero gravity environments. Current Soviet research in space biology and medicine which is directed towards increasing human tolerance to various flight factors, and ensuringhigh reliability of man machine systems, is also discussed. S.C.W.

N68-17744# Joint Publications Research Service, Washington, D. C.

RESULTS AND FUTURE OF RESEARCH IN THE FIELD OF SPACE GENETICS

O. G. Gazenko and G. P. Parfenov *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 10-17 (See N68-17742 08-04)

A review of space genetics research during the period 1930 to 1967 is presented. Discussed are evolutionary trends which involved studies of the effects of cosmic ionizing radiation on organic evolution, the biological effects of galactic cosmic radiation, and experimental studies to determine the applications of biological indexes and dosimetry during manned space flight. It is surmised that future space genetics research will be marked by an increase in the duration of spaceflights to an extent commensurate with the duration of the ontogenetic developement of multicell organisms, the duration of their reproductive period, and the lifetime of individual biological specimen. S.C.W.

N68-17745# Joint Publications Research Service, Washington, D. C.

STRUCTURAL AND FUNCTIONAL IMPAIRMENTS OF CERTAIN SYSTEMS OF THE ANIMAL BODY IN RESPONSE TO EXTREME EXPOSURES

V. V. Parin and I. M. Khazen *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 18-29 refs (See N68-17742 08-04)

Studies on structural and functional impairments of some systems of the animal body when exposed to hypoxia, accelerations, and other stress factors are reported. Results indicate that: (1) Apparent changes of the tissue structure of different systems (especially the digestive system) as well as changes of internal media can be revealed using special techniques. (2) The impairments are latent and may develop against the background of a satisfactory good state of health, the absence of significant changes in behavioral responses, and rapid recovery of vital systems (central nervous, cardiovascular and respiratory systems), thus giving evidence of a good compensatory capacity of the animal and human body. (3) The use of the function of the nerve and glandular apparatus of the digestive system as an indicator of the response of the

organism to space flight stress can help in an analysis of the homeostatic mechanisms at different regulation levels. (4) Aside from the higher mechanisms of the cortical and subcortical levels, the adaptive system of an automatic control and self-control with an alternative structure appears to play a significant role. (5) A proper theoretical approach makes possible prediction of the development of physiological processes and their control, maintaining the homeostatic functions of man and ensuring his good health and performance. Author

N68-17746# Joint Publications Research Service, Washington, D. C.

MATHEMATICAL MODELING OF HEAT AND HUMIDITY VARIATION IN AIRTIGHT SPACESHIP COMPARTMENTS

B. A. Adamovich, A. V. Kostetskiy, V. A. Kurochkin, and G. G. Ter-Minas'yan *In its* Space Biol. and Med., Vol. 1, No. 5 1967 9 Feb. 1968 p 30-39 refs (See N68-17742 08-04)

Differential equations of the fluctuation of temperature and relative humidity in spaceship compartments are presented. Using the model derived, temperature and humidity changes in the environmental control system and spaceship compartments are studied. The block diagram of the model for the computer program is given. Curves of the temperature and relative humidity fluctuations are plotted with respect to the assigned levels of the parameters in three connected compartments. Author

N68-17747# Joint Publications Research Service, Washington, D. C.

EFFECT OF A DIET CONTAINING UNICELLULAR ALGAE ON THE COMPOSITION OF ENTERIC MICROFLORA IN ANIMALS

V. M. Shilov, N. N. Liz'ko, V. I. Fofanov, and N. S. Klyushkina *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 40-45 refs (See N68-17742 08-04)

The effect of diets containing different protein sources on the composition of enteric microflora was studied using white rats of two generations. Casein containing diets fed to the experimental animals decreased the number of acidophil bacteria whereas diets containing unicellular algae increased the number of spore forming anaerobic bacteria and resulted in an insignificant increase of the number of *Escherichia coli* in the feces of the first generation rats. The changes observed appear to be related to the quality of the protein in the diet. Author

N68-17748# Joint Publications Research Service, Washington, D. C.

EFFECT OF TRANSVERSE ACCELERATIONS ON THE ACETYLCHOLINE CONTENT AND CHOLINESTERASE ACTIVITY OF THE BLOOD OF EXPERIMENTAL ANIMALS

N. V. Korneyeva and A. S. Ushakov *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 46-52 refs (See N68-17742 08-04)

Reported is a study designed to determine the effects of exposure to transverse accelerations of 8 g on the acetylcholine content and cholinesterase activity of rabbit blood. Exposure produced reversible changes in the acetylcholine content. Immediately after exposure the acetylcholine content increased sharply, then gradually decreased and disappeared completely in one to three days and reached the normal level by the fifth day after exposure. Cholinesterase activity remained virtually constant, showing only a slight increase three days after exposure. Acetylcholinesterase activity rapidly decreased, one and three days after exposure. The relative volume of erythrocytes (hematocrit) revealed no changes after exposure of rabbits to accelerations. Author

N68-17749# Joint Publications Research Service, Washington, D. C.

CORRELATION OF ELECTROENCEPHALOGRAPH (EEG) SHIFTS AND THE FOOD PROCURING REFLEX OF RABBITS DURING INCREASING HYPOXIA

L. V. Kalyuzhnyy, N. A. Agadzhanyan, and I. N. Zakharova *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 53-66 refs (See N68-17742 08-04)

Experiments were carried out on unrestrained rabbits which had developed a food-procuring reflex to a rhythmic light stimulus. The animals were exposed to a low atmospheric pressure with a gradual rise of 25 m/sec. As shown by their EEG records, the function of the frontal and lateral hypothalamic parts increased at simulated altitudes of 2,000 to 3,000 m, thus promoting their reflex activity. At simulated altitudes of 5,000 to 7,000 m the rabbits exhibited generalization of rhythms of signal assimilation and their transformation in the subcortical nonspecific activating system due to the development of parabiotic phases which caused the disappearance of conditioned reflexes. At altitudes of 5,000 to 7,000, signal rhythm assimilation occurred only in the optic cortex and not in the subcortex. It is surmised that the disappearance of conditioned reflexes at altitudes of 5,000 to 7,000 m is related to excessive excitation and parabiosis of the nonspecific activating system of the brain stem resulting from hypoxia. Author

N68-17750# Joint Publications Research Service, Washington, D. C.

EXPERIENCE IN USE OF PROPHYLACTIC AND THERAPEUTIC COMPLEXES DURING REPEATED EXPOSURE TO IONIZING RADIATION

M. N. Trushina *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 67-76 refs (See N68-17742 08-04)

The purpose of this study was to test the effect of prophylactic, therapeutic, and protective complexes on dogs exposed to X-rays. The animals received 30 to 40 R four times a week, the total dose being 600 R. The therapeutic complexes included vitamins, amino acids, orotic acid, leucocytine and prednisolone, which produced a favorable effect on the clinical development of radiation sickness, promoting the survival of irradiated animals. The complexes administered for two weeks before a repeated exposure of dogs to irradiation improved the hematological indices recorded during the first two to three weeks of irradiation. The complex of vitamins and amino acids appeared to give the best therapeutic results. An application of protectors and the vitamin-amino acid complex used two weeks after irradiation alleviated the disease, thus increasing the percentage of survival of the animals tested. Author

N68-17751# Joint Publications Research Service, Washington, D. C.

SOME INTERPRETATIONS OF THE BIOLOGICAL EFFECT OF CHRONIC γ IRRADIATION

A. F. Khoruzhenko, A. I. Laptev, I. G. Oreshkin, V. N. Malakhovskiy, and V. A. Rezontov *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 77-85 refs (See N68-17742 08-04)

Rats were exposed daily to fractional Co^{60} γ-irradiation, the duration of exposure ranging from 1 to 90 days in different experiments. As the duration of exposure increased, the magnitude of the median lethal dose increased in an asymmetrical sigmoid relation. The correlation was analyzed using the method of a quantitative expression of the radiobiological effect through dose units. On this basis it was possible to develop a model of accumulations and repair of radiation damage associated with chronic exposure to gamma rays. Results obtained are in agreement with the theory of monotonic repair of the elementary damage with a 20% level of irreversibility. As a result, the response of the animal body to chronic γ-irradiation appears similar to that of acute γ-irradiation. Author

N68-17752# Joint Publications Research Service, Washington, D. C.

THE COMBINED EFFECT OF TWO-MONTH HYPOKINESIA AND RADIAL ACCELERATIONS ON THE CARDIOVASCULAR SYSTEM

G. P. Mikhaylovskiy, T. V. Benevolenskaya T. A. Petrova, I. Ya. Yakovleva, O. I. Boykova, et al *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 86-90 refs (See N68-17742 08-04)

Six healthy male test subjects were exposed to a 62 day bedrest and radial accelerations of the maximum tolerable magnitude. Bedrest reduced the strength of muscular vessels, disturbed ophthalmic and nasal regional circulation, and decreased orthostatic tolerance of all subjects. The latter was associated with some cardiovascular disorders and deterioration of circulatory adaptation mechanisms to a physical load. The combined effect of bedrest and radial accelerations on the cardiovascular system was more distinct than the single effects of acceleration. Physical exercises performed during bedrest yielded positive results. Author

N68-17753# Joint Publications Research Service, Washington, D. C.

FUNCTIONAL CHANGES IN THE NERVOUS SYSTEM AND FUNCTIONING AND CERTAIN ANALYZERS IN RESPONSE TO THE COMBINED EFFECT OF HYPOKINESIA AND RADIAL ACCELERATION

T. N. Krupina, A. Ya. Tizul, N. M. Boglevskaya, B. P. Baranova, E. I. Matsnev et al *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 91-99 refs (See N68-17742 08-04)

The functional state of the nervous system and some analyzers was studied using six healthy male test subjects aged 23 to 36 years who had been subjected to a 62-day bedrest combined with radial accelerations. Three of the subjects performed physical exercises using a bunjee cord and bicycle ergometer. Prior to the bedrest experiment, the test subjects were twice (at an interval of 4 to 6 days) exposed to transverse accelerations. Transient neuro-autonomic disturbances were observed, the most distinct being autonomic and vascular disorders and asthenization phenomena which appeared earlier and disappeared later in test subjects performing no physical exercises. Functional changes of the acoustic and vestibular analyzers also were noted. These changes were related to an increase of the acoustic thresholds and decrease of the vestibulo-autonomic tolerance. The functional changes of the nervous system and some analyzers occur due to hemodynamic disturbances and afferent-efferent changes. Author

N68-17754# Joint Publications Research Service, Washington, D. C.

HUMAN BASAL METABOLISM DURING PROLONGED BEDREST

B. S. Katkovskiy *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 100-107 refs (See N68-17742 08-04)

The metabolic rate and pulmonary function of healthy test subjects were studied during 20- and 62-day bedrest experiments, before and after which they were subjected to accelerations. Three subjects who performed no physical exercises during the 62 day bedrest revealed a decreased metabolic rate and virtually unaltered pulmonary function. Three test subjects who performed physical exercises during the experiments also manifested a reduction of oxygen consumption and metabolic rate beginning with the third 10 day period. It appears that the latter is unrelated to hypokinesia but is due to an increased physical conditioning or to adaptation to a changed hydrostatic pressure of body fluids. Author

N68-17755# Joint Publications Research Service, Washington, D. C.

RESULTS OF PHYSIOLOGICAL STUDIES PERFORMED IN A SLOW ROTATION CHAMBER

R. R. Galle and M. D. Yemel'yanov *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 108-118 refs (See N68-17742 08-04)

Sixteen seven day experiments were carried out on test subjects in a slow rotation chamber which rotated at a rate of 10 and 40°/sec for study of the effect of centripetal and Coriolis accelerations on the human vestibular function. Individual peculiarities of the human body are of importance for its adaptation to this effect. The vestibular analyzer, especially its central parts, plays a significant role in the adaptation of the human body to prolonged rotation. Long term confinement inhibits the adaptation process. Results show that: (1) the angular rate of 40°/sec should not be regarded as the tolerance limit for man and (2) the prolonged rotation tolerance test can be used as an examination criterion. Author

N68-17756# Joint Publications Research Service, Washington, D. C.

ON THE INTERACTION OF ANALYZERS DURING WEIGHTLESSNESS

L. A. Kitayev-Smyk *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 119-125 refs (See N68-17742 08-04)

Data on the effect of weightlessness on the analyzers are presented. Tests were performed on various animals and 270 humans during weightlessness created by jet parabolic flights. It is suggested that spatial perception results from the interaction of information provided by gravity receptors and optic analyzers. It is also indicated that emotional, psychic, vestibular-autonomic, and motor reactions are closely related in their functions. Author

N68-17757# Joint Publications Research Service, Washington, D. C.

CHARACTERISTICS OF REACTION OF THE HUMAN ACOUSTIC ANALYZER TO SOME SPACE FLIGHT FACTORS

Yu. V. Krylov *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 126-133 refs (See N68-17742 08-04)

The dynamics of acoustic thresholds was studied on test subjects exposed to chronic noise, isolation, hypodynamics, an artificial atmosphere, and other factors characteristic of the space environment. Fluctuations of acoustic thresholds below 10 to 15 db can be classified as a reflection of the physiological rhythm and adaptation to a new environment. Fluctuations over 20 db can be interpreted as a manifestation of fatigue of the acoustic analyzer. A long term deprivation of acoustic signals results in a phenomenon of stable acoustic sensitization in man. The data indicate a significant adaptive capacity of the acoustic analyzer during human exposure to space flight factors. Author

N68-17758# Joint Publications Research Service, Washington, D. C.

BIOLOGICAL RHYTHMS AND DEVELOPMENT OF WORK AND REST REGIMES FOR COSMONAUTS

F. P. Kosmolinskaya *In its* Space Biol. and Med. Vol. 1, No. 5, 1967 9 Feb. 1968 p 136-141 (See N68-17742 08-04)

Biorhythmological research designed to determine tolerance levels and the degree of physiological (biorhythmic processes) adaptability of cosmonauts to solar time periods (i.e., the astronomical day) is reported. Reviewed are papers presented at a symposium on "Biological Rhythms and the Formation of Work and Rest Regimes" which was held in Moscow during June 1967. Emphasized is the need to understand definite rhythmic variations so that optimum and specific work and rest regimes for cosmonauts can be developed. S.C.W.

N68-17759# Joint Publications Research Service, Washington, D. C.

ANNUAL MEETING OF THE ALL-UNION BOTANICAL SOCIETY

L. V. Dmitriyeva *In its* Space Biol. and Med., Vol. 1, No. 5, 1967 9 Feb. 1968 p 142 143 To be presented at the 39th Ann. Sci. Conf. of the Aerospace Med. Assoc., Bell Harbor, Fla., 6-9 May 1968 (See N68-17742 08-04)

Notes on the general annual meeting of the All Union Botanical Society which was held on April 3, 1967 are presented. Cited is the presentation of the reports on: (1) the basic theoretical premises for the development of closed life support systems using autotropic organisms as a regenerator of food, water, and the atmosphere; (2) experimental research for the development of a link of higher plants for such systems; (3) the principles for selecting agricultural plants for use in closed systems and (4) methods for cultivating plants under conditions of weightlessness. Problems of the quantity and quality of radiant energy in closed life support systems, and the closely associated problem of gas exchange of plants in such systems were also discussed. S.C.W.

N68-17760# Washington State Univ., Pullman. Research Div.
THE SENSATION OF SOUND
Eugene W. Greenfield *Its* Bull. No. 34 1967 32 p refs

A detailed explanation of the hearing process is presented. The discussion begins with descriptions of the ear's anatomy and performance characteristics followed by details of the outer, middle, and inner ear. The cochlea and the organ of Corti, their functions, and the conversion of mechanical energy into electrical pulses in these two organs are described. An experiment pointing to the analog to digital conversion-like process of the ear is discussed. Finally, consideration is given to the functions and structure of the auditory nerve and individual neurons, the concept of pulse coded hearing, and the auditory nerve pathways to the brain. R.N.A.

N68-17780# Arizona Univ., Tucson. Dept. of Chemistry.
PHOTOBIOLOGY Final Report, 1 Oct. 1964–30 Sep. 1967
Gordon Tollin 10 Oct. 1967 68 p refs
(Contract AF 19(628)-4376)
(AFCRL-67-0590; AD-663752)

Molecular complexes of flavins with indoles and phenols were studied. Optical and thermodynamic properties provide insight into the role of charge transfer and other forces in these materials. The role of solvent was also investigated. The mechanism of phototaxis in Euglena was studied using a photoelectric technique. The response was shown to involve a shading from light of a photosensitive region by a carotenoid-containing organelle. The energy required to orient the organism with respect to the light source is derived from photosynthetic phosphorylation. Polarized light experiments indicate that the carotenoid molecules are aligned with their long axes parallel to the long axes of the organism. EPR and optical studies show reversible light-induced single electron transfer between chlorophyll and hydroquinone in solution. The role of oxygen and organic bases in this reaction has been elucidated. Quinones also participate in similar reactions. Studies using a variety of solvents have shown that solvent electrons are not involved in semiquinone radical formation and that carbonyl-containing solvents form complexes with the semiquinone radicals. Quenching experiments demonstrate that the chlorophyll triplet state is involved in both oxidation and reduction processes. Author (TAB)

N68-17788# Naval Personnel Research Activity, San Diego, Calif.
SEQUIN 2: A COMPUTERIZED ITEM SELECTION AND REGRESSION ANALYSIS PROCEDURE
William J. Moonan, John G. Balaban, and M. Joyce Geyser Nov. 1967 52 p ref
(SRM-68-11; AD-663894)

A computer program called SEQUIN II is described. The procedure used in the program to select items from those available in a battery of tests has been characterized. The selections were made so as to develop scores for the tests which could in turn be used to predict a criterion score. The possibilities available for selecting items with other procedures or heuristics were presented. Applications of this technique to military and other testing programs were discussed and the computations for a particular application were illustrated. The use of the program in a computer system is described in detail and a listing of the FORTRAN statements is also given. Author (TAB)

N68-17790# Universidad Peruana de Ciencias Medicas y Biologicas, Lima (Peru).
THE ROLE OF ADRENAL CORTEX IN THE PROCESS OF ACCLIMATIZATION TO HIGH ALTITUDES Final Report
Federico Moncloa Rio de Janeiro (Brazil) Defence Res. Office Oct. 1967 15 p
(Contract DA-ARO-49-092-65-G89)
(Rept.-3; AD-663845)

Adrenal function and cortisol metabolism during acute exposure of sea level natives to 4,300 meters of altitude were studied. The results show the following: (a) Cortisol secretion rate is temporarily increased correlating with increases in its plasma concentration and in the urinary excretion of its metabolites; (b) Hypoxia does not result in a maximal stimulus for the adrenal cortex since it can be further stimulated by exogenous corticotrophin; (c) The adrenocortical response to high altitude can be blocked by the administration of dexamethasone; (d) The second compartment in which cortisol is distributed is diminished. This may be related with the contraction of the radiosulfate space, observed under the same experimental conditions; and (e) The metabolic clearance rate of cortisol is not significantly altered. Corticotrophin half-life (t 1/2) was also studied. Results indicate that a 24 aminoacids ACTH has a t 1/2 slightly longer than a 39 aminoacids ACTH. Using the same type of experiments the t 1/2 of the 39 aminoacids ACTH in 11 high altitude natives was also investigated. The results were similar to the ones obtained in the sea level controls.
Author (TAB)

N68-17792# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
AEROMEDICAL FACTORS IN AIR-REFUELED EXTENDED HELICOPTER FLIGHT Final Report
Charles R. O'Briant Nov. 1967 12 p refs
(AMRL-TR-67-47; AD-663727)

The development of a helicopter air refueling capability now greatly extends the time of nonstop flight possible. Helicopter crews may now be exposed to the possible adverse effects of prolonged periods of noise and vibration. A flight surgeon worked closely with the aircrews on the test program and flew as a crewmember on an 18-hour nonstop mission, which covered 2200 nautical miles and included several aerial refuelings. No notable adverse effects on or detectable physiological changes in the crewmembers occurred as a result of this extended 18-hour helicopter flight. Author (TAB)

N68-17839# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DIGITAL COMPUTER SIMULATION OF VISUAL INFORMATION PROCESSING IN THE HUMAN BRAIN
William Clarke Hillsman (M.S. Thesis) Jun. 1967 152 p refs
(GA/EE/67-1; AD-663722)

A visual information processing system, based on selected aspects of human physiology, is simulated on the IBM 7094 digital computer through the use of over 50 test patterns. Monochromatic test patterns, represented by up to 2500 resolvable elements within a 50x50 array, are used to simulate static, foveal, monocular vision. Patterns are compared after scaling, rotation, and translation. The technique used for comparison which resembles the well known cross-correlation technique, is based upon the absolute-magnitude-of-the-difference of two functions; an algorithm

is used for scaling and rotation. Similar and identical patterns are identified by means of empirically derived discrimination thresholds. Author (TAB)

N68-17862# FMC Corp., Santa Clara, Calif. Central Engineering Labs.
THE DEVELOPMENT OF BUILT-IN MECHANISMS FOR SOFTENING AND REHYDRATING COMPACTED FOOD BARS
R. A. Lampi Natick, Mass. Army Natick Labs. Dec. 1967 159 p refs *Its* Ser. FL-66
(Contract DA-19-129-AMC-44(N))
(TR-68-13-FL; AD-663827)

Compressed bars representing various vegetables and fruits, a cereal, a bakery item, meat, a casserole type item, non fat milk solids, and a high cook caramel candy were prepared in a manner to accentuate hardness. The effectiveness of various mechanisms for improving bitability and mastication were examined. A laminating technique resulting in a bar of thin layers held together with a mild binder was observed to be generally applicable, since individual layers could be separated for easy mastication and accelerated hydration. For fibrous products bitability was markedly improved by application of the compressive force at 90 degrees from the direction of the bite. Physical, chemical and sensory data are recorded for bars stored at four different temperatures. Author (TAB)

N68-17876# Indiana Univ., Indianapolis. Hearing and Communication Lab.
SIGNAL DETECTION THEORY AND PSYCHOPHYSICS: A TOPICAL BIBLIOGRAPHY
James P. Egan Dec. 1967 166 p refs
(Contract Nonr-2300(05))
(AD-663906)

Approximately 1,000 references to current research in the area of signal detection theory and psychophysics are presented in series of categories. Author (TAB)

N68-17889# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ABC OF OUTER-SPACE PILOTING [AZBUKA KOSMICHESKOGO PILITAZHA]
I. Merkulov 28 Jul. 1967 14 p Transl. into ENGLISH from Tekhn.-Molodezhi (USSR), no. 1, 1966 p 20-23
(FTD-HT-23-891-67; AD-663912)

Spacecraft guidance, control, stabilization, correction, deceleration, and landing systems are discussed. It is noted that the exhaust velocity of a spacecraft is 2000 - 4000 m/sec and that a parachute-landing engine system was employed in the soft landing of the Voskhod spacecraft. The engine was switched on when the spacecraft was close to the Earths surface so that it decelerated the drop of the parachute reducing the velocity to a negligible value at the moment of landing. TAB

N68-17925# Aerospace Corp., El Segundo, Calif.
MATERIALS FOR SPACE CABINS: THE FIRE HAZARD AND ATMOSPHERE CONTAMINANT CONTROL PROBLEMS
George Epstein and Edward F. Westlake, Jr. Oct. 1967 28 p refs
(Contract F04695-67-C-0158)
(TR-0158(3250-20)-8; SAMSO-TR-67-76; AD-663418)

The report discusses the flammability and atmospheric contaminant hazards associated with the use of plastics and other nonmetallic materials in manned spacecraft cabins. Outgassing characteristics and mechanisms of typical materials are described. Flammability and combustion rates are discussed as highly important materials selection factors. An approach is presented for minimizing the hazards through judicious selection and batch control of cabin materials. Author (TAB)

N68-18009*# National Aeronautics and Space Administration, Washington, D. C.
SENSATION PERIOD, A CONTRIBUTION TO THE THEORY OF TIME, SPACE, AND MOTION SENSATION [DIE EMPFINDUNGSZEIT, EIN BEITRAG ZUR LEHRE VON DER ZEIT-, RAUM- UND BEWEGUNGSEMPFINDUNG]
F. W. Froelich Dec. 1967 26 p refs Transl. into ENGLISH from Fischer Verlag (Jena), Pt. 2, 10. 1929 p 4-21, 234-245
(NASA-TT-F-11350) CFSTI: HC $3.00/MF $0.65 CSCL 06P

A historical review of the development of sensation time is followed by discussions of the correlation between sensation time and reaction time, based on psychological tests patterned on astronomic observations of star transits in various types of telescopes. Personal equation, systematic errors in reaction times, and response to various sensory stimuli are explained and discussed. Tabulated and composite results indicate that the reaction time depends on the intensity of the sensory stimulus and that reaction times to sound stimuli and electric skin stimuli are shorter than to light stimuli. Differing results of various authors are explained on the basis of personal equation, anticipatory reactions, and physical condition of the individual. A theory is developed for proving that stimuli of equal sensation time necessarily mean equally long reaction times. Author

N68-18014*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
ANALYSIS OF HUMAN RESPONSE IN COMBINED CONTROL TASKS
Hugh P. Bergeron, James J. Adams, and George J. Hurt, Jr. Washington Mar. 1968 55 p refs
(NASA-TN-D-4356) CFSTI: HC $3.00/MF $0.65 CSCL 05H

The simulation consisted of a primary control task to which were added secondary or side tasks. A trajectory control problem was used as the primary control task for the pilot. The trajectory task was a fixed-base simulation of a lunar letdown. The task-loading effects on the letdown were found to be predominant during the final hover and translation phase. All multitask tests were made by using either the lunar-letdown simulation or the multiloop representation as the primary control task. The secondary or side tasks consisted of: (1) a system-failures task integral to a typical space vehicle, and (2) a well-defined motor response task. The study generated a quantitative index of the information processing characteristics of a full (multitask) simulation. A method for determining the information processing requirements of a trajectory control task was devised to provide the quantity related to this index. By combining this quantity with the information processing measurements of the side tasks, the total workload for various combinations of tasks was determined. A quantitative analytical model was also generated for the multiloop control in a multitask simulation. A duty-cycle shaping technique developed in this study was used to generate the model. Author

N68-18023*# Scripta Technica, Inc., Washington, D. C.
OPINIONS CONCERNING FATIGUE AND MAN'S ADAPTATION TO HEAT [OPINIONS CONCERNANT LA FATIGUE ET L'ADAPTION DE L'HOMME A LA CHALEUR]
H. Laborit Washington NASA Feb. 1968 19 p refs Transl. into ENGLISH from Revue de Med. Navale (France), v. 14 1959 p 217-236
(Contract NASw-1694)
(NASA-TT-F-11476) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Experiments aimed at maintaining or restoring normal metabolic functioning of cells in the case of work and fatigue in a hot environment. The following therapeutic suggestions are advanced: 1) An energy and dietetic supply of substances, which has not yet been studied sufficiently, but in which a major role can already be predicted for monosaccharides, vitamins, certain amino acids and ions; 2) The maintenance of a normal splanchnic vasomotor

activity capable of preserving a correct hepatorenal functioning and limiting certain disturbances of the nitrogen metabolism; 3) A surveillance of the intestinal flora; 4) A guided replacement of hydro-electrolytic losses; 5) Control measures must rely on certain blood and urine examinations, but special attention should be given to the study of neuro-muscular excitability, in view of its simplicity and the wealth of information which it provides. Author

N68-18072# General American Transportation Corp., Niles, Ill. General American Research Div.
A CLOSED SYSTEM RESPIRATORY EVALUATOR Final Report, 1 Jul. 1965–31 Jul. 1966
Max Sussman Wright-Patterson AFB, Ohio AMRL Oct. 1967 68 p refs
(Contract AF 33(615)-2830)
(MR-1285; AMRL-TR-66-246; AD-663754) CSCL 06B

The CSRE simulates human respiration and performs all the metering, sensing, and recording functions necessary to evaluate the performance of space cabin simulators, pressure suit systems coupled to their environmental control systems; environmental control systems; life support systems; and rescue and survival systems. The respiratory functions simulated include oxygen consumption and carbon dioxide, water vapor and heat production. Oxygen consumption is simulated by physically extracting from the system under test gas at a rate sufficient to equal the oxygen consumption rate. Carbon dioxide production is simulated by bleeding CO2 into the system from a storage bottle. Water vapor is introduced by a conventional type humidifier while heat is added by an electrical radiator. The gas rates and heat are computed and automatically controlled by an analog computer directed electromechanical control system. The system thereby avoids the delicate problems of control, balance, undesirable by products, and erratic performance found in systems utilizing adsorption-absorption techniques, catalytic oxidation, or organic materials oxidized to provide the correct carbon dioxide, water, and heat input with simultaneous oxygen removal. Author (TAB)

N68-18080*# Massachusetts Inst. of Tech., Cambridge. Engineering Projects Lab.
STATE SPACE MODELS OF REMOTE MANIPULATION TASKS
Daniel E. Whitney (Ph.D. Thesis) Jan. 1968 192 p refs
(Grant NsG-107-61)
(NASA-CR-93360; DSR-70283-5) CFSTI: HC $3.00/MF $0.65 CSCL 05H

This thesis presents a formal structure by which a computer may aid the operator and the manipulator. The computer maintains a model of the task site, controls the manipulator, and receives commands from the operator. The model is a discrete representation of all the consequences of executing atomic commands selected from a limited set. The consequences of any command or string of commands is a new configuration of objects; each configuration, differing from its most similar neighbors by what one atomic command can accomplish, is called a *state* of the task site. Hence, the model is a *state space* representation of the task possibilities theoretically attainable using strings of these commands. Upon receiving the operator's command, the computer must find a sequence of atomic commands which, in principle, will carry the task site from the current state to the desired state. Each command is assigned a cost, which may depend on fuel or time consumed, risk or uncertainty, or arbitrary units. A search algorithm finds that path between initial and final states which costs the least. Author

N68-18132 Royal Aircraft Establishment, Farnborough (England).
THE ROLE OF THE PILOT IN ALL-WEATHER OPERATION
J. C. Morrall Jun. 1966 34 p refs
(RAE-TM-BLEU-123)

The total tasks a pilot must perform during an instrument approach and landing are summarized, cockput procedures are outlined, and the instruments which provide the necessary information are described and their performance plotted. On the basis of the above, design criteria are recommended for a head-up display which would allow for easy and progressive transition from instrument to visual flight and for rapid reversal to instrument information if needed. In all-weather operating conditions, the pilot would have all vital information in one place, allowing him to piece together instrument information, visual information if available, and information on subsystem failures. Such a design would provide for pilot interpretation of the situation and decision making in place of the simple go, no-go choice currently available. A pereferred panel layout and suggested failure warning indicators are depicted. E.J.S.

N68-18142*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
RESEARCH AND DEVELOPMENT PROGRAM FOR A COMBINED CARBON DIOXIDE REMOVAL AND REDUCTION SYSTEM, PHASE 2A Final Report, Sep. 1966–Nov. 1967
Nov. 1967 373 p refs
(Contract NAS1-4154)
(NASA-CR-66519; HSER-4908) CFSTI: HC $3.00/MF $0.65 CSCL 06K

This work is concerned with electrochemical processes for the removal and reduction of carbon dioxide through the electrolysis of a fused salt and with engineering activities to select a practical electrolytic cell configuration. Research was conducted on the three basic functions of the fused carbonate CO_2 reduction cell: the oxygen-producing anode, the carbon-collecting cathode, and the CO_2-absorbing scrubber. Analyzed were composition and properties of the electrolyte, processes at the electrode and their control, and the susceptibility of materials to chemical attack by liquid and gaseous reactants. Several cathode configurations were demonstrated, and conditions were established for controlling high quality carbon deposition at higher current densities than seemed feasible at first. The anode was shown to be primarily a materials and configuration problem. Scrubbing of carbon dioxide was demonstrated in practical configurations. A laboratory demonstration model was fabricated for independent CO_2 removal-reduction experiments and for testing alternative concepts. Cell performance and corrosion were tested. An oscillating electrolyte concept was selected for a four-man cell complex design. Cathode efficiency and carbon purity values of approximately 100% and 75 to 85%, respectively, were attained. Specifications for a zero-gravity CO_2 removal and reduction system were prepared. K.W.

N68-18187*# General Electric Co., Philadelphia, Pa. Missile and Space Div.
VARIABLE FLEXIBILITY TETHER
David J. Withey Feb. 1968 36 p refs
(Contract NAS9-7336)
(NASA-CR-65966) CFSTI: HC $3.00/MF $0.65 CSCL 06B

A prototype restraint and positioning system for use by an astronaut during EVA has been designed, fabricated, and assembled. The system utilizes two variable flexibility tethers, one mounted on each hip, to form a double hip tether restraint system. The unique feature of the system is that the tethers may be selectively rigidized to varying degrees in any random curvature or shape as required by the astronaut. The tether is constructed of many ball and socket links, strung over a central cable. To rigidize the tether, the astronaut cranks the handle of a hip mounted controller which applies tension to the cable, and a compressive load to the ball/socket joints. The resulting friction between the balls and sockets maintains the tether rigidity, the degree of rigidity being a direct function of cable tension. To relax the tether, a quick release mechanism is incorporated into the control handle. The distal ends of the tethers consist of modified "vise grip" pliers suitable for attachment to a variety of work stations. Author

N68-18193*# National Aeronautics and Space Administration, Washington, D. C.

USE OF RADIOTELEMETRY IN SPACE MEDICINE [PRIMENENIYE RADIOTELEMETRII V KOSMICHESKOY MEDITSINE]

I. T. Akulinichev and R. M. Bayevskiy Feb. 1968 7 p Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR, (Moscow), V. 2, 1964 p 60-66

(NASA-TT-F-11528) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Discussion of systems transmitting biomedical data from manned spacecraft in orbit. The physiological measuring system in Vostok-3 and Vostok-4 capsules is described. The concerted effort between physicians, physiologists, physicists, mathematicians and chemists in the field of space medicine is stressed. No suggestions for the use of space medicine on the ground can be offered at this time, but a sharing of experience between terrestrial and space medicine must be continued. Author

N68-18218# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

TIMING IN TEMPORAL TRACKING

J. A. Michon 1967 130 p refs

(TDCK-49194; IZF-1967-18)

A framework is developed for describing the temporal relations between the elements in a chain of actions, and a formal model of timing is provided to account for sequential dependence that may be present in certain conditions. The approach adopted is related to the systems analysis models of spatial (manual) tracking, since serial production of intervals (key tapping) may be considered as the temporal analog of spatial tracking performance. In the basic experiments, subjects tried to synchronize taps on a key with a series of clicks presented to them through earphones. Data were obtained on the type of dynamic mechanism responsible for timing in key tapping, for the case of stationary and modulated inputs respectively, and were used to derive some formal properties of a time sense conceived of as a dynamic system. The influence of information process load on the timing mechanism is considered, and three experiments are presented on the impact of a well defined component of information processing load, event uncertainty, and timing behavior. Various aspects of the timing system are summarized and stated in the form of an information processing model. M.G.J.

N68-18248# Kansas State Univ., Manhattan. Dept. of Psychology.

THE VISUAL REALM IN SPACE. STUDY OF VISUAL PERCEPTION IN HUMANS AND ANIMALS

John Lott Brown Dec. 1967 37 p refs Paper presented at the Conf., Blacksburg, Va., 14-18 Aug. 1967

(Contract Nonr-3634(04))

(TR-4; AD-663575)

Mans presence on extended space missions is dictated by his unique effectiveness for coping with unusual situations. For his size, mass, and energy requirements, it is probable that he can handle a broader range of eventualities more effectively than any automatic equipment which might be designed. Critical elements in his performance are his sensory input channels. The most important of these is probably vision. Visual problems which may be encountered in space flight are reviewed. The unique characteristics of the visual realm on space missions are discussed, from the instrument arrays and other aspects of space vehicle interiors, to the extravehicular situations, from rendezvous and docking with other vehicles through landing on extraterrestrial bodies and exploration of their surfaces. The significant characteristics of the human visual system, which will be essentially the same is space as on the earths surface, are reviewed in relation to the problems which may be encountered. Author (TAB)

IAA ENTRIES

A68-18918
CROSS-ADAPTIVE OPERATOR LOADING TASKS.
Charles R. Kelley and Michael J. Wargo (Dunlap and Associates, Inc., Santa Monica, Calif.).
Human Factors, vol. 9, Oct. 1967, p. 395-404. 16 refs.
Contract No. Nonr-4986(00).

Discussion of the cross-adaptive operator-loading technique, which automatically adjusts the difficulty level of the loading task on the basis of primary task performance. Data are presented which demonstrate that the cross-adaptive technique effectively standardizes scores on the primary task, while casting all the variance in performance to the loading-task scores. The cross-adaptive secondary scores thereby become a single unambiguous and sensitive index of effort expended to reach a preestablished level of task performance. Procedures for the implementation of the cross-adaptive technique are discussed, and guidelines for its use are suggested. R. B. S.

A68-18919
EFFECT OF REDUCED PRESSURE ON HUMAN PERFORMANCE.
Joseph L. Seminara, Richard J. Shavelson, and Stuart O. Parsons (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).
Human Factors, vol. 9, Oct. 1967, p. 409-418.

Experimental investigation of the performance of a human being in a pressurized (3.7 psi) Apollo suit in an atmosphere of reduced pressure (1.5 psi). Two subjects were tested on three different types of tasks: psychomotor, a lunar mission-specific task, and walking. The results of the study indicate that it will require greater effort to complete the same tasks in the reduced-pressure condition than at normal atmospheric pressure. During the reduced-pressure condition, an increase in total time, total errors, heart rate, and carbon dioxide production was consistently observed over the ambient (14.7 psi). condition. R. B. S.

A68-18920 #
READABILITY OF DIALS AT DIFFERENT DISTANCES WITH CONSTANT VISUAL ANGLE.
Alphonse Chapanis and Lorraine C. Scarpa (Johns Hopkins University, Dept. of Psychology, Baltimore, Md.).
Human Factors, vol. 9, Oct. 1967, p. 419-425. 15 refs.
Contract No. Nonr-4010(03).

Study of the readability of dials at different distances when the visual angle subtended by the dials is held constant. Five dials were tested at distances ranging from 14 to 224 in. Each of 20 subjects made 20 readings on each dial. A focus sign above each dial was used to hold the accommodation time constant. Response times, errors of estimation, and questionnaire data were recorded. The results show a significant effect of distance on readability; dials located at distances greater than 28 in. were read faster than two smaller, closer dials. Although there are no significant differences among the errors made on the five dials, the error data are consistent with the time data. R. B. S.

A68-18921 #
JUDGMENTS OF RELATIVE DISTANCE BASED ON SEPARATE 2-D TV VIEWS.
Billy M. Crawford and William N. Kama (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Human Engineering Div., Wright-Patterson AFB, Ohio).
Human Factors, vol. 9, Oct. 1967, p. 447-453. 11 refs.

An experiment was conducted to determine human capabilities for making judgments of relative distance based on cues obtained from two ordinary, two-dimensional, closed-circuit television systems. The two cameras were placed so that their lines-of-sight converged symmetrically upon the midpoint between the two rods of a modified Howard-Dolman depth perception apparatus. Four camera lines-of-sight convergence angles were investigated: 15°, 30°, 60°, and 90°. Difference thresholds for relative depth perception were determined for 24 subjects by the psychophysical Method of Limits. Thresholds were on the order of 12' to 13' in terms of the parallactic difference angle for the camera lines-of-sight. The results are related to the design of viewing systems for remote operations. (Author)

A68-18923 #
TACTUAL CODING OF CYLINDRICAL KNOBS.
James V. Bradley (Antioch College, Aerospace Medical Research Laboratories and Behavior Research Laboratory, Yellow Springs, Ohio).
Human Factors, vol. 9, Oct. 1967, p. 483-496. 18 refs.

Investigation of certain parameters of cylindrical knobs as a basis for tactual coding. Rim surface, diameter, and thickness were all found to be suitable for this purpose. When feeling one of two knobs whose pictures were before them, subjects rarely identified the wrong picture as the felt knob in any of the following situations: knob diameters differ by 1/2 in. or more, knob thicknesses differ by 3/8 in. or more, and the knobs differ with respect to whether they have either smooth, fluted, or knurled rim surfaces. R. B. S.

A68-18924
THE SUBJECTIVE RESPONSE TO THE THERMAL ENVIRONMENT.
Warren H. Teichner (Northeastern University, Boston, Mass.).
Human Factors, vol. 9, Oct. 1967, p. 497-510. 21 refs.
Grants No. AF AFOSR 60; No. AF AFOSR 958-65.

Techniques used to assess subjective reactions to the thermal environment are evaluated and found to have been developed without any conceptual basis. In addition, the scales used lack sensitivity and interexperimenter consistency. A novel approach to the problem has been developed which assumes that such measurements must account explicitly for the subject's motivation and which depends upon the correlation between physiological and behavioral measurements on the one hand, and voluntary exposure time on the other. Exploratory data are presented as a first step in the direction of developing methods for introducing the concepts into the laboratory. (Author)

A68-19165 *
IMMUNE RESPONSE OF RABBITS DURING SHORT TERM EXPOSURE TO HIGH ALTITUDE.
Robert P. Tengerdy and Theodore Kramer (Colorado State University, Dept. of Microbiology and Dept. of Biochemistry, Fort Collins, Colo.).
Nature, vol. 217, Jan. 27, 1968, p. 367-369. 14 refs.
NASA-supported research.

Experiments on rabbits immunized against exposure to high altitudes. New Zealand white male rabbits, weighing between 2.1 and 2.6 kg were used in the experiments. The rabbits were immunized with crystalline ovotransferrin (Sigma). The rabbits were exposed to a simulated 20,000 ft (350 mm of mercury) altitude in a 30-ft-long, 10-ft-diam double pressure lock chamber. The pressure was maintained within ±20 mm Hg throughout the experiments with a temperature at a constant 74°F. It was found that the humoral antibody production was stimulated significantly in the altitude stressed rabbits only if the immunogenetic stimulus coincided with the altitude stress. P.v.T.

A68-19464
REPRESENTATION OF THE HUMAN OPERATOR AS A SAMPLED-DATA SYSTEM.
G. W. Lange (Ministry of Technology, National Physical Laboratory, Teddington, Middx., England).
Institution of Electrical Engineers, Proceedings, vol. 115, Feb. 1968, p. 342-354. 13 refs.

Investigations showing that the characteristics of the human operator performing a compensatory tracking task can be represented very satisfactorily in terms of a sampled-data model. By an analog simulation of an idealized form of this model, a very convincing match to both quantitative and qualitative features of the operator's output was obtained. According to this model, the salient features of the operator's action are: (1) the operator samples both the position and velocity of his input in a random fashion; the sampling action occupies not more than 50 msec, and is repeated after an average interval of 150 msec; (2) each sample is processed at the cerebral level during the succeeding sampling interval; and (3) the result of cerebral processing is a program of hand movement which is released to the lower levels and periphery of the neuromuscular system at the same time as a further sample of the input is acquired This program may be thought of as a combination of a velocity triangle, to correct for predicted position errors, and a velocity ramp, to correct for predicted velocity errors at the end of the sampling interval over which the program is designed to operate. P.v.T.

A68-19500 *

INFLUENCE OF pH, SODIUM AND CALCIUM IONS ON THE D.C. RESISTANCE OF BLACK EGG LECITHIN-CHOLESTEROL FILMS.

S. Ohki (New York, State University, Dept. of Biophysics and Center for Theoretical Biology, Buffalo, N.Y.) and A. Goldup (BP Research Centre, Sunbury-on-Thames, Middx., England; New York, State University, Center for Theoretical Biology, Buffalo, N.Y.).

Nature, vol. 217, Feb. 3, 1968, p. 458, 459. 8 refs.
NIH-NASA-supported research.

Outline of some preliminary observations on the effect of pH, in the presence of sodium and calcium ions, on the dc resistance of egg lecithin-cholesterol films. Three series of experiments showed that in sodium chloride at both high and low pH film formation was rapid, but in calcium chloride at pHs greater than nine thinning was very slow, and the film became rather rigid. In all cases dc resistance was found to be ohmic, at least up to applied potentials of 60 mv. It is of interest to note that at pH 10 and 11 the presence of only 0.001 normal calcium chloride was sufficient to enable films to be prepared whereas in the absence of calcium chloride complete black films could not be formed. P.v.T.

A68-19573 #

CELL AND TISSUE CULTURES AS OBJECTS OF STUDIES IN SPACE BIOLOGY AND MEDICINE [KUL'TURY KLETOK I TKANEI KAK OB'EKTY ISSLEDOVANIIA V KOSMICHESKOI BIOLOGII I MEDITSINE].

V. V. Portugalov, F. V. Sushkov, and V. B. Starikova.

Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 8-17. 109 refs. In Russian.

Review of papers dealing with cell and tissue cultivation outside living organisms, covering developments in the field since the method was first proposed by Harrison in 1906. Various applications of this method, notably in space biology and space medicine, are discussed briefly. Animal cell and tissue suspensions as sources of food protein are given special attention. V.Z.

A68-19574 #

CERTAIN EFFECTS PRODUCED BY HYPOKINESIA (EXPERIMENTS ON MICE) [O NEKOTORYKH EFFEKTAKH, VOZNIKAIUSHCHIKH PRI GIPOKINEZII (OPYTY NA MYSHAKH)].

V. V. Portugalov, O. G. Gazenko, E. I. Il'ina-Kakueva, V. B. Malkin, T. V. Artiukhina, I. A. Bukaeva, V. Ia. Gotlib, K. D. Rokhlenko, N. A. Roshchina, and V. I. Starostin.

Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 18-25. 5 refs. In Russian.

Physiological cytochemical, and histological study of the muscular activity, the nervous system, the adrenal and thyroid glands, and the liver of a group of 71 mice during a 30-day hypokinesia. An increase in the weight of the adrenal glands, a decrease in the ribonucleoprotein content in the hypothalamus and increased succinodehydrogenase activity in the myocardium are established in the early stage of the experiment. V.Z.

A68-19575 #

CONTROL MECHANISMS OF HEMODYNAMIC SHIFTS IN THE PRESENCE OF ACCELERATION (EXPERIMENTAL STUDY ON A PHYSIOLOGICAL MODEL) [MEKHANIZMY REGULIATSII GEMODINAMICHESKIKH SDVIGOV PRI DEISTVII USKORENII (EKSPERIMENTAL'NOE ISSLEDOVANIE NA FIZIOLOGICHESKOI MODELI)].

E. B. Shul'zhenko and T. V. Sebekina.

Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 25-28. 8 refs. In Russian.

Study of shifts in the lesser pulmonary circulation of a group of 19 dogs subjected to acceleration under anesthesia. Decreased systolic pressure in the left ventricle and decreased pressure in the aorta are observed during the early stage of the experiment in animals with intact sinocarotid zones and 71.4% pulmonary tissues inactivated functionally for 30 sec. Evidence is found to support the theory that these cardiovascular changes are linked with the neuro-reflex responses of the pulmonary-artery acceptors. V.Z.

A68-19576 #

CERTAIN DATA CONCERNING THE MECHANISM OF DISORDERS OF THE PERCEPTIVE FUNCTION OF THE CEREBELLUM UNDER ACCELERATION [NEKOTORYE DANNYE O MEKHANIZME NARUSHENIIA VOSPRINIMAIUSHCHEI FUNKTSII MOZZHECHKA PRI DEISTVII USKORENII].

L. D. Klimovskaia and N. P. Smirnova.

Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 29-33. 18 refs. In Russian.

Study of disorders in the cerebellar cortex function of a group of 42 rats subjected to 4-min acceleration at 10 g under weak anesthesia. The acceleration-induced amplitude fluctuations in the electrical potential of the cerebellum are determined. Tentative theories are proposed to explain the mechanism of the observed disorders. V.Z.

A68-19577 #

CERTAIN ASPECTS OF ACETYLCHOLINE METABOLISM IN THE BRAINS AND HEARTS OF GUINEA PIGS SUBJECTED TO ANGULAR ACCELERATIONS [NEKOTORYE STORONY OBMENA ATSETILKHOLINA V GOLOVNOM MOZGU I V SERDTSE MORSKIKH SVINOK PRI UGLOVYKH USKORENIIAKH].

N. V. Korneeva and A. S. Ushakov.

Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 33-37. In Russian.

Investigation of the effect of 6-hr angular accelerations at 1.5 g on the content of free and bonded acetylcholine and on the activity of acetylcholine esterase in the brains and hearts of a group of guinea pigs. A higher esterase activity is established in the brains of experimental rats 10 min and 24 and 72 hr after experiments and a normal activity after 120 hr. V.Z.

A68-19578 #

EFFECT OF HYPOXIA ON THE FUNCTION OF THE VESTIBULAR ANALYSOR IN RATS [VLIIANIE GIPOKSII NA FUNKTSIIU VESTIBULIARNOGO ANALIZATORA KRYSY].

I. I. Voinova.

Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 37-40. 12 refs. In Russian.

Investigation of the effect of hypoxia on the vestibular function of the analysor of a group of 23 rats in a pressure chamber at simulated altitudes from 11,000 to 12,000 m. A 40 to 70% increase in the duration of the postrotation nystagmus and a 30 to 45% increase in the number of nystagmic movements are established in the experimental rats. It is also found that the higher the speed of the ascent, the faster the changes in the vestibular reactions. V.Z.

A68-19579 #

INCORPORATION OF P^{32} INTO THE PROTEINS OF THE BLOOD SERUM AND INTO THE LIVER AND THE BRAIN OF RATS IRRADIATED WITH HIGH-ENERGY PROTONS [VKLIUCHENIE P^{32} V BELKI SYVOROTKI KROVI, PECHENI I GOLOVNOGO MOZGA KRYS, OBLUCHENNYKH PROTONAMI VYSOKIKH ENERGII].

R. D. Govorun and R. L. Orlianskaia.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 41-44. 10 refs. In Russian.

Investigation of the distribution of P^{32} isotope in the protein of the blood serum, the liver, and the brain of a group of 120 rats bombarded with 300, 600, and 1000-rad doses of 660-Mev protons. Changes in the distribution of injected P^{32}, revealed in irradiated rats, are discussed. V.Z.

A68-19580 #
A MATHEMATICAL MODEL FOR CHLORELLA-CULTIVATION PARAMETERS UNDER CONDITIONS OF IONIZING IRRADIATION [K MATEMATICHESKOI MODELI PARAMETROV KUL'TIVIROVANIIA KHLORELLY V USLOVIIAKH IONIZIRUIUSHCHEGO OBLUCHENIIA].
I. S. Sakovich, I. V. Smirnov, V. A. Sakovich, and L. K. Vekshina.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 44-47. 14 refs. In Russian.

Discussion of mathematical models for studying the growth of Chlorella cells and biomasses under illumination available during a space flight, in the presence of ionizing radiation. Formulas are derived to determine the ratio between the division rates and the growth rates of Chlorella cells as a function of the radiative energy supply. The validity of the results for continuous exposure of Chlorella suspensions to ionizing radiation is discussed. V.Z.

A68-19581 #
CERTAIN DATA ON THE VOLATILE (OXYGEN-CONTAINING) SECRETIONS OF VEGETABLE PLANTS [NEKOTORYE DANNYE O LETUCHIKH (KISLORODSODERZHASHCHIKH) VYDELENIIAKH RIADA OVOSHCHNYKH RASTENII].
V. P. Dadykin, L. N. Stepanov, and V. E. Ryzhkova.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 48-52. 13 refs. In Russian.

Discussion of a branch of science, allelopathy, which deals with chemical interactions of plants, as applied to the gas-liberating activity of edible plants considered as ingredients of the life-support systems of space flights. Gas chromatography is applied to determine the amount and the composition of the gaseous secretions from the leaves of radishes, beets, tomatoes, potatoes, sweet potatoes, and carrots, and from the roots of potatoes and carrots. The presence of acetaldehyde, acetone, propionic aldehyde, methanol, and ethanol is established in the secretions. V.Z.

A68-19582 #
VALUE OF THE PROTEIN OF ONE-CELLED ALGAE [O POLNOTSENNOSTI BELKOV ODNOKLETOCHNYKH VODOROSLEI].
N. S. Kliushkina and V. I. Fofanov.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 52-56. In Russian.

Study of the nutritive value of protein from discolored algae biomasses on groups of several generations of immature rats, kept on algae biomass, casein, and soybean diets for one month. The biomass-diet group of rats gained in weight nearly as much as the casein-diet group while the rats on a soybean diet generally showed a considerably lower gain in weight. V.Z.

A68-19583 #
INVESTIGATION OF THE POSSIBILITY OF CULTIVATING CHLORELLA ON SOLUTIONS OF MINERALIZED HUMAN WASTES [IZUCHENIE VOZMOZHNOSTI VYRASHCHIVANIIA KHLORELLY NA RASTVORAKH IZ MINERALIZOVANNYKH PRODUKTOV ZHIZNEDEIATEL'NOSTI CHELOVEKA].
A. L. Agre, I. V. Aleksandrova, G. V. Ilgach, V. V. Krasnoshchekov, I. E. Ivanova, E. K. Lebedeva, and V. I. Iazdovskii.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 56-59. In Russian.

Experimental investigation of the possibility of using human wastes, mineralized by the method of "wet" burning, for cultivating chlorella culture. The mineralization of the wastes was conducted in a 4-liter autoclave at a temperature of 275°C and an initial pressure of 60 atm. Preliminary tests with mineralized fecal solutions demonstrated their ability to support chlorella cultivation after the removal of toxic organic substances. Intensive chlorella cultivation was conducted in solutions containing a sufficient amount of the fundamental biogenic elements to ensure the growth of 6 g of dry biomass in one liter of solution. After the growth of from 5 to 6 g, the chlorella cells were separated and suspended in a fresh solution. Results are given for the rate of chlorella growth and the change in the pH of the solution over a period of 26 hours. T.M.

A68-19584 #
CALCULATION OF THE CONCENTRATION OF GAS IMPURITIES IN THE ATMOSPHERE OF FLIGHT-VEHICLE CABINS [K RASCHETU KONTSENTRATSII GAZOVOI PRIMESI V ATMOSFERE KABIN LETATEL'NYKH APPARATOV].
L. T. Bykov.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 59-65. In Russian.

Examination of the process of flight-vehicle cabin ventilation involving the separation and removal of harmful or undesirable gaseous contaminants. Formulas are derived for calculating the required level of ventilation in relation to the permissible concentration of contaminants. Numerical results are given for the time required for CO_2 gas to reach a certain concentration within different volumes (with various numbers of human occupants) at different rates of contaminant removal. The equations derived make it possible to compare the efficiency of ventilation systems operating at different performance levels. A differential equation is given which may be used as the process equation for automatic control of contaminant concentration in space-vehicle cabins. T.M.

A68-19585 #
CHANGE IN THE OVERALL RESISTANCE OF THE HUMAN ORGANISM DURING 62-DAY HYPOKINESIA AND THE ACTION OF ACCELERATION [IZMENENIE OBSHCHEI REZISTENTNOSTI ORGANIZMA PRI 62-SUTOCHNOI GIPOKINEZII I VOZDEISTVII USKORENII].
G. P. Mikhailovskii, N. N. Dobronravova, M. I. Kozar', M. M. Korotaev, N. I. Tsyganova, V. M. Shilov, and I. Ia. Iakovleva.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 66-70. 7 refs. In Russian.

Experimental study of the changes in the overall resistance of the human organism during exposure to 62-day hypokinesia and radial accelerations. Six subjects were studied, three of whom daily performed physical exercises of successively increasing intensity. On the sixth and twelfth day, the subjects were exposed to lateral accelerations (11.9 to 14.5 g) with a rate of acceleration from 0.15 to 0.2 g/sec. Additional accelerations were conducted on a centrifuge during the first and eighteenth days, and on the fiftieth day for three of the subjects. Beginning with the third week of the experiment, a significant decrease was noted in the amount of blood properdin, the phagocytic effect of neutrophils, the lysozymic activity of the saliva, and the bactericidal function of the skin. Together with the inhibition of natural immunity, the development of inflammatory diseases mostly affecting the mucous membranes and the vascular system was noted. T.M.

A68-19586 #
INFLUENCE OF LATERALLY DIRECTED ACCELERATIONS ON CERTAIN KIDNEY FUNCTIONS [VLIIANIE POPERECHNO NAPRAVLENNYKH USKORENII NA NEKOTORYE FUNKTSII POCHEK].
M. M. Korotaev and A. I. Grigor'ev.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 70-75. 33 refs. In Russian.

Experimental results of the effect of lateral accelerations on the functional state of human kidneys. Forty subjects aged from 19 to 42 were subjected to three acceleration experiments spaced from two to four days apart. The experiments involved (1) accelerations of 4 and 6 g for a duration of 120 sec at intervals of 5 to 10 sec, (2) an acceleration of 8 g for a duration of 60 sec, and (3) an acceleration of 10 g for 20 sec. The rate of acceleration was 0.2 g/sec.

The quantity of the creatinine and nitrogen in the kidneys, before and after the experiments, demonstrated the insignificant dynamics of these indices and did not exceed normal physiological variations. The diuresis increased, due to higher globular filtration after the experiments. The number of erythrocytes in the urine increased by a factor of 1.5 to 2.5 after the experiments for all subjects.
T.M.

A68-19587 #
INFLUENCE OF LONG-TERM RESTRICTION OF HUMAN MUSCULAR ACTIVITY ON THE DYNAMICS OF CARDIAC CONTRACTION [VLIIANIE DLITEL'NOGO OGRANICHENIIA MYSHECHNOI DEIATEL'NOSTI CHELOVEKA NA DINAMIKU SERDECHNOGO SOKRASHCHENIIA].
N. E. Panferova, V. A. Tishler, and T. G. Popova.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 75-78. 12 refs. In Russian.

Experimental investigation of the effects of long-term (5 to 20 days) restriction of muscular activity on the dynamics of cardiac contraction in 15 test subjects. The studies were conducted using polycardiographic techniques, and the obtained results were treated by variational statistics to yield average values and mean error. The restricted activity resulted in an increased tension period (at the expense of the phases of asynchronous and isometric contractions), a decreased ejection period, a reduced intrasystolic index, a decreased rate of growth of the intraventricular pressure, and an elevated index of myocardial tension. These changes were accompanied by an increased pulse rate, decreased systolic pressure (and minute and stroke blood volumes), and an increase in diastolic pressure. The duration of the general and mechanical systoles remained normal. Possible mechanisms for producing these symptoms are examined. T.M.

A68-19588 #
EXPERIMENTER'S OBSERVATION AS ONE OF THE FACTORS OF SILENCE-CHAMBER TESTS [NABLIUDENIE EKSPERIMENTATORA KAK ODIN IZ FAKTOROV SURDOKAMERNYKH ISPYTANII].
O. N. Kuznetsov.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 79-82. 18 refs. In Russian.

Experimental study of the effect of external observation on the behavior of the test subject during sensory-deprivation tests conducted in isolation chambers. Preliminary results are given for the psychophysiological features of the behavior of female subjects induced by the continuous presence of external observation during long-term isolation. The pattern and degree of the subject's response to the observation is shown to reflect the psychological peculiarities of the particular individual. Immunity to external observation is regarded as a particular case of immunity to disturbances in general. It is concluded that the effect of "public solitude" has to be taken into account during psychological and nervous-system tests in isolation chambers for the purpose of obtaining complete and accurate estimates of the individual's personality. T.M.

A68-19589 #
A UNIVERSAL VESTIBULOMETRIC CHAIR (UVC) [UNIVERSAL'NOE VESTIBULOMETRICHESKOE KRESLO (UVK)].
S. S. Markarian, A. A. Matveev, and I. V. Pavlov.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Nov.-Dec. 1967, p. 83-85. 20 refs. In Russian.

Description of an experimental chair intended for inducing irritation of the vestibular analysor in tests involving the interaction between the vestibular analysor and other body functions. The features of the described system include a wide range of angular accelerations and rotational velocities, action of the Coriolis forces, various rates of chair inclination, and simultaneous inclination of the chair and body in various planes with and without rotation.
T.M.

A68-19653 *
CONDITIONAL PROBABILITY ANALYSES OF THE SPIKE ACTIVITY OF SINGLE NEURONS.
Peter R. Gray (Massachusetts Institute of Technology, Research Laboratory of Electronics, Center for Communication Sciences, Cambridge; Massachusetts Eye and Ear Infirmary, Eaton-Peabody Laboratory of Auditory Physiology, Boston, Mass.).
Biophysical Journal, vol. 7, no. 6, 1967, p. 759-777. 9 refs.
NIH Grants No. GM-14940-01; No. NB-01344; Contract No. DA-28-043-AMC-02536(E); Grant No. NsG-496.

With the objective of separating stimulus-related effects from refractory effects in neuronal spike data, various conditional probability analyses have been developed. These analyses are introduced and illustrated with examples based on electrophysiological data from auditory nerve fibers. The conditional probability analyses considered involve the estimation of the conditional probability of a firing in a specified time interval (defined relative to the time of the stimulus presentation), given that the last firing occurred during an earlier specified time interval. This calculation enables study of the stimulus-related effects in the spike data with the time since the last firing as a controlled variable. These calculations indicate that auditory nerve fibers "recover" from the refractory effects that follow a firing in the sense that after a "recovery time" of approximately 20 msec, the firing probabilities no longer depend on the time since the last firing. Probabilities conditional on this minimum time since the last firing are called "recovered probabilities." Recovered probabilities are contrasted with the corresponding poststimulus time histograms, and the differences are related to the refractory properties of the nerve fibers. (Author)

A68-19808
THE MEDICAL ASPECTS OF SKILL.
A. J. Barwood (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
(Royal Aeronautical Society, Centenary Congress; International Council of the Aeronautical Sciences, Congress, 5th, London, England, Sept. 12-16, 1966.)
IN: AEROSPACE PROCEEDINGS 1966; ROYAL AERONAUTICAL SOCIETY, CENTENARY CONGRESS AND INTERNATIONAL COUNCIL OF THE AERONAUTICAL SCIENCES, CONGRESS, 5TH, LONDON, ENGLAND, SEPTEMBER 12-16, 1966. VOLUME 2. [A68-19790 07-02]
Edited by Joan Bradbrooke, Joan Bruce, and R. R. Dexter. London, Macmillan and Co., Ltd., 1967, p. 963-971; Discussion, A. D. Baxter (Rolls-Royce, Ltd., Bristol Engines Div., Bristol, England) and D. Keith-Lucas (College of Aeronautics, Cranfield, Beds., England), p. 971, 972.
[For abstract see issue 22, page 3858, Accession no. A66-40668]

A68-19809
THE QUESTION OF THE PILOT TRANSFER FUNCTION WITH RESPECT TO EXPECTED PERTURBATIONS OF THE FLIGHT PATH [ZUR FRAGE DER ÜBERTRAGUNGSFUNKTION DES PILOTEN BEI "VORAUSAHNBAREN" STÖRUNGEN DER FLUGBEWEGUNG].
H. Schmidtlein (Vereinigte Flugtechnische Werke GmbH, Abteilung für Simulationstechnik, Bremen, West Germany).
IN: AEROSPACE PROCEEDINGS 1966; ROYAL AERONAUTICAL SOCIETY, CENTENARY CONGRESS AND INTERNATIONAL COUNCIL OF THE AERONAUTICAL SCIENCES, CONGRESS, 5TH, LONDON, ENGLAND, SEPTEMBER 12-16, 1966. VOLUME 2. [A68-19790 07-02]
Edited by Joan Bradbrooke, Joan Bruce, and R. R. Dexter. London, Macmillan and Co., Ltd., 1967, p. 973-985; Discussion, K. Kraemer (Aerodynamische Versuchsanstalt, Göttingen, West Germany), p. 985. In German.

Examination of the problem of landing an aircraft in a cross wind, with emphasis on the pilot transfer function. An experiment performed in a Boeing 707 simulator is described. A block diagram is shown which illustrates the relationship between the integrated pilot/aircraft control loops in the experiment. Inputs in the simulator experiment include rudder and aileron deflection angle, aircraft velocity, and angle of bank. Based upon these inputs and various assumptions, an equation is derived which describes the pilot transfer function in cases where the angle of bank of the aircraft becomes zero during the landing maneuver. R.B.S.

A68-19934
COMPARATIVE STUDIES ON PHYSIOLOGICAL INDICES OF FITNESS IN MAN UNDER EXERCISE, LOW PRESSURE AND ACCELERATION.
Karl E. Klein, H. Brüner, E. D. Voigt, and H. M. Wegmann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
IN: HUMAN ADAPTABILITY AND ITS METHODOLOGY.
Edited by H. Yoshimura and J. S. Weiner.
Tokyo, Japan Society for the Promotion of Sciences, 1966, p. 234-247. 50 refs.
(DVL-688)

Study of the effects of low pressure and acceleration on the physical performance and adaptability of a group of 20 young men unused to these conditions. Various methods of measuring physical fitness and stress tolerance are applied, and the results are compared. The meaning and the definition of these two concepts are discussed. V.Z.

A68-20295
ERRONEOUS ESTIMATES OF THE MAXIMUM OXYGEN INTAKE AS DETERMINED BY INDIRECT METHODS [FEHLEINSCHÄTZUNGEN DER MAXIMALEN SAUERSTOFFAUFNAHME BEI IHRER BESTIMMUNG MIT INDIREKTEN METHODEN].
J. Eichhorn, H. Brüner, K. E. Klein, and H. M. Wegmann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 24, 1967, p. 275-283. 20 refs. In German.
(DVL-717)

Measurement of the maximum oxygen intake by 19 young male students (20 to 28 years of age), who were not in training for sports, during a stepwise increase in their exercise on a bicycle ergometer (direct method). The average oxygen intake was found to be 3.03 liters/min, while the maximum heart rate for the group was 186/min. In addition, the maximum oxygen intake was estimated by various indirect methods, using the well known linear relationship between the heart rate and the oxygen intake. These indirect methods involve (1) Åstrand's nomogram, (2) extrapolation of the upper value (195/min), and (3) extrapolation of the lower value (180/min) of the maximum heart rate given in the literature for comparable groups. All indirect methods proved to be useful in showing a statistically significant correlation to the direct method. P.v.T.

A68-20434 *
PARADOXICAL SLEEP - EFFECT OF LOW PARTIAL PRESSURES OF ATMOSPHERIC OXYGEN.
Jorge Huertas and Janice K. McMillin (NASA, Ames Research Center, Moffett Field, Calif.).
Science, vol. 159, Feb. 16, 1968, p. 745, 746. 13 refs.

Indication that, when cats are exposed to an atmosphere of 100% oxygen at a sufficiently low pressure, their sleeping patterns are changed. It is found that under such conditions paradoxical sleep disappears and drowsiness increases. Return of a cat to a normal atmosphere produces a rebound. The cat spends more time in paradoxical sleep than it did during the base-line period. It is suggested that a mechanism related to the metabolism of oxygen in the brain is prominent in the production of paradoxical sleep. B.B.

A68-20558
DISSOCIATION IN BACILLUS BREVIS VAR. G-B DURING FLIGHT OF "VOSKHOD."
G. P. Parfenov and A. A. Lukin.
(Kosmicheskie Issledovaniia, vol. 5, July-Aug. 1967, p. 633-635.)
Cosmic Research, vol. 5, July-Aug. 1967, p. 547-549. Translation.
[For abstract see issue 21, page 3577, Accession no. A67-38597]

A68-20601
HYPOXIA - A CLINICAL-PHYSIOLOGICAL APPROACH.
Ulrich C. Luft and Silvio Finkelstein (Lovelace Foundation for Medical Education and Research, Physiology Dept., Albuquerque, N. Mex.).
(AEROSPACE MEDICAL ASSOCIATION, 1967 ANNUAL SCIENTIFIC MEETING, WASHINGTON, D.C., APRIL 10-13, 1967, PREPRINTS OF SCIENTIFIC PROGRAM, p. 147, 148. Abridged.)
Aerospace Medicine, vol. 39, Feb. 1968, p. 105-110. 11 refs.
PHS Grant No. HE-10298-02.
[For abstract see issue 23, page 3953, Accession no. A67-41591]

A68-20602 #
OBSERVATIONS ON MAN IN AN OXYGEN-HELIUM ENVIRONMENT AT 380 MM. Hg TOTAL PRESSURE - V CHROMOSOME PROFILES.
John E. Prince, Llewellyn H. Mori (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Biosciences Branch, Brooks AFB, Tex.), Howard J. Zeft (Duke University, Medical Center, Cardiovascular Laboratory, Durham, N.C.), B. E. Welch (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Environmental Systems Branch, Brooks AFB, Tex.), and Anthony P. Amarose (Union University, Albany Medical College, Albany, N.Y.).
Aerospace Medicine, vol. 39, Feb. 1968, p. 111-114. 23 refs.

Experimental investigation in which exposure of six men for 15 days to an oxygen-helium atmosphere at 380 mm Hg total pressure and essentially ambient pO_2 did not affect modal number of chromosomes nor frequency of chromosomal aberrations in the circulating lymphocytes. These negative findings are consistent with other clinical and physiological data indicating no hematologic, electrolyte, or liver-function abnormalities in these subjects as a consequence of living in a helium-oxygen environment at reduced barometric pressure but with normal alveolar pO_2. M.M.

A68-20603 *#
ABDOMINAL BLOOD FLOW CHANGES DURING ACCELERATION STRESS IN ANESTHETIZED DOGS.
H. L. Stone (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.) and W. C. Alexander (Bowman-Gray School of Medicine, Dept. of Physiology, Winston-Salem, N.C.).
Aerospace Medicine, vol. 39, Feb. 1968, p. 115-119. 7 refs.
NASA Contract No. T-37761-G.

Measurement of the changes in abdominal blood flow during acceleration stress by a hydrogen-electrode technique used in nine anesthetized dogs. The electrodes were implanted in the renal cortex, adrenal gland, and the small intestine. Measurements of tissue blood flow, heart rate, and mean arterial pressure were made at levels of acceleration up to $+12G_x$ in the supine position. The position of the animal was changed in 10^o increments toward the head-up position, with 30^o-head-up tilt being the maximum tilt used. These measurements were repeated at each G level until no discernible tissue flow could be measured. The tissue blood flow was found to remain within normal limits up to 6 or 8 $+G_x$ in the supine and 10^o-head-up positions, but was found to be significantly reduced about these G levels. In the 20^o- and 30^o-head-up positions a more rapid decline in tissue flow occurred. The changes in mean arterial pressure and heart rate were recorded. M.M.

A68-20604
RELATIONSHIPS AMONG CHRONOLOGICAL AGE, LENGTH OF EXPERIENCE, AND JOB PERFORMANCE RATINGS OF AIR ROUTE TRAFFIC CONTROL SPECIALISTS.
Bart B. Cobb (Federal Aviation Administration, Civil Aeromedical Institute, Oklahoma City, Okla.).
Aerospace Medicine, vol. 39, Feb. 1968, p. 119-124.

Survey-type study of several hundred journeymen radar-control specialists of four air-route traffic-control centers for determining the extent to which job performance might be associated with chronological age and length of experience in control work. For each of several experimentally derived ratings of job performance, a statistically significant and negative relationship was found with age. Group-performance means for controllers over 40 years of age were significantly lower than those of younger groups. Length of

experience, when considered independently of age, was found to be of negligible importance, and no statistically significant interaction effects of age and experience were discovered. However, a comparison of the data for dichotomized groups of controllers aged 40 and less and 41 and older revealed a higher mean rating for the younger group of controllers at every experience level. Yet these differences between the younger and older air traffic control specialists of each experience group were nonsignificant. M.M.

A68-20605

CORIOLIS VESTIBULAR STIMULATION AND THE INFLUENCE OF DIFFERENT VISUAL SURROUNDS.

William E. Collins (Federal Aviation Administration, Civil Aeromedical Institute, Psychology Laboratory, Oklahoma City, Okla.).

Aerospace Medicine, vol. 39, Feb. 1968, p. 125-130. 9 refs.

Coriolis vestibular stimulation was used to produce disorientation and simulated "pilot's vertigo" under controlled laboratory conditions. During angular velocities of 72°/sec, subjects made 30° lateral head movements under three conditions: (1) in total darkness, (2) while viewing simulated aircraft lights in an otherwise totally dark room, and (3) while viewing the simulated aircraft lights through a "window" in a luminous "cabin" which was secured about the rotating device. Verbal estimates of the illusions of "diving" or "climbing" maneuvers resulting from the head movements ranged from a mean of 33.8° to 87.2° depending on the head movement and the visual conditions for different groups of subjects. Relative intensity of the sensations occasioned by one head movement as opposed to another depended upon the turning direction (yaw-axis) of the stimulator (clockwise or counterclockwise) and upon the visual surrounds. (Author)

A68-20606

CARDIOVASCULAR RESPONSE OF MEN TO STIMULATION BY SINUSOIDAL GRAVITATIONAL FIELD.

Samuel T. Lim and John Fletcher (Webb Associates, Inc., Yellow Springs, Ohio).

Aerospace Medicine, vol. 39, Feb. 1968, p. 130-138. 22 refs.
Contract No. AF 41(609)-2897.

Experimental investigation in which seven subjects were each subjected to three-minute roll and pitch rotations at 1.5 to 16 rpm, using a rotational flight simulator. The center of rotation was at the level of the iliac crest. EKG, respiration, prerun and postrun blood pressure, rotational rate, and subject position were continuously telemetered to an eight-channel Beckman strip-chart recorder. The data showed that cardio-acceleration in response to turning toward head-up position was gradual and that cardio-deceleration in response to turning to head-down position was rapid. The peak of cardio-acceleration lagged behind the directly head-up position, while the trough of cardio-deceleration lagged behind the directly head-down position. These phase lags tended to increase with increase of rotational rate. The maximum-to-minimum heart-rate range was greatest at the slow rpm and diminished as the rpm was increased. No striking difference was found in the response characteristic between the roll and pitch profiles. The EKG pattern appeared to be related to body position. The blood pressure did not show undue hypertension or hypotension resulting from the rotation. The results were interpreted in terms of the cardiovascular response to stimulation by the sinusoidal component of the earth's gravitational field resulting from the rotation. M.M.

A68-20607 #

SUBJECTIVE ANALYSIS OF SPEECH IN HELIUM ENVIRONMENTS.

Charles W. Nixon and Henry C. Sommer (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Biodynamics and Bionics Div., Biological Acoustics Branch, Wright-Patterson AFB, Ohio).

Aerospace Medicine, vol. 39, Feb. 1968, p. 139-144. 15 refs.

Review of speech communication in aerospace environments in which helium is used as a component of the life-sustaining atmosphere. Some physical and psychoacoustical factors that comprise speech in helium concentrations of 0 to 80% and at pressures of 760 to 258 mm Hg are defined. Helium speech shows (1) good intelligibility; (2) less vocal output than speech in air; (3) shifts of speech energy to higher frequencies; (4) a susceptibility to masking by ambient noise; and (5) the strange, unnatural quality of the speech. These characteristics of speech communication in partial helium environments can be attributed to the physical acoustics involved and as such are not significantly influenced by crew-member training and experience. These findings suggest that speech communication may not be a limiting factor to the use of partial helium atmospheres for space operations. However, it appears that special techniques or communication equipment to account for some of the differences of speech in helium from that in air may be necessary. In addition, special instrumentation may be required with the use of conventional speech processing equipment such as the vocoder (designed to process average speech in air). (Author)

A68-20608

OXYGEN CONSUMPTION BY FLUORIDE INHIBITED BAT AND RAT HEART HOMOGENATES.

Philip L. Hawley (Illinois, University, College of Medicine, Dept. of Physiology, Chicago, Ill.).

Aerospace Medicine, vol. 39, Feb. 1968, p. 144, 145. 5 refs.

Experimental investigation into the differences between hibernators (bats) and nonhibernators (rats), in which winter bats maintained at 11°C were sacrificed and the heart rapidly removed, minced, and blended in a Potter blender with pH 7.4 Tris buffer in the cold. The enzyme brei was added to Warburg flasks containing a system for glucose oxidation. Intermediary metabolism was blocked at the pyruvate level by the addition of NaF, final concentration 0.003 M. Glucose-6-phosphate, 5 μM, was the substrate added. Either NAD, 5 μM, or NADP, 5 μM, was added to drive the reaction via either glycolysis or the hexose monophosphate shunt. The bath temperature was 30°C. In NAD-driven reactions the oxygen consumption was 210 μliters of oxygen per milligram per hour, while the activity for NADP-driven flasks was 150 μliters of oxygen per milligram per hour. An explanation of the results obtained lies in the presence of an active pyridine nucleotide transhydrogenase in the bat heart which is not present in that of the rat. M.M.

A68-20609 *

STORAGE OF BIOLOGICAL SAMPLES.

T. M. Fraser (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.).

Aerospace Medicine, vol. 39, Feb. 1968, p. 146-152. 24 refs.
Contract No. NASr-115.

Current considerations in manned space flight are concerned with the measurement of human function in space. A problem in early missions lies in determining what biological samples need be examined in orbit, what need be stored, and what storage facilities are necessary. The paper examines the storage requirements in biological samples for a mission of up to 90 days, using an Apollo-type vehicle. Samples that may be stored are identified, as is the duration of useful storage. The relative merits of preservation, refrigeration, drying, lyophilization, and freezing were examined. There would seem to be little, if any, advantage in the use of drying or lyophilization. Some materials would not require special handling except for hygienic reasons, and some would require chemical additives in addition to cold storage. (Author)

A68-20610 *

USE OF SIMPLE PHYSIOLOGICAL MEASUREMENTS IN OBTAINING RELATIVE ENERGY EXPENDITURE AND WORKLOADS DURING A SIMULATED LUNAR SURFACE MISSION.

J. E. Haaland (Honeywell, Inc., Systems and Research Div., Manned Systems Sciences Research Dept., Minneapolis, Minn.).

Aerospace Medicine, vol. 39, Feb. 1968, p. 153-158. 18 refs.
Contract No. NAS 8-20006.

Investigation in which an 18-day, two-man lunar surface mission was simulated using a lunar surface cabin mockup of minimum volume. Prior to and after the simulation, each subject's maximum aerobic work capacity was determined during treadmill tasks. Heart

rates, respiratory rates, and oxygen consumption were recorded concurrently during the treadmill walks and runs. Graphical treatment of these data provided calibration curves for the subjects, relating their oxygen consumption to recorded heart and respiratory rates. These graphs permitted the extimation of oxygen consumption from heart rates measured during simulation tasks. Relative task workload was obtained by using the ratios of heart and respiratory rates for any given task to the values obtained during maximum aerobic work. Physical fitness as measured by the maximum aerobic oxygen capacity did not depreciate over the 18 days. The use of calibrated personnel in space simulations and missions can provide information on relative task workload in a remote and hostile environment by monitoring heart and respiratory rates. M.M.

A68-20611
INTEGRATED SCORING OF TILT TABLE RESPONSE AS A MEANS TO EVALUATE CARDIOVASCULAR DECONDITIONING DUE TO TRUE OR SIMULATED SPACE FLIGHT.
Fred B. Benjamin, John C. Townsend, S. P. Vinograd, and J. Bollerud.
Aerospace Medicine, vol. 39, Feb. 1968, p. 158-161.

Description of a method for integrating a number of suitable parameters into one integrated score which can be used for medical monitoring during the flight and for comparative evaluation of preventive and therapeutic procedures in ground experiments. It is pointed out that the term "cardiovascular deconditioning" is commonly used to describe the combination of cardiovascular changes which can occur under actual or simulated space flight. M.M.

A68-20612
GRAVITATIONAL EFFECTS ON BLOOD DISTRIBUTION.
Russell H. Kesselman (Harvard University, Medical School, Div. of Mathematical Biology, Dept. of Medicine, Cambridge; Peter Bent Brigham Hospital, Boston, Mass.).
Aerospace Medicine, vol. 39, Feb. 1968, p. 162-165. 15 refs.

Analysis of gravitational effects on blood distribution. Blood vessel luminal radius and consequently blood distribution depend on the relationship of intravascular pressure and extravascular pressure. The intravascular pressure gradient is related in part to gravitational forces. It is shown that an artificially applied external pressure gradient can alter blood distribution significantly. Such an artificial gradient may be useful in combating the problems of both the returning astronaut and the patient who has been restricted to prolonged bed rest. (Author)

A68-20613 *
A PARTIAL BACTERIOLOGICAL PROFILE OF THE TEST PILOTS AND THEIR APOLLO SPACE VEHICLE DURING A SIMULATED FOURTEEN-DAY LUNAR FLIGHT.
Kenneth A. Borchardt, John M. Vogel, and Charles R. Goucher (North American Rockwell Corp., Downey, Calif.).
Aerospace Medicine, vol. 39, Feb. 1968, p. 166-171. 10 refs.
NASA Contract No. T-55346-G.

A simulated 14-day lunar flight by three test pilots was monitored for bacteriological analyses. Bacterial contamination of the spacecraft after 14 days of occupancy was minimal except inside the urine relief receptacle. Two of the test pilots' bodies yielded similar Enterobacter species from the groin and axilla areas. (Author)

A68-20614
AN INTERDISCIPLINARY APPROACH TO RESEARCH IN BIOLOGY AND MEDICINE AND THE RESEARCH AND DEVELOPMENT OF BIOMEDICAL SYSTEMS.
O. K. Niess.
Aerospace Medicine, vol. 39, Feb. 1968, p. 171-174.

Review of the disciplines involved in missile and space technology, and of those involved in biology and medicine. The requirements for an interdisciplinary merging of competence in both fields to accelerate progress in biomedical research and biomedical systems development are discussed. Professional-communication and fiscal-support problems are discussed, and estimates are made of the time scale of progress which will occur as this interdisciplinary effort unfolds. M.M.

A68-20615
PROTECTIVE PASSENGER SMOKE HOOD.
Ernest B. McFadden, H. I. Reynolds, and Gordon E. Funkhouser (Federal Aviation Administration, Civil Aeromedical Institute, Oklahoma City, Okla.; G.T. Schjeldahl Co., Northfield, Minn.).
Aerospace Medicine, vol. 39, Feb. 1968, p. 177-181. 6 refs.

Description of initial prototypes of a simple, lightweight, protective, bag-shaped passenger smoke hood which incorporates a neck seal and is fabricated out of a thin, pliable, high-temperature, transparent, polyimide, plastic film. The prototype designs incorporated rebreathing or ventilation as provided by a controlled flow from small disposable compressed-gas cylinders. The polyimide film used has no melting point, but exhibits a tendency to char when a temperature of 1500°F is attained. The simple rebreathing type of hood has been worn by human subjects with a natural gas flame enveloping the facial portion of the hood for short durations. Attempts are being made to standardize and evaluate this type of test. Rebreathing prototypes were also evaluated for CO_2 accumulation during rest and maximal work. Ten experimental hoods were constructed using a selected formulation which would provide maximum IR reflectance and at the same time permit maximum visual acuity. Evaluations of hood capability to provide short-term and extended protection from smoke and flame inhalation in a a fire environment are discussed. M.M.

A68-20616
SIMPLIFIED TECHNIQUE FOR DIABETES SCREENING IN FLIGHT PERSONNEL.
G. F. Catlett and G. J. Kidera (United Air Lines, Inc., Medical Dept., Chicago, Ill.).
Aerospace Medicine, vol. 39, Feb. 1968, p. 181-183. 7 refs.

Description of a clinically simple method for detecting individuals with poor carbohydrate tolerance. The method, which utilizes a one-minute color comparison test for glucose in capillary blood, was found to be an efficient substitute for more elaborate screening techniques requiring a clinical laboratory. In view of the known prevalence of latent diabetes in the general population and the poor case yield from random urinalysis, a procedure similar to the one described is suggested for routine use in all types of aviation medical examinations. (Author)

A68-20617 #
BORDERLINE MEDICAL PROBLEMS AND FITNESS FOR FLYING.
Guthrie L. Turner, Jr. and Timothy N. Caris (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).
Aerospace Medicine, vol. 39, Feb. 1968, p. 184-188. 9 refs.

Description of aeromedical evaluations performed on 5382 patients with difficult, obscure, or borderline medical problems. These aeromedical evaluations were analyzed to determine borderline medical problems and recommendations for flying after medical evaluation. The two disease groups accounting for the majority of the referrals to the Aerospace Medicine Consultant Service were diseases of the circulatory system and the diseases related to symptoms and ill-defined conditions. Fifty-five percent (2940) of the patients evaluated were found to be fully qualified for flying or to possess only minor medical defects, representing a substantial saving of experienced rated personnel. M.M.

A68-20656
SOCIETY OF AUTOMOTIVE ENGINEERS, AEROSPACE RECOMMENDED PRACTICE, NO. ARP 998, NOVEMBER 15, 1967.
New York, Society of Automotive Engineers, Inc., 1967. 3 p.

Discussion of devices for improving restraint systems for flight crew and cabin attendants in transport-type aircraft. Consideration is given to existing requirements of the FAA and to the recommendations of airline operators and those involved in the manufacture or use of restraining devices. Crew-member safety is the primary objective, with appropriate provisions for crew comfort taken into consideration. Criteria are designed for standardizing restraining systems without hindering the development of new, improved systems. M.M.

A68-20662 *
HUMAN DESCRIBING FUNCTIONS MEASURED IN FLIGHT AND ON SIMULATORS.
Harriet J. Smith (NASA, Flight Research Center, Systems Analysis Section, Edwards AFB, Calif.).
IEEE Transactions on Human Factors in Electronics, vol. HFE-8, Dec. 1967, p. 264-268.

Comparisons have been made between human describing functions measured in flight and on the ground using two different types of ground simulation. A T-33 variable-stability airplane was used for the in-flight measurements. The ground tests were conducted in the T-33 airplane on the ground with simulated instrument flight and also on a general-purpose analog computer in conjunction with a contact analog display. For this study, a multiple-degree-of-freedom controlled element was used in a single-loop compensatory tracking task. The input disturbance in each case consisted of the sum of 10 sine waves with a corner frequency of 1.5 rads/sec. A digital computer was used to analyze the data, which were stored on magnetic tape. The describing functions were determined from Fourier transforms on the time histories. The results indicate no significant difference between the average describing functions measured in flight and those measured in a fixed-base simulator. However, the variance was found to be considerably higher in the flight data. (Author)

A68-20663
THE SYSTEM APPROACH TO THE DESIGN OF AN OPTICAL LANDING DISPLAY.
Barbour Lee Perry (U.S. Navy, Office of Naval Research, Naval Research Laboratory, Engineering Psychology Branch, Washington, D.C.).
IEEE Transactions on Human Factors in Electronics, vol. HFE-8, Dec. 1967, p. 269-278. 9 refs.

Development of a new display for increasing the precision with which a pilot can land high-performance aircraft on board carriers. The Rainbow Optical Landing System provides high-gain lead information in the form of a color-sequence coded indication of error in rate of descent. The Altitude Rate Command System, an outgrowth of the basic Rainbow System, provides the same rate-error information by means of an intensity-sequence coded signal. A high level of accuracy is achieved in using either display because of three features: (1) display sensitivity independent of range, (2) provision of a quickening term, and (3) sensitivity of display to angular rate inversely proportional to error from glide path. M.F.

A68-20664
TWO APPLICATIONS OF A CRITICAL-INSTABILITY TASK TO SECONDARY WORK LOAD RESEARCH.
H. R. Jex (Systems Technology, Inc., Hawthorne, Calif.).
IEEE Transactions on Human Factors in Electronics, vol. HFE-8, Dec. 1967, p. 279-282. 10 refs.
Contract No. AF 33(615)-2826.

Description of experiments designed to explore the sensitivity of the critical-instability scores of skilled pilots to various stressors such as work load, drugs, and physical discomfort. An attempt is made to correlate the results with conventional psychomotor performance measures such as step reaction time and tracking errors. The application of the critical-task concepts to the secondary-workload problem is discussed. M.F.

A68-20665
A SIMPLE TEST FOR OPTIMALITY.
Julian Wolkovitch (Systems Technology, Inc., Hawthorne, Calif.).
IEEE Transactions on Human Factors in Electronics, vol. HFE-8, Dec. 1967, p. 282-285. 10 refs.
Contract No. AF 33(615)-3652.

Description of a simple test for optimality applicable to systems forced by stationary random inputs - e.g., the human operator in some tracking tasks. The test has the advantage that it does not require calculation of the describing function of the system. M.F.

A68-20823
THE IN VIVO CARBON DIOXIDE TITRATION CURVE IN THE PRESENCE OF HYPOXIA.
J. C. Mithoefer, M. S. Karetzky, and W. F. Porter (Mary Imogene Bassett Hospital, Cardiopulmonary Laboratory, Cooperstown, N. Y.).
Respiration Physiology, vol. 4, Jan. 1968, p. 15-23. 18 refs.
NIH Grants No. HE-09130-02; No. HE-09130-03.

Three types of CO_2 titration curves were studied in the dog: (1) in vivo, arterial P_{CO_2} was increased by CO_2 breathing in the presence of high inspired oxygen; (2) in vivo, P_{CO_2} was increased by hypoventilation, while breathing air, producing hypoxia in association with respiratory acidosis; and (3) in vitro, by equilibration of whole blood with CO_2 mixtures in oxygen. CO_2 titration curves obtained by Methods 1 and 3 confirm the findings of others that the in vivo curve differs from that found in vitro primarily because of the equilibration of CO_2 with interstitial fluid which has a lower buffering capacity than blood. The curve obtained by Method 2 differs from that of Method 1 since, beyond a P_{CO_2} of 60 mm Hg, bicarbonate concentration becomes progressively depressed, largely as a result of lactic acid formation secondary to hypoxia. This curve represents the effect of hypoxia on in vivo CO_2 titration and describes a relationship which must exist when severe respiratory acidosis develops during air breathing. (Author)

A68-20824
ROLE OF HYPOCAPNIA IN THE BLOOD LACTATE ACCUMULATION DURING ACUTE HYPOXIA.
Nariko Takano (Kanazawa University, Dept. of Physiology, Kanazawa, Japan).
Respiration Physiology, vol. 4, Jan. 1968, p. 32-41. 20 refs.

Changes in blood lactate concentration during hypoxia were compared with and without hypocapnia in anesthetized dogs. In hypoxia with hypocapnia, a marked increase in blood lactate was found at Pa_{O_2} below 50 mm Hg when hypocapnia was evidently due to hypoxic hyperventilation. In hypoxia without hypocapnia, during which 3 to 5% CO_2 was added to maintain normocapnia, the lactate increase did not appear until Pa_{O_2} was lowered below 35 mm Hg, in spite of the drastically elevated ventilation. The effect of hypocapnia on lactate accumulation in hypoxia was about three times greater than that of hyperventilation alone as reported previously. Suppression of lactate accumulation in hypoxia without hypocapnia could not be explained by increased whole body mean tissue P_{O_2} because no change in arterio-mixed venous O_2 content difference was seen when CO_2 was added. This study suggests that hypocapnia plays a more potent role in lactate accumulation in hypoxia at Pa_{O_2} over 35 mm Hg than hypoxemia or tissue anoxia. (Author)

A68-20939 #
STUDY OF THE BIOLOGICAL EFFECT OF COSMIC RAYS USING BALLOON PROBES [ETUDE DE L'ACTION BIOLOGIQUE DES RAYONS COSMIQUES AU MOYEN DE BALLONS SONDES].
R. Grandpierre (Bordeaux, Université, Faculté de Médecine, Bordeaux; Ecole Pratique des Hautes Etudes, Laboratoire, Paris, France), L. Miro (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Groupe de Biophysique, Marcoussis, Essonne, France), R. Kaiser (Centre National de la Recherche Scientifique, Centre de Recherches Nucléaires de Strasbourg, Département de Physique Corpusculaire, Strasbourg-Cronenburg, Bas-Rhin, France), A. Pfister, G. Deltour (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Service Histophysiologie, Paris, France), and H. Atlan (Caen, Université, Faculté de Médecine, Rouen, France).
IN: UTILIZATION OF BALLOONS FOR SCIENTIFIC RESEARCH; CENTRE NATIONAL D'ETUDES SPATIALES, INTERNATIONAL MEETING, PARIS, FRANCE, JULY 10-13, 1967, PAPERS. VOLUME 2 [UTILISATION DES BALLONS POUR LA RECHERCHE SCIENTIFIQUE; CENTRE NATIONAL D'ETUDES SPATIALES, COLLOQUE INTERNATIONAL, PARIS, FRANCE, JULY 10-13, 1967, PAPERS. VOLUME 2]. [A68-20934 08-30]
Paris, Centre National d'Etudes Spatiales, 1967, p. 210-219. In French.

Description of balloon-probe experiments conducted on black mice at an altitude of 30,000 m to study the biological effects of cosmic rays, with particular attention given to the effect of heavy ions of cosmic origin. From five weeks to three months after exposure to cosmic rays at an altitude of 30,000 m, the mice developed tufts of white hair corresponding to the impacts of cosmic rays. Histological studies showed the absence of any trace of melanine pigments at the level of the hair follicle struck by a heavy ion.

M.F.

A68-21149 * ≠

SUMMARY OF GEMINI EXTRAVEHICULAR ACTIVITY.

Edwin E. Aldrin, Jr. (NASA, Manned Spacecraft Center, Houston, Tex.).

(Society of Experimental Test Pilots, Symposium, 11th, Beverly Hills, Calif., Sept. 28-30, 1967, Paper.)

Society of Experimental Test Pilots, Technical Review, vol. 8, no. 4, 1967, p. 259-289.

Brief description of the Gemini Program extravehicular operations. The actual systems employed, the preparation of the flight crews, and the operational aspects are described from a developmental viewpoint. During the Gemini Program, the basic feasibility of extravehicular activity was established. Other significant results are: (1) demonstration of retrieval of equipment from within the spacecraft adapter and from another satellite; (2) establishment of requirements for handholds, foot restraints, and body restraints; (3) evaluation of the dynamics of motion on a short tether; (4) preliminary evaluation of a hand-held maneuvering device; (5) demonstration that the extravehicular work load could be maintained within the limits of the life-support system and the capabilities of the pilot; and (6) demonstration that underwater zero-g simulation is valid in solving body-restraint problems and in assessing work loads. Most of the extravehicular operations were successful; however, several limitations were identified.

M.M.

LC ENTRIES

A68-80588
PHOTOSENSITIVE DERMATITIS FROM SOAPS.
A. E. Ison and J. B. Tucker (Miami U., School of Med., Dept. of Dermatol., Coral Gables, Fla.).
New England Journal of Medicine, vol. 278, Jan. 11, 1968, p. 81–84. 15 refs.
Grant NIAMD 2A5262; Army, Dept., and Dermatol. Found. of Miami supported research.

Antibacterial soaps containing halogenated salicylanilides cause photosensitive skin eruptions that can be reproduced by a simplified photopatch testing technic. Twelve patients with photosensitive reactions due to soaps had positive tests to either dibromosalicylanilide or tribromosalicylanilide, or a soap solution containing these substances, but tests were negative if soap solutions free of halogenated salicylanilides were used. Of 21 patients with other dermatologic disease only one had a positive test to halogenated salicylanilides. Comparative photopatch tests in sensitive patients with a series of halogenated salicylanilides in current use showed no significant difference in the number of positive reactions to the several agents tested.

A68-80589
ABSENCE OF TRANSFER IN A FAMILY OF SIMILAR TASKS.
Mymon Goldstein (Long Island U., N. Y.) and Jerome M. Fleming (Roosevelt U., Chicago, Ill.).
Perceptual and Motor Skills, vol. 25, Dec. 1967; p. 909–912.

Three different visual discrimination learning tasks were designed on the basis of a new–old principle; i.e., each trial involved one "old" element also present during the preceding trial and one "new" element not present during the preceding trial. Attempts to establish transfer of training between pairs of these tasks yielded no evidence of either facilitation or interference.

A68-80590
COMPENSATION FOR AUDITORY RE-ARRANGEMENT FOLLOWING EXPOSURE TO AUDITORY-TACTILE DISCORDANCE.
Sanford J. Freedman and Lynn Wilson (Tufts U., Medford, Mass.).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 861–866. 10 refs.
Contract AF 49(638)-1282 and Grant VRA RD-1890-P.

Fifteen observers presented with discordant auditory and tactile information about the location of the same object, compensated rapidly for an auditory re-arrangement when asked to point at an unseen auditory traget. Unlike most perceptual compensation studies, movement by the observer was not permitted. It is suggested that discordance between or among different kinds of spatial information may be the condition that leads to compensation for re-arrangement.

A68-80591
OBSERVING BEHAVIOR IN THE SQUIRREL MONKEY IN A SITUATION ANALOGOUS TO HUMAN MONITORING.
John O. De Lorge, Jonathan Hess, and Fogle C. Clark (Evansville State Hosp., Ind.).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 745–767. 41 refs.
NASA Grant NSG-446, Grants NIMH 1 KO3 MH35062-01 and NIMH 1 RO3 MH14401-01.

Observing and detection behavior were examined in four squirrel monkeys under schedule conditions similar to those employed in human monitoring experiments. Observing responses produced either a visual signal (S^d) indicating availability of food reinforcement for an instrumental (detection) response or an S^Δ indicating non-availability of reinforcement. Signals were terminated by a detection response and followed by reinforcement. S^Δ exposures in the absence of signals were 0.5 sec. in duration. Detection responses in S^Δ had no consequence. Signal availabilities were programmed according to random interval schedules. Mean intersignal availability times of one, two, four, and eight min. corresponding to average signal rates of 60, 30, 15, and 7.5 per hr. were examined in that order. All schedules used generated a constant high rate of observing responses with short detection latencies in the presence of signals and very few detection responses in the absence of signals. No decrease in observing rate or increase in detection time was obtained within two-hr. sessions. Neither observing rate nor detection latency varied systematically as a function of signal frequency. Distributions of observing inter-response times in the absence of stimuli were random except in one animal. Results are discussed in relation to data from other experiments on operant behavior.

A68-80592
INFLUENCE OF PERIODICITY OF EATING ON ENERGY METABOLISM IN THE RAT.
Gilbert A. Leveille and Eugene Kevin O'Hea (Ill. U., Dept. of Animal Sci., Div. of Nutr. Biochem., Urbana).
Journal of Nutrition, vol. 93, Dec. 1967, p. 541–545. 25 refs.
Grant PHS AM-10774-01.

Previous studies had shown that rats having access to food for a single daily two-hr. period (meal-fed) utilized their food for weight gain more efficiently than ad libitum-fed (nibbling) rats. This observation suggested that the energy expenditure of meal-fed animals was reduced. In the studies reported the spontaneous activity of meal-fed and nibbling rats was determined during the day (8 AM to 4:30 PM) and night (4:30 PM to 8 AM). Meal-fed animals had a significantly lower level of activity than the nibbling rats, particularly during the evening hours when activity was reduced by 57%. The basal oxygen consumption and heat production were not reduced in meal-fed animals. These data are interpreted as showing that the greater feed efficiency of the meal-fed rat is the result of a reduced activity level and consequently energy expenditure. The similarities between the obese human and meal-fed rat are discussed.

A68-80593
WATER ON THE MOON.
H. C. Urey (Calif. U., Dept. of Chem., San Diego).
Nature, vol. 216, Dec. 1967, p. 1094–1095. 13 refs.
AEC supported research.

Using as evidence Orbiter 4 and 5 lunar pictures and comparing the earth's structure in certain northern regions with the lunar surface, the author supports the view that water has existed in liquid and solid form beneath and on the surface of the moon. He points out that the maria of the moon are dried up or frozen seas, and that water has aided in forming the final features of the moon.

A68-80594
ENZYME HISTOCHEMICAL STUDIES IN EXPERIMENTAL VITAMIN B_6 DEFICIENCY IN WHITE RATS [FERMENTHISTOCHEMISCHE UNTERSUCHUNGEN BEIM EXPERIMENTELLEN VITAMIN-B_6-MANGEL DER WEISSEN RATTE].

Eberhard Seidler, Arno Hecht, and Tamara Seeberg (Humboldt-U., Pathol. Inst. and Rudolf-Virchow-Haus der Charité, Berlin, East Germany).
Experimentelle Pathologie, vol. 1, no. 4, 1967, p. 216–225. 20 refs. In German.

Young Wistar rats were vitamin B_6 deprived up to nine mo. Histological investigations were made in liver, spleen, myocardium, kidney and adrenal gland tissues. Enzymhistochemical determinations were made of adenosin-5-triphosphatase (ATPase pH 7.5 and 9.4), adenosin-5-monophosphatase (AMPase pH 7.5 and 9.4), fructose-1-6-diphosphatase, alcaline phosphatase (APase), alcaline napthylphosphatase (ANPase), acid phosphatase (SPase), acid napthylphosphatase (SNPase), lactatedehydrogenase (LHD), succino-dehydrogenase (SDH), succino-dehydrogenase (SDH), glutamade-dehydrogenase (GsDH), glycerophosphatedehydrogenase (GDH), cytochromoxydase, a-ketoglutaratdehydrogenase (a-KGO), diaphorase I (Dia I), monoaminoxydase (MAO), nothing-dehydrogenase (NDH) and naphtylesterase (N-esterase). Biochemical investigations included determinations of alcaline and acid phosphatase activity, SDH and a-KGO in liver homogenate, determination of phosphorous contents in dry masses and determination of nitrogen values using the Kjeldahl method. Vitamin B_6-deprived animals were reduced in body weight and skin lesions occurred after five to seven wk. Pathological changes in the liver were revealed histologically. The investigated dehydrogenases demonstrated histochemically intensified reactions in general; Dia I and a-KGO were increased in the lobular center, whereas GDH, LDH were increased in the lobular periphery. After feeding of normally composed nutrition, activity decreased. Referring to the phosphatases, FDPase, SPase, and SNPase were most increased. N-esterase was diminished up to the sixth wk. MAO caused no changes in liver homogenate. The values of biochemical activity of alcaline phosphatase and acid phosphatase were significantly increased after three wk., likewise SDH and a-KGO increased after six wk. No changes were observed in protein and phosphorous contents. Additional doses of antivitamin B_6 (2-methyl-4-amino-5-hydroxylmethylpyrimidine = toxopyrimidine) produced neither acceleration nor increase of vitamin B_6-deficiency appearances. The morphologic and biochemical findings were discussed with regard to the literature in the field.

A68-80595
THE EFFECT OF DIET AND VITAMIN E ON LIVER INJURY DUE TO CARBON TETRACHLORIDE.
A. E. M. McLean (Med. Res. Council, Toxicol. Res. Unit, Carshalton, Great Britain).
British Journal of Experimental Pathology, vol. 48, Dec. 1967, p. 632–636. 19 refs.

Carbon tetrachloride (CCl_4) was fed to rats and the amount of liver damage assessed. A single oral dose of 35 mg. vitamin E (α-tocopherol acetate) did not reduce the liver damage found 24 hr. after CCl_4 in rats fed stock diets. In rats fed a vitamin E deficient diet there was some slight protection against CCl_4 poisoning by an oral dose of vitamin E. It seems unlikely that lipid peroxidation plays a major part in the toxic effects of CCl_4.

A68-80596
HUMAN CEREBRAL EVOKED RESPONSES TO ODOROUS STIMULI.
T. Allison and W. R. Goff (Veterans Admin. Hosp., West Haven and Yale U., School of Med., New Haven, Conn.).
(Am. EEG Soc., Meeting, Denver, Oct. 1966).
Electroencephalography and Clinical Neurophysiology, vol. 23, Dec. 1967, p. 558–560. 14 refs.
Grant NIMH M-05286

Presentation of brief pulses of odorized air to human subjects induced cerebral electrical activity which was recorded by response averaging. The response was largest in the vertex region and consisted mainly of a positive wave with a peak latency of 450 to 550 msec. It had distinguishing characteristics from vertex potentials evoked in other senses. Evidence suggested that the response may be evoked primarily by stimulation of olfactory receptors, but the possibility of nasal trigeminal afferent stimulation was evaluated.

A68-80597
EFFECTS OF CARBON DIOXIDE ON THE ALPHA FREQUENCY AND REACTION TIME IN HUMANS.
M. Russell Harter (Ariz. U., and U.S. Navy Electron. Lab., San Diego, Calif.).
Electroencephalography and Clinical Neurophysiology, vol. 23, Dec. 1967, p. 561–563. 12 refs.
Grant NSF GB-1384; NASA and NAS-NRC supported research.

The effects of acute exposure (five min.) to carbon dioxide (0 to 7.9%) on the electroencephalograms and reaction times of five humans were investigated. Alpha frequency and alpha amplitude were recorded from the central and from the occipital-parietal areas of the scalp while subjects reacted with their right index finger to flashes of light. Variance analyses indicated that the percentage CO_2 inhaled significantly affected alpha frequency and reaction time. Alpha frequency and reaction time were significantly faster under the 0 to 5.5% CO_2 conditions than under the 7.9% CO_2 condition. A slight increase in alpha frequency and decrease in reaction time were evident under the 3.5 and 5.5% CO_2 conditions as compared to the 0 and 1.5% CO_2 conditions.

A68-80598
OBSERVATIONS ON SOME EXPERIMENTS ON VISUAL MASKING.
K. N. Leibovic (N. Y. State U., Center for Theoret. Biol., Dept. of Biophys., Buffalo).
Journal of General Psychology, vol. 78, Jan. 1968, p. 19–26. 12 refs.
NASA Grant NGR-33-015-016 and Grant PHS RO1-NB-06682-01.

The results of a study by another worker involving the masking of visual stimuli by each other were interpreted in terms of the neurophysiology of the visual pathway and the views of a previous paper. It followed from the interpretation that the interstimulus interval (1S1) for maximum error in the experiments depended primarily on processes in the retina and the spike frequencies of the set of responding optic nerve fibers. The maximum error 1S1 was therefore considered to be a suitable measure of retinal and optic nerve activity.

A68-80599
CORRELATION OF RETICULAR AND COCHLEAR MULTIPLE UNIT ACTIVITY WITH AUDITORY EVOKED RESPONSES DURING WAKEFULNESS AND SLEEP. I.
Wallace D. Winters, Kenjiro Mori, Charles E. Spooner, and Raymond T. Kado (Calif. U., School of Med., Brain Res. Inst. and Dept. of Pharmacol., Los Angeles).
Electroencephalography and Clinical Neurophysiology, vol. 23, Dec. 1967, p. 539–545. 25 refs.
NASA Grant NsG 237-62, Grants PHS 5 TI-MH-6415-08, PHS 1 ROI MH12121-01, PHS 1 PO7-FR-0257-02, and PHS NB-02501.

A correlation of the cochlear nucleus and midbrain reticular formation multiple unit activity with electroencephalogram and auditory evoked responses during wakefulness and sleep was studied. The basal level of reticular unit activity decreased from wakefulness to slow wave sleep but was highest during rhombencephalic sleep. On the other hand, the basal level of the cochlear nucleus unit activity did not change during wakefulness or sleep. The amplitude of the evoked responses in the cochlear nucleus, reticular formation and association cortex all were largest during slow wave sleep, smaller during wakefulness, and smallest during rhombencephalic

sleep. The findings suggested that the input stimulus is modulated at a level peripheral to the cochlear nucleus presumably by reticular influence on this system.

A68-80600
ALTERATIONS IN THE NON-SPECIFIC CORTICAL AFFERENCE DURING HYPERVENTILATION.
Ira Sherwin (Veterans Admin. Hosp., Neurol. Serv., Boston and Boston U., Med. School, Dept. of Neurol., Mass.).
(Veterans Admin. Med. Res. Conf., Ann., Cincinnati, Nov. 29, 1966).
Electroencephalography and Clinical Neurophysiology, vol. 23, Dec. 1967, 1967, p. 532–538. 23 refs.

The effect of hyperventilation on cortical excitability was studied in unanesthetized cats before and after interruption of the non-specific thalamic projection system (NSTPS). The results suggested that the primary site of action of hypocapnia is subcortical and that its secondary effects on the cortex depend upon the integrity of the NSTPS. As a possible mechanism, the role of selective regional alterations in the blood-brain barrier was discussed.

A68-80601
COMPARISON OF EEG CORRELATES OF REINFORCEMENT, INTERNAL INHIBITION AND SLEEP.
S. R. Roth, M. B. Sterman, and C. D. Clemente (Calif. U., Depts. of Psychol., Anat. and Physiol., Los Angeles and Veterans Admin. Hosp., Sepulveda).
Electroencephalography and Clinical Neurophysiology, vol. 23, Dec. 1967, p. 509–520. 23 refs.
Grants PHS MH-10083 and PHS MH-07037; Veterans Admin. supported research.

Electrocortical synchronization in cats was studied during various active and quiescent behavioral states. A similar pattern of synchronization occurred in the cortex during the following behaviors: the consumption of milk following the successful performance of a lever-pressing task, ad lib milk consumption, grooming and drowsiness. This pattern was localized over the dorsal aspect of the lateral (marginal) gyrus and had a dominant frequency of 4 to 8 c.p.s. During various learned behavioral inhibitions, a different pattern of synchronization occurred. This activity was localized over the sensori-motor cortex with a dominant frequency of 12 to 16 c.p.s. The same parameters were found to be characteristic of sleep spindles. Synchronization during slow wave sleep occurred over the entire cortex and was characterized by large 4 to 12 c.p.s. activity. These findings suggested that more than one active synchronogenic substrate exists in the brain. The mechanisms involved are operant in both behaviorally active and quiescent states.

A68-80602
PERCEPTION OF DEPTH AS MEASURED BY MAGNITUDE ESTIMATION.
Gerald V. Barrett, Thomas R. Williamson, Carl L. Thornton (Goodyear Aerospace Corp., Akron, Ohio).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 905–908. 6 refs.

Eleven subjects used the magnitude estimation technique to judge depth in 3 three-dimensional scenes of varying complexity. Also the subject's perceptual style, as measured by the rod-and-frame test, was determined to test the hypothesis that perception of depth is significantly related to the subject's perceptual style. Each subject given 30 trials under five eye conditions, i.e., left eye occluded, right eye occluded (both aware and unaware of occlusion), and neither eye occluded. No significant relationship was found between various eye conditions and judgment of depth or between subjects perceptual style and judgments. A significant relationship was found among scenes, with the more complex scene judged as having greater depth.

A68-80603
GENERALITY OF FITTS' LAW UNDER DIFFERENTIAL ERROR INSTRUCTION.
Gordon H. Robinson (Wis. U., Ind. Eng. Div., Madison) and Richard P. Leifer (USAF, Edwards AFB, Calif.).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 901–904.

This experiment examines the applicability of Fitts' "channel capacity" model for discrete motor movements in a situation where the error rate (missing the target) is substantially increased and the resulting movement time decreased. Two experimental groups averaged approximately 3% and 19% error but yielded essentially the same information transmission rate in bits per second. The generality of the law over a wide error range is therefore indicated.

A68-80604
PERCEPTION BIBLIOGRAPHY: LI PSYCHOLOGICAL ABSTRACTS, 1936, VOLUME 10, SECOND HALF.
R. B. Ammons and C. H. Ammons (Mont. U., Missoula).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 869–872. 107 refs.

One-hundred and seven items concerned with perception are listed in alphabetical order. These include articles on vision, vibration, sound localization and spatial orientation.

A68-80605
CONVERGENCE OF LABYRINTHINE AND CEREBRAL NYSTAGMOGENIC IMPULSES ON BRAIN-STEM UNITS.
G. B. Azzena, M. L. Giretti, and P. L. Deriu (Sassari U., Inst. of Human Physiol., Italy).
Experimental Neurology, vol. 19, Dec. 1967, p. 401–411. 28 refs.
C.N.R. supported research.

The thermic stimulation of the labyrinth induced rhythmical (slow and quick) and tonic responses of 98 units localized in the oculomotor nuclei, pontomesencephalic reticular formation, red nuclei and gray substance ventral to the aqueduct of curarized guinea pigs. These responses were related to the labyrinthine eye nystagmus by recording simultaneously the brain-stem unitary discharge and the action potentials of a few fibers of an oculomotor nerve. The 93% of such units was also influenced by the electrical stimulation of the cerebral nystagmogenic area. The eye nystagmus produced by stimulation of the cerebral nystagmogenic area induced the same types of responses as those provoked by labyrinthine stimulation. Thus the conclusion was reached that the cerebral eye nystagmus involves the great majority of the brain-stem units activated during vestibular eye nystagmus.

A68-80606
ON THE MECHANISM OF THE TRANSVERSE DISTRIBUTION OF AUXIN IN GEOTROPICALLY EXPOSED PEA ROOTS.
H. Konings (Harvard U., Biol. Labs., Cambridge, Mass. and Utrecht U., Botan. Lab., The Netherlands).
Acta Botanica Neerlandica, vol. 16, Nov. 1967, p. 161–176. 19 refs.
Grants NSF GB-4337 and Netherlands Organ. for Advan. of Pure Res. (Z.W.O.) supported research.

Carboxyl-labeled and methylene-labeled indolacetic acid-^{14}C (IAA-^{14}C) were applied to the tips of two-day old horizontal pea roots var. Alaska, and the tissue was subsequently halved and counted. In every experiment the lower halves of the subapical four

mm. became more radioactive than the upper halves. With an experimental period not over two hr. the upper and lower halves contained an average of 33 and 67% of the total radioactivity in the tissue respectively. Decapitation of the roots at 0.5 mm. or more (removal of the entire root cap) prevented the transverse distribution of the applied auxin almost entirely. If the roots were allowed to absorb caffeic acid of 2,4-dichlorophenol prior to the application of the IAA-^{14}C, the difference between the amounts of IAA-^{14}C present on the two sides was greatly decreased. The IAA-oxidase activity of homogenates made from the lower halves of the apical three mm. of horizontal roots was less than that of homogenates from the upper halves. Decapitation did not affect this phenomenon. Apparently the unequal distribution of applied auxin and the difference between the activities of the IAA-oxidase on the two sides are not connected.

A68-80607
COMPLEXITY JUDGMENTS OF PHOTOGRAPHS AND LOOKING TIME: REPLICATION.

Walter A. Watman (Fairleigh Dickinson U., Rutherford, N. J.).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 768.

Three scores were obtained for 30 subjects: the total amount of time spent looking at pictures of high, middle, and low complexity. The mean looking times were 8.3, 7.4 and 6.5 sec., respectively, indicating that judged complexity of the stimuli was positively related to looking time. An analysis of variance for complexity was significant showing that complexity and looking time are not independent. The differences between the means of individuals were also significant suggesting individual differences in looking times. Individual comparisons between the high–medium, medium–low and high–low differences showed only the last to be significant ($p < .01$). The absence of significant differences for the other two comparisons appears to be due to lower rater agreement in the present study for the complexity level of the stimuli. The confirmation of significant differences found by Leckard and Bakan despite the presence of smaller differences in mean looking time is of particular interest. This, and the demonstration of the reliability of using subjective judgments to quantify stimuli when more objective methods are unavailable, suggest that continued exploration of looking time would be worthwhile.

A68-80608
COMPARATIVE INVESTIGATION ON THE RELATION BETWEEN AEROBIC AND ANAEROBIC CAPACITY AT MAXIMAL ERGOMETRIC PERFORMANCE. [VERGLEICHENDE UNTERSUCHUNGEN UBER DAS VERHALTNIS DER AEROBEN ZUR ANAEROBEN KAPAZITAT BEI MAXIMALER ERGOMETRISCHER LEISTUNG].

G. Hansen (Inst. für Leistungsmed., Berlin, East Germany).
Schweizerische Zeitschrift für Sportmedizin, vol. 15, no. 2, 1967, p. 68–75. 13 refs. In German.

The relation between the aerobic and anaerobic capacity was studied in 13 well-trained male subjects by spiroergometry during maximal performance of one, two, three, six, ten and 20 min. duration. The results were graphically presented. The determinations showed the following results. The relation between the aerobic and the anaerobic capacity during different performances were found to be: at one min. duration, 1:3.9; at two min. duration, 1:1.2; at three min. duration 1:0.9; at six min. duration 2.5:1; at ten min. duration 5.6:1; at 20 min. duration 10.8:1. From the knowledge of the relation between the aerobic and the anaerobic capacity at performances of different durations, conclusions should be drawn for training methods.

A68-80609
PERCEPTION BIBLIOGRAPHY: L. PSYCHOLOGICAL ABSTRACTS, 1936, VOLUME 10, FIRST HALF.

C. H. Ammons and R. B. Ammons (Mont. U., Missoula).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 769–772. 108 refs.

One-hundred and eight items, listed in alphabetical order, concern some aspects of sensory perception.

A68-80610
STIMULUS DISCRIMINATION GRADIENTS AS A FUNCTION OF TEST STIMULI SPACING.

Donald A. Shurtleff (MITRE Corp., Bedford, Mass.) and David I. Mostofsky (Boston U., Mass.).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 797–802. 6 refs.
Grant PHS M-5827; Boston U. supported research.

Stimulus discrimination gradients were compared for conditions in which intervening (test) stimuli (auditory clicks) were spaced equally between the positive (S+) and negative (S−) stimuli and when test stimuli were spaced unequally between S+ and S−. Food-deprived albino rats were used as subjects. When the gradients are plotted as a function of the physical units of the stimulus dimension, no differences attributable to stimulus spacing are evident. The results further suggested that the subjects responded to intervening stimuli according to their arrangement on an interval scale rather than to their arrangement on an ordinal scale.

A68-80611
MOTOR SKILLS BIBLIOGRAPHY: LXXX. PSYCHOLOGICAL INDEX NO. 23, 1916.

R. B. Ammons and C. H. Ammons (Mont. U., Missoula).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 803–804. 56 refs.

Fifty-six references to research on motor skills are listed alphabetically.

A68-80612
MOTOR SKILLS BIBLIOGRAPHY: LXXXII. PSYCHOLOGICAL INDEX NO. 25, 1918.

R. B. Ammons and C. H. Ammons (Mont. U., Missoula).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 963–964. 51 refs.

Fifty-one citations of work on motor skills are listed alphabetically.

A68-80613
VESTIBULAR INFLUENCES ON THE RED NUCLEUS DURING SLEEP.

O. Pompeiano and T. Satoh (Pisa U., Ist. di Fisiol. and C.N.R., Inst. di. Med. Sper., Italy).
Pflügers Archiv für die gesamte Physiologie, vol. 298, Dec. 4, 1967, p. 159–162. 12 refs.
Grant PHS NB 05695-03.

The integrated activity recorded from the red nucleus in unrestrained, unanesthetized cats increased phasically during the outbursts of rapid eye movements which are characteristic of the desynchronized phase of sleep. Bilateral destruction of the vestibular complex, particularly when localized to the medial and descending vestibular nuclei, abolished not only the rapid eye movements but also the related phasic increases of rubral activity. These results suggested that ascending volleys originating from the vestibular nuclei during desynchronized sleep excited not only the neurones of the oculomotor nuclei but also those of the red nucleus.

A68-80614
TRANSMISSION OF SOMATIC SENSORY VOLLEYS THROUGH ASCENDING SPINAL HINDLIMB PATHWAYS DURING SLEEP AND WAKEFULNESS.

G. Carli, H. Kawamura, and O. Pompeiano (Pisa U., Ist. di Fisiol. and C.N.R., Ist. di Med. Sper., Italy).
Pflügers Archiv für die gesamte Physiologie, vol. 298, Dec. 4, 1967, p. 163–169. 14 refs.
Grant PHS NB 05695-02.

In unrestrained, unanesthetized cats the mass discharge recorded from the ventral and lateral funicles on single shock stimulation of ipsilateral hindlimb nerves was investigated during physiological sleep and wakefulness. The response elicited polysynaptically by stimulation of the cutaneous and high threshold muscular afferents was not affected during quiet wakefulness and synchronized sleep, nor during desynchronized sleep, in the absence of ocular movements. A depression of the response, however, occurred particularly during the bursts of rapid eye movements characteristic of the desynchronized sleep and also during the transient orienting reaction associated with arousal of the animal. It was suggested that the depression is due to supraspinal inhibition of the interneurons which transmit these somatic afferent volleys to ascending spinal hindlimb pathways, probably including the spinoreticular tract.

A68-80615
CARDIAC EXCITABILITY DETERMINED BY ELECTRONIC COMPUTER.
Hugo Geivers, Wolfgang Schaper, Jan Servaes, and Raymond Xhonneux (Janssen Pharm., Res. Lab., Beerse, Belgium).
Pflügers Archiv für die gesamte Physiologie, vol. 298, Dec. 4, 1967, p. 185–190. 11 refs.

An apparatus is described which is capable to determine cardiac excitability through the automatic registration of the strength-duration curve. The instrument consists of a circuit which discriminates premature QRS-complexes from normal QRS-complexes, it features logic circuits which "decide" whether strength or duration of the stimulus pulse should be altered and it contains a circuit which allows premature cardiac stimulation using a programmed sequence of stimuli. The instrument was designed to study local cardiac excitability which is important for the site of implantation of pacemakers and for the description of drug action. The mechanism of ventricular fibrillation and of physiological, pathological and pharmacological influences on cardiac refractoriness can be studied with greater ease.

A68-80616
OBSERVATIONS ON THE EFFECT OF DIFFERENT INTRAPERITONEAL MEDIA ON DEGREE OF TISSUE DESTRUCTION CAUSED BY ULTRASONIC RADIATION IN THE RAT MESENTERY.
Erkki J. Valtonen (Helsinki U., Electron Microscope Lab. and U. Central Hosp., Dept. of Phys. Med., Finland).
Virchows Archiv für Pathologie Anatomie, vol. 343, Dec. 12, 1967, p. 136–141. 7 refs.
Paulo Found. supported research.

The effects of intraperitoneal salt solution (water) and air on the degree of tissue destruction produced by ultrasonic radiation in the rat mesentery were studied. The degree of tissue destruction was greatest in the group of animals having air injected into the peritoneal cavity, and also corresponded to the increase of body temperature caused by the ultrasound. Salt solution (water), although a good transmitting medium, had a cooling effect; therefore with it the destruction of the tissue and the increase of the body temperature were less.

A68-80617
MONITORING CEREBRAL BLOOD FLOW, METABOLISM AND EEG.
John S. Meyer, K. Sakamoto, M. Akiyama, K. Yoshida, and S. Yoshitake (Wayne State U., School of Med., Dept. of Neurol., Wayne Center for Cerebrovascular Res., Harper Hosp., and Detroit Gen. Hosp., Detroit, Mich.).
Electroencephalography and Clinical Neurophysiology, vol. 23, Dec. 1967, p. 497–508. 23 refs.
Grant PHS NB 03564; Detroit Gen. Hosp. Res. Corp. and Mich. Heart Assn. supported research.

Records of cerebral oxygen consumption were correlated with changes in the electroencephalogram (EEG) induced by hyperventilation, hypoxia, anoxia, ischemia and bemegride-induced EEG epilepitform discharges in the monkey, *Macaca nemestrina.* Cerebral oxygen consumption could be reduced by about 25% during acutely induced anoxia before the EEG became abnormal and compensatory increases of cerebral blood flow began at this point. Moderate EEG slowing was noted when the cerebral metabolic rate for oxygen ($CMRO_2$) was reduced by 29% or more. Progressive reduction of $CMRO_2$ correlated with progressive deterioration of the EEG during anoxic anoxia. When the EEG was flat during ischemic anoxia by occlusion of both the vertebral and carotid arteries, the $CMRO_2$ was decreased by 70%. Respiratory alkalosis during passive hyperventilation and acidosis did not significantly decrease $CMRO_2$. Presumably the EEG slowing during acidosis was due to effects of CO_2 on the cell membrane rather than on oxidative enzymes. During epileptiform activity in the EEG, $CMRO_2$ was increased by 64% and cerebral blood flow by 130%.

A68-80618
PSYCHOLOGY OF MEMORY—1966: A BIBLIOGRAPHY.
C. Michael Levy and Karen Hartnagle (Fla. U., Gainesville).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 825–839. 398 refs.
Grants NSF GY-995 and NSF GY-2670; Fla. U. supported research.

Three-hundred and eighty nine contributions to the psychology of memory and forgetting published in 1966 are listed.

A68-80619
MOTOR SKILLS BIBLIOGRAPHY: LXXXI. PSYCHOLOGICAL INDEX NO. 24, 1917.
C. H. Ammons and R. B. Ammons (Mont. U., Missoula).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 855–856. 56 refs.

This is an alphabetical listing of 56 references to research on motor skills.

A68-80620
EFFECT OF X IRRADIATION ON THE ACTIVE TRANSPORT OF GLUCOSE THROUGH THE INTESTINE OF THE RAT IN VIVO.
F. Ponz and M. Lluch (Navarra U., Fac. of Sci., Dept. of Physiol. and Biochem. (C.S.I.C.), Pamplona, Spain).
Revista Española de Fisiologia, vol. 23, Jun. 1967, p. 117–126. 31 refs.
Contract IAEA 263/RB. "Min. de Educ. y Cienc." supported research.

A study was made on the effect of X irradiation of rats on the capacity of active transport of glucose (2.77 mM) by the intestine of the rat *in situ* as well as of the radioprotective effect of cysteamine. The irradiation of the whole body quite clearly altered the absorption. An initial decrease was noticed (two to eight hr.), followed by an increase (24 hr.) and later a second phase of inhibition up to 96 hr. These disturbances were attributed to an effect on organs of the abdominal cavity, since they were produced both by irradiation of the whole body and by that of the abdominal region alone. They ceased to appear when the animals were

irradiated with the abdomen protected. Cysteamine (10 mg./100 g., intraperitoneal injection ten min. before the exposure) exercises a perfect radioprotective action.

A68-80621
DIURNAL VARIATIONS IN TISSUE GLYCOGEN AND LIVER WEIGHT OF MEAL-FED RATS.

Gilbert A. Leveille and Krishna Chakrabarty (Ill. U., Dept. of Animal Sci., Div. of Nutr. Biochem., Urbana).

Journal of Nutrition, vol. 93, Dec. 1967, p. 546–554. 23 refs.
Grant PHS AM-10774-01.

The studies reported were designed (1) to describe the diurnal variations in tissue glycogen levels in meal-fed rats (animals having access to food for a single daily, two-hr. meal), and (2) to compare the tissue glycogen storage capacity of meal-fed and nibbling (ad libitum-fed) rats. Rats trained to a meal-eating schedule and nibbling rats were maintained without food for 22 hr. and then allowed access to food for two hr. The rats were killed at various times after the initiation of the meal, and liver, diaphragm and adipose tissue glycogen content was determined. Fasting liver glycogen levels were higher in meal-fed rats, but glycogen accumulated at the same rate in livers of meal-fed and nibbling rats for up to eight hr. after the start of the meal. Liver glycogen then decreased linearly from eight to 22 hr. Meal-fed rats had a greater capacity to accumulate glycogen in diaphragm muscle and adipose tissue than nibbling rats. In meal-fed animals glycogen accumulated in diaphragm and adipose tissue for eight hr. fell sharply between eight and ten hr. after the initiation of the meal, and decreased more slowly from ten to 22 hr. Liver weight increased significantly upon meal ingestion in both meal-fed and nibbling rats. Water accounted for about 66% of the increase and glycogen was responsible for the remainder. It was estimated that about 30% of the calories stored during and following the daily meal in meal-fed rats were in the form of glycogen. The data are discussed in terms of the importance of glycogen as a storage form of energy for the meal-fed animal.

A68-80622
NEW KNOWLEDGE OF TRAINING ON THE ENDURANCE CAPACITY OF HIGHLY TRAINED ENDURANCE ATHLETES [NEUE ERKENNTNISSE UBER DAS TRAINING DER AUSDAUERLEISTUNGSFAHIGKEIT DES HOCHLEISTUNGS-SPORTLERS].

H. Weidemann, H. Roskamm, and H. Reindell (Med. Universitätsklin., Lehrstuhl für Kreislaufforsch. und Leistungs-Med., Freiburg i. Br., West Germany).

Schweizerische Zeitschrift für Sportmedizin, vol. 15, no. 2, 1967, p. 52–67. 16 refs. In German.

A total of 68 electrocardiogram storages of amateur cyclists, oarsmen, cross-country skiers and skaters of German National teams and of untrained students (14 to 16 yr.) were taken during training or competition and compared. It was found that the highly-trained endurance athlete works out with much higher pulse rates than was previously assumed. The training heart rates of all examined highly trained athletes were at the rate which were found in the same person at an ergometer load of 300 w. These training heart rates of 170 to 190 beats/min. were kept for one training unit that is up to 30 min. The higher stimulus-intensity at prolonged stimulus duration may be the basis for the performance increase in the endurance sports activities.

A68-80623
MASSED PRACTICE IN PURSUIT ROTOR TASK AND TWO FACTOR THEORY OF INHIBITION.

Arjun P. Purohit (Queen's U., Kingston, Ontario, Canada).

Journal of General Psychology, vol. 78, Jan. 1968, p. 9–17. 25 refs.
NRC, Canada supported research.

Massed practice in pursuit rotor task results in a decreased growth of the performance curve. Furthermore, if massed practice is interrupted by rest pauses, then the postrest performance curve is characterized by reminiscence, warm-up or upswing, and down-swing following upswing. The relevant theories were examined which have so far been proposed to explain one or more of these phenomena. An extended version of Kimble's two-factor theory of inhibition was presented, which explained the above-mentioned features of performance in pursuit rotor task under massed practice.

A68-80624
ALPHA AND THETA EEG IN VIGILANCE.

Robert S. Daniel (Mo. U., Columbia).

Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 697–703. 16 refs.
NASA Grant NGR-26-004-003 and Grant PHS 10936.

During a one-hr. vigilance session subjects were required to detect specified digit triads in an uninterrupted random digit series. Electroencephalograms were recorded continuously with sampled epochs analyzed by computer for autocorrelation and period analysis. Correlogram ratios indicated progressively decreasing arousal through the session but did not distinguish responses from detection failures. Incidence of alpha waves by period analysis also did not identify errors, but incidence of theta waves dropped significantly just prior to failures and did not do so around responses.

A68-80625
TWO DIFFERENT HEMODYNAMIC PATTERNS UNDERLYING HYPOTENSION DURING DESYNCHRONIZED SLEEP.

T. Kumazawa, G. Baccelli, M. Guazzi, G. Mancia, and A. Zanchetti (Milan U., Ist. di Patol. Med. and Consiglio Nazl. delle Ric., Ist. Nazl. di Med. Sper., Italy).

Experientia, vol. 23, Dec. 15, 1967, p. 1021–1022.
Grant AF EOAR 66-47; Consiglio Nazl. delle Ric. and Nagoya U. supported research.

Experiments to further clarify the hemodynamics of sleep with particular reference to desynchronized sleep (DS) were carried out on cats. The electroencephalogram, cervical electromyogram and eye movements were monitored. The hypotension present during the DS, with sino-aortic reflexes intact or abolished, resulted largely or entirely from a decreased peripheral resistance and seldom from a decrement in cardiac output. Only in a small proportion of DS episodes in sino-aortic deafferented cats when the blood pressure fell causing cerebral ischemia, were the lowest values of cardiac output and highest resistance attained. These experiments showed that hypotension during DS was independent of cardiac innervation and usually resulted from decreased peripheral resistance, suggesting that vasodilatation was brought about by a decreased sympathetic activity.

A68-80626
VARIABLES AFFECTING THE PERCEPTION OF ANGULAR CHANGE.

Alfred G. Klipple (U.S. Bur. of Public Roads, Dept. of Transportation, Traffic Systems Div., Washington, D. C.).

Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 1025–1032. 6 refs.

A study was made of the effects of four variables (initial angle size, rate of change, direction of change and percentage of change) on the accuracy of judgments of size changes in visual angles. Two groups of subjects in a darkened room reported their judgments of the expansion or contraction of a variable bar of light.

The accuracy of these judgments was affected by rate of change, direction of change, and percentage of change but not directly by initial angle size. Significant interactions were found for initial angle size by percentage of change, direction of change by percentage of change, percentage of change by rate of change and direction of change by percentage of change by groups.

A68-80627
THE PSYCHOLOGY OF MEMORY—1960–1964: A BIBLIOGRAPHY.
C. Michael Levy, Karen Hartnagle, and Eleanor Levy (Fla. U., Gainesville).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 921–948. 760 refs.
Grants NSF GY-995 and NSF GY-2670; Fla. U. supported research.

Seven-hundred sixty contributions to the psychology of memory and forgetting published between 1960 and 1964 are listed.

A68-80628
HALLUCINATIONS AND DISTURBANCES OF AFFECT, COGNITION, AND PHYSICAL STATE AS A FUNCTION OF SENSORY DEPRIVATION.
Carol A. Schulman, Milton Richlin, and Sidney Weinstein (New York Med. Coll., N. Y.).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 1001–1024. 62 refs.
NASA Grant NsG-489 and NASA Grant NGR-33-145-001.

A post-isolation interview was administered to 134 subjects confined for up to 72 hr. under three conditions of sensory deprivation: Auditory-Tactual-Visual (Total Deprivation); Auditory-Tactual; and Auditory. Results indicated that subjects were not severely disorganized by the isolation experience. Total deprivation produced greater disturbance of affect and cognition than the two less severely restricted conditions, while complaints of physical discomfort were greater in the latter two groups. Hallucinations were analyzed in the Total Deprivation Group. The occurrence of visual, auditory, olfactory, kinesthetic, and body-image hallucinations was reported. Confirmation of previous findings for visual sensations was dependent on the criteria for classification. A significant proportion of subjects reported multimodal, complex sensory experiences (CSE). The history of CSE in sensory deprivation and related research was reviewed, and their relation to other types of hallucinations was discussed.

A68-80629
PROTECTIVE EFFECT OF MAGNESIUM PEMOLINE AGAINST LETHAL DOSES OF X-IRRADIATION.
H. LeVan (Ill. U., Coll. of Med., Dept. of Radiol., Chicago).
Experientia, vol. 23, Dec. 15, 1967, p. 1058–1059. 5 refs.
Grant UIF 2-46-33-90-3-10.

Magnesium pemoline already known for its property of enhancing memory and learning was found to have radioprotective properties. Experiments studying the radioprotective effect were carried out on male mice, each experiment involving 360 mice divided into three groups. On the first day all were exposed to 50 r of x-ray irradiation; the second day one-half of the mice in each group was injected with 0.6 $cm.^3$ of magnesium pemoline and the other half with bacteriostatic water, then all were immediately exposed to 50 r. The third day the first group was exposed to an additional 800 r. The second and third groups of mice received this lethal dose three and five days respectively after the injection of water and magnesium pemoline. Mortality in each group was recorded daily. The percentage of survival of the mice injected with pemoline was highest in group I and lowest in group III. The drug seemed most effective when the time between administration and exposure was the shortest.

A68-80630
EFFECTS OF OPERATOR MOOD ON PERFORMANCE IN A SIMULATED DRIVING TASK.
Norman W. Heimstra, Vernon S. Ellingstad, and Arlan R. De Kock (S. Dak. U., Vermillion).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 729–735.
Grant PH AC00188-02.

One hundred seventy five males and 175 females were administered a Mood Adjective Check List and were then tested in a simulated driving task. Correlations between mood factor scores and performance measures were computed. Little relationship appeared between mood factors and performance on the various tasks required in the operation of the device. However, in an analysis involving high and low mood-score groups for each mood factor, subjects scoring high on factors of aggression, anxiety, and fatigue performed more poorly on various tasks than those subjects who scored lower on these factors. Also, performance of males was superior to that of the females on several tasks.

A68-80631
THE EFFECT OF ENVIRONMENTAL TEMPERATURE ON BROWN AND WHITE ADIPOSE TISSUE IN THE STARVING NEWBORN RABBIT.
T. Heim and M. Kellermayer (U. Med. School, Dept. of Paediat. and Inst. of Pathol., Pécs, Hungary).
Acta Physiologica Academiae Scientiarum Hungaricae, vol. 31, no. 4, 1967, p. 339–346. 25 refs.

Newborn rabbits were starved to death at two different environmental temperature and their brown and white adipose tissues were subjected to histological and chemical analysis. Rabbits kept at an ambient temperature of 35 to 36°C. died on the sixth day having lost 33% of their original body weight, while rabbits maintained at 20 to 23°C. died on the third day after losing 14 to 16% of their original body weight. After death white adipose tissue was found depleted of fat in both groups. Brown adipose tissue, however, was still replete with fat in the animals starved to death in the thermoneutral environment but was completely depleted of fat in rabbits starved to death at room temperature. It was concluded that a significant functional difference exists between brown and white adipose tissue. Brown fat is mobilized in response to cold but not during starvation in a thermoneutral environment, whereas white fat apparently serves as a general metabolic reserve and is used during starvation both in the absence and the presence of a cold induced increase in heat production.

A68-80632
CIRCADIAN RHYTHM OF ACTIVITY IN THE HOLARCTIC MAMMALS [LE RYTHME CIRCADIEN DE L'ACTIVITE CHEZ LES MAMMIFERES HOLARCTIQUES].
Marie-Charlotte Saint Girons (Brunoy, Museum, Lab. of Gen. Ecol., France).
Mémoires du Muséum National d'Histoire Naturelle, Nouvelle Série, Série A, Zoologie, vol. 40, no. 3, 1966, 187 p. 245 refs. In French.

A monographic study is presented on the spontaneous motor activity of various groups of mammals. The animals, species of rodents, carnivores, insectivores, bats and artiodactyls, showed a rhythm of activity of about 24 hr. The rhythm is polyphasic in having several periods of peak activity with periods of response in between. The timing mechanisms varied with the different species. Endogenous and exogenous factors are discussed. Environmental and ethological factors in timing and modification of the activity cycle are explained. A comprehensive bibliography is included.

A68-80633
TEMPORAL EXPERIENCE AS A FUNCTION OF SENSORY STIMULATION AND MOTOR ACTIVITY.
Alan R. Miller, Roland A. Frauchiger, and Vernon L. Kiker (Calif. State Coll., Los Angeles).
Western Psychol. Assn., San Francisco, May 1967).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 997–1000. 8 refs.

This study was concerned with establishing quantifiable continua of phenomenal temporal judgments. Using six levels of sensory input and three levels of motor behavior, a linear relationship was found between sensory input and temporal estimation for a 90-sec. interval. Both sensory input and motor behavior had significant effects, but not the interaction. It was postulated that the so-called unfilled interval could be better understood if it could be related to various levels of information input.

A68-80634
EFFECTS OF AUDITORY STIMULATION UPON DECREMENT AND REMINISCENCE IN ROTARY PURSUIT TRACKING.
John F. Catalano and Patricia M. Whalen (Naval Training Device Center, Port Washington, N. Y.).
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 981–988. 6 refs.

Two experiments were carried out to determine the effects of an auditory stimulus which was considered to be activating upon rotary pursuit tracking performance. In Experiment I 70-db. stimulation presented during a tracking period tended to prevent the occurrence of decrement for 20 of 27 subjects. In Experiment II both 70 db. and 100 db. presented during a rest period appeared to enhance the amount of subsequent reminiscence for 15 subjects of 21. The results were interpreted as supporting the hypothesis that changes of activation level may contribute to such performance changes as decrement and reminiscence.

A68-80635
HYPOXIA AND SPONTANEOUS LOCOMOTOR ACTIVITY IN THE RAT.
Martin J. Gerben.
Perceptual and Motor Skills, vol. 25, Dec. 1967, p. 969–978. 14 refs.

Three experiments investigated the effects of hypoxia on activity wheel running in male Sprague–Dawley rats. Subjects were exposed to atmospheres containing 21% O_2 (normoxia), 16% O_2, 12% O_2 and 8% O_2 for 20 min. of running. Decreases in activity occurred in atmospheres below 16% O_2. Activity over the length of each 20-min. running period decreased as a function of amount of previously elapsed running time but was not significantly affected by the duration of previous exposure to the experimental atmosphere. Running in a normoxic atmosphere was increased if the immediately preceding exposure involved a hypoxic rather than normoxic atmosphere. The results suggest a dual effect of hypoxia. Hypoxia initially increases the tendency to be active in the non-running rat but eventually reduces activity in the running animal. Hypoxia was compared to other deprivation states with respect to motivational properties.

A68-80636
THE OCCURRENCE OF HEARING DEFICIENCIES CAUSED BY DETONATION TRAUMA IN DEPENDENCE OF PARTS OF MILITARY FORCES AND RANK GROUPS [DAS AUFTRETEN KNALLTRAUMATISCH BEDINGTER HORSCHADEN IN ABHANGIGKEIT VON TEILSTREITKRAFT UND DIENSTGRADGRUPPE].
G. Frohlich.
Wehrmedizinische Monatsschrift, vol. 11, Dec. 1967, p. 412–415. In German.

In a total of 2,000 first medical examinations regarding fitness for active flying service in the airforce, the number of rejections because of hearing deficiencies caused by detonation trauma amounted to 20% among army officers, 13% among non-commissioned officers and 3.9% among enlisted men. For the navy the rejection rate was 5.4% for officers and 7.2% for officer cadets. Airforce members showed only minor rejection rates of 0.9 to 2.2%. The differences of rejection rates ran parallel to the degree of hearing deficiencies. It was highest among army pilots and lowest in members of the airforce. The strong detonation stresses experienced by army training personnel were considered responsible for this. Therefore, this group was encouraged during shooting to wear noise-protection apparati. Hearing tests with conversational and whisper language were insufficient for the recognition of early damage to the hearing. Instead of it the hearing tests should be performed by means of pure-tone audiometry or with a three-stage audiometer (250, 1,000, 4.999 c.p.s.). Especially the army flying corps lost a high percentage of its already militarily qualified cadets through these hearing defects. The remaining causes for rejection in the ear, nose and throat field were only of minor significance.

A68-80637
DIURNAL CHANGES IN BRAIN NORADRENALIN.
Donald J. Reis and Richard J. Wurtman.
Life Sciences, vol. 7, Jan. 1, 1968, p. 91–98. 22 refs.
Grants NIH NB-06911, NIH AM-11709, NIH AM-11237, and NIH 5-K3-NB-31756.

The noradrenalin concentrations in parts of the cat hypothalamus and cervical spinal cord vary dirunally. They are higher at 1900 than at 0700. No such variation occurs elsewhere in the brain. The cat pineal gland shows an opposite rhythm, which is similar to the noradrenalin cycle previously observed in the rat pineal. The diurnal changes in brain noradrenalin content probably occur within the axon terminals of noradrenalin-containing neurons.

A68-80638
THE EFFECT OF IMMOBILIZATION STRESS ON THE ACTIVITY OF CENTRAL MONOAMINE NEURONS.
Hans Corrodi, Kjell Fuxe, and Tomas Hökfelt (Göteborg U., Dept. of Pharmacol.; AB Hässle, Biochem. Labs., Göteborg; Karolinska Inst., Dept. of Histol., Stockholm, Sweden).
Life Sciences, vol. 7, Jan. 1, 1968, p. 107–112. 23 refs.
Grant MRC, Swed. (14X-1015-03); Bergvall's Found. and Knut Wallenberg Found. supported research.

With the help of inhibitors of the amine synthesis and chemical determinations of dopamine, noradrenaline (NA) and 5-hydroxytrystamine it has been possible to obtain good evidence that there is a specific activation of the various NA nerve terminal systems of the brain and the spinal cord under the influence of immobilization stress.

A68-80639
NIGHT VISION AS CHROMATIC VISION.
Björn Stabell and Ulf Stabell (Oslo U., Inst. of Psychol., Norway).
Scandinavian Journal of Psychology, vol. 8, no. 3, 1967, p. 145–149. 35 refs.

Assuming that night vision is an exclusive function of the rods, and that it is colorless, the duplicity theory states that rod vision is achromatic vision. Studies relevant to color in night vision are reviewed. It is concluded that color may be observed well below the breakpoint of the dark adaptation curve, and that the duplicity theory therefore needs revision.

A68-80640
EFFECT OF A SPECIFIC NOISE ON VISUAL AND AUDITORY MEMORY SPAN.
Stanislav Dornič (Slovak Acad. of Sci., Inst. of Exptl. Psychol., Bratislava, Czechoslovakia).
Scandinavian Journal of Psychology, vol. 8, no. 3, 1967, p. 155–160. 23 refs.

Messages of visual and aural stimuli (digits) were presented together with a specific noise consisting of different auditory and visual stimuli. The auditory memory span, measured by the amount of digits recalled immediately after presentation, was not at all affected by the interfering visual noise, whereas the visual memory span was found to be significantly reduced by the acoustic noise. The results are interpreted as giving support to the hypothesis on the acoustic nature of information storage in immediate memory. Possible differences in the properties of the visual and auditory peripheral filter are discussed.

A68-80641
GEOMETRIC ILLUSIONS. I. EFFECTS OF FIGURE TYPE, INSTRUCTION, AND PRE- AND INTERTRIAL TRAINING ON MAGNITUDE AND DECREMENT OF ILLUSION.
Veijo Virsu (Helsinki U., Inst. of Psychol., Finland).
Scandinavian Journal of Psychology, vol. 8, no. 3, 1967, p. 161–171. 14 refs.
Natl. Res. Councils, Board supported research.

The effects of instruction and training on the magnitude of illusion were investigated using as stimuli Müller–Lyer, Müller–Lyer–Ebbinghaus, and Oppel's figures, and a perspective illusion. The subjects estimated the difference between the standard and the variable. The results suggest that changes in judging attitudes, and perceptual learning, contribute to the decrement of illusion during repeated presentation; adaptation to a two-dimensional stimulus world seems to affect the size of illusions which can be explained on the basis of constancy theory. The interactions between the treatments were fairly high.

A68-80642
GEOMETRIC ILLUSIONS. II. FEATURES OF THE METHOD OF MAGNITUDE ESTIMATION OF LENGTH DIFFERENCES.
Juhani Pietarinen and Veijo Virsu (Helsinki U., Inst. of Psychol. and Natl. Res. Council for the Humanities, Finland).
Scandinavian Journal of Psychology, vol. 8, no. 3, 1967, p. 172–176. 8 refs.

The following experimental results were discussed: (1) the direct numerical estimates of the differences between the lengths of the variable and the standard in the stimulus figures gradually became smaller during the experiment; and (2) these estimates suddenly became smaller when a relatively illusion-free stimulus figure was followed by a more illusion-like figure. These results suggested that the numerical judgments only partially reflected the strength of illusions; they were in addition affected by certain biasing factors. A method for evaluating the relative effects of the illusion and the biasing factors was presented.

A68-80643
THE SHAPE SLANT INVARIANCE HYPOTHESIS IN STATIC PERCEPTION.
E. Sture Eriksson (Uppsala U., Dept. of Psychol., Sweden).
Scandinavian Journal of Psychology, vol. 8, no. 3, 1967, p. 193–208. 25 refs.

The hypothesis of geometric invariance in monocular static slant perception was found to be inadequate as a description of data from some experiments performed under reduced viewing conditions. Instead the data suggested that the subjects function according to two subrelations: (a) a variable subjective slant principle; and (b) a principle concerning the distortion of the visual field.

A68-80644
VISUAL EVOKED POTENTIALS IN HUMANS AND CATS AS A FUNCTION OF INTENSITY [VISUELLE REAKTIONSPOTENTIALE AN MENSCHEN UND KATZEN IN ABHANGIGKEIT VON DER INTENSITAT].
U. Kuhnt (Max-Planck-Inst. für Psychiat., Abt. für Neurophysiol., Munich, West Germany).
Pflügers Archiv für die gesamte Physiologie, vol. 298, no. 1, 1967, p. 82–104. 31 refs. In German.

The variation of the visual evoked potential (v.e.p.) of cats and humans at different stimulus intensities was investigated. The v.e.p. of cats were recorded from the pial surface under barbiturate anesthesia, those of humans from the skull using averaging techniques (CAT 400 B and 1000). Monopolar recordings were used, the indifferent electrode being placed over the frontal sinus in cats and on the chin in humans. Light stimuli were either 300 to 500 msec. flashes between 0.01 and 5,103 Lux or stroboscopic flashes of 0.07 J/flash the intensity of which could be reduced by neutral density filters. The flash sequence was irregular between 0.05 and 0.2/sec. The subjects were dark-adapted. In cats the peak latencies and amplitudes of the primary components of the v.e.p. (primary positivity and negativity) were dependent on the light intensity in a predictable manner. This dependency could be expressed equally by a logarithmic as well as by a power function. The exponents of the power functions were between 0.1 and 0.3. The peak-to-peak distance between the primary positivity and negativity did not change with light intensity indicating that both potentials were closely locked with each other. The secondary negative potential (latency 100 to 150 msec.) was inconsistancy and not systematically dependent on the stimulus intensity. The v.e.p. behaved identically over the whole visual cortex, in the somato-motor and -sensory areas no v.e.p.'s could be recorded. In humans, v.e.p.'s could be recorded from all points of the skull with some regional differences. The descriptive nomenclature of Ciganek for the different components of the occipital v.e.p. was adopted in this paper, but a careful study revealed that a separation of components one, two, three was mostly not justified and therefore artificial. The components one-third to six were all dependent on the light intensity in the same manner. As in cats, this dependency could be expressed by logarithmic or power functions, the exponents of the latter being between 0.1 and 0.3. Also in humans, the peak-to-peak latencies did not change significantly with light intensity. Only the amplitudes but not the latencies of the v.e.p. were changed, if the stimulus intensity was kept constant and the background illumination was changed. The results were discussed especially in relation to the Weber–Fechner-function and the power law. Since both, the logarithmic as well as the power function fitted the data equally well, a distinction between both was considered irrelevant for the visual system.

A68-80645
CONTINUOUS INTRA-ARTERIAL BLOOD PRESSURE MEASUREMENT.
A. L. Macmillan and F. D. Stott (Med. Res. Council, Churchill Hosp., Oxford, Great Britain).
Bio-medical Engineering, vol. 3, Jan. 1968, p. 20–27. 14 refs.

Both the capacitance-manometer recording system and the strain-gauge manometer recording system were examined. The capacitance-manometer recording system will record blood pressure at low pulse rates with an error greater than 10%. The strain-gauge manometer recording system when used to record blood pressure without added damping showed an inconstant inaccuracy. A system for hydraulic damping using a helical stenosis has been developed

and when adjusted as described the system recorded blood pressure at pulse rates up to 120/min. with an error of less than 1.05%. This system also recorded over a wider range of pressure and had greater operational simplicity. Direct blood-pressure measurement with a membrane manometer and intra-arterial catheter may be most inaccurate. By attention to details of the technique this error can be reduced to about 1%.

A68-80646
THYROXINE AND NOREPINEPHRINE EFFECTS ON THE METABOLIC RATES OF HEAT-ACCLIMATED HAMSTERS.
Y. Cassuto and Y. Amit (Negev Inst. for Arid Zone Res., Beer-Sheva, Israel).
Endocrinology, vol. 82, Jan. 1968, p. 17–20. 9 refs.
Israel Council for Res. and Develop. supported research.

The effects of thyroxine and norepinephrine, administered separately and together, on the metabolic rates of heat-acclimated and control hamsters were investigated. Metabolic rates of heat-acclimated hamsters were lower than rates of controls when measured at ambient temperatures of 32°C. and −15°C. Separate administration of norepinephrine or thyroxine decreased the difference between the two groups, while their combined administration eliminated the difference entirely when metabolic rates were measured at ambient temperatures of 32°C. Administration of these hormones separately or together did not affect the metabolic rates of the control groups, but slightly stimulated those of the heat-acclimated hamsters, when measured at −15°C.

A68-80647
EFFECTS OF HYPERCALCEMIA AND HYPOCALCEMIA ON THE THYROCALCITONIN CONTENT OF RAT THYROID GLANDS.
Ruben F. Gittes, Svein U. Toverud, and Cary W. Cooper (Harvard School of Dental Med., Biol. Res. Labs. and Harvard Med. School, Dept. of Pharmacol., Boston, Mass.).
Endocrinology, vol. 82, Jan. 1968, p. 83–90. 23 refs.
Grants PHS A-1787, PHS A-8261, and PHS A-10106.

Systemic hypercalcemia induced in intact rats by intraperitoneal injection of $CaCl_2$, gavage feeding of Ca lactate or a very high calcium diet, consistently reduced the thyrocalcitonin (TC) content of the thyroid gland measured by biological assay. Maximal reduction to 35±5% of the content in normocalcemic controls was noted as early as two hr. after the induction of hypercalcemia. Large doses of vitamin D or prolongation of dietary hypercalcemia to 23 days did not decrease the content further. Recovery to a normal content was noted 16 hr. after the end of a hypercalcemia of two hr. The chronic hypocalcemia of parathyroidectomized rats kept on normal diet was associated with a progressive accumulation of TC in the thyroid gland. A 12-fold increase in the content was present after 14 wk., the longest interval studied. Restoration of normocalcemia with four parathyroid homografts or the delayed induction of chronic dietary hypercalcemia both significantly reduced but did not eliminate the TC accumulation in such rats. The absence of parathyroid tissue during a hypercalcemia did not alter the amount of residual TC detectable in the thyroid, negating the role of a TC-releasing factor from the parathyroid. It was concluded that in the rat systemic hypercalcemia is a stimulus for the rapid release of TC. The results suggest that TC is available to combat only brief challenges of hypercalcemia. The accumulation of TC in the thyroid of chronically hypocalcemic rats is viewed as the result of continuing synthesis in the absence of normal stimuli for release. This interpretation and a partial reversal of the accumulation of TC when such rats were made normocalcemic by parathyroid homografts both suggest an active role for TC in the maintenance of normocalcemia in rats.

A68-80648
ENVIRONMENTAL INFLUENCES ON INITIATION AND MAINTENANCE OF HIBERNATION IN THE ARCTIC GROUND SQUIRREL, CITELLUS UNDULATUS.
James W. Drescher (Wis. U., Dept. of Zool., Madison).
Ecology, vol. 48, Autumn 1967, p. 962–966. 28 refs.
Grants NSF G-23564, AINA ONR-357, and AINA ONR-364; Wis. U. supported research.

A controlled laboratory experiment was designed to investigate the ecological effects of temperature and photoperiod on patterns of hibernation in the arctic ground squirrel. Increased hibernation was clearly associated with regimes of decreasing photoperiod and constant temperature. Decreasing temperature and constant photoperiod had similar, though greater, effects. The combination of decreasing photoperiod and temperature, which constituted the best simulation of natural conditions, was associated with a hibernation time exceeding the sum of times in the two independent tests. Photoperiod seemed to have as great an influence on initiation of hibernation as did temperature, although the latter was more influential in maintaining hibernation. Statistical analysis clearly indicated that, under the conditions of this experiment, simulated natural photoperiod and temperature fluctuations served as external environmental timing cues to which arctic ground squirrels responded by adjusting their patterns of hibernation. It is suggested that the same mechanisms may operate in the field.

A68-80649
VISUAL RESOLUTION OF TWO-BAR PATTERNS AND SQUARE-WAVE GRATINGS.
Jacob Nachmias (Pa. U., Dept. of Psychol., Philadelphia).
Journal of the Optical Society of America, vol. 58, Jan. 1968, p. 9–12. 12 refs.
Grant PHS NB06050.

Contrast thresholds for resolution were measured with two types of display: (1) a test field of constant size filled by square-wave gratings of spatial frequencies between 0.44 and 8.75 cycles/deg; (2) two bright bars, comprising one and one-half cycles of the square-wave gratings. Results show that even with one and one-half cycles, there is some decline of contrast sensitivity at low spatial frequencies, and an interaction between the effects of exposure duration and spatial frequency. However, data obtained with gratings of constant size can give an exaggerated impression of the magnitude of inhibitory interactions in the visual nervous system.

A68-80650
ORIENTATION-SPECIFIC EFFECTS OF PATTERNS OF ADAPTING LIGHT ON VISUAL ACUITY.
Alberta S. Gilinsky (Bridgeport U., Conn.).
Journal of the Optical Society of America, vol. 58, Jan. 1968, p. 13–18.
Grant NSF GB-6067.

Inspection of a pattern of horizontal, vertical, or oblique lines differentially affects the visual acuity for test gratings as a function of their orientation. After a horizontal grating is viewed for one sec. or longer, the resolution threshold for horizontal contours is greater than the threshold for the identification of vertical and obliquely oriented contours. Conversely, prolonged viewing of vertical contours raises the threshold for the identification of vertical lines above those for other orientations. Similar results are found following adapting exposures to left- and right-oblique contours. The differential masking effects are systematic functions of the duration of exposure to the light-and-dark adapting pattern.

A68-80651
CALCIUM HOMEOSTASIS IN CHRONIC THYROCALCITONIN DEFICIENCY.

W. C. Sturtridge and M. Ashwini Kumar (Toronto U., Dept. of Pharmacol., Canada).
Endocrinology, vol. 81, Dec. 1967, p. 1297–1300. 13 refs.
J. P. Bickell Found. and Med. Res. Council, Canada supported research.

Chronic thyrocalcitonin (TC) deficiency was produced in rats by thyroidectomy and thyroxine replacement. These and control animals had the parathyroids implanted into neck muscles. Four to five wk. after surgery, administration of Ca (0.15 mEq/100 g.ip) produced marked and prolonged hypercalcemia in TC-deficient rats. Basal plasma Ca in these animals was the same as in the controls. Parathyroidectomy made no difference to the Ca tolerance pattern in TC-deficient and control animals. When ^{45}Ca tracer was given to the two groups of rats either or with eight days before the Ca load, changes in the plasma ^{45}Ca activity (absolute and specific) indicated that TC acts by inhibiting bone resorption. Inhibition of bone resorption by TC during hypercalcemia is an important homeostatic process which is permanently impaired in thyroidectomized animals. The growth and general health of rats seemed unaffected by TC deficiency.

A68-80652
PERCEIVED RATE OF MONOTIC AND DICHOTICALLY ALTERNATING CLICKS.
S. Axelrod, L. T. Guzy (N. Y. State U., Buffalo), and I. T. Diamond (Duke U., Durham, N. C.).
Journal of the Acoustical Society of America, vol. 43, Jan. 1968, p. 51–55. 11 refs.
PHS and United Health Found. supported research.

Subjects compared the apparent repetition rates of trains of dichotically alternating clicks, presented at 1–40/sec., with the apparent rates of monotic trains. All dichotic rates were underestimated, the degree of underestimation varying from a few percent at 1/sec. to 35%–40% from about 7.5/sec. onward. The latter rate corresponds to the switching rates producing minimal intelligibility of speech presented alternately to the two ears. Unlike the results of switched-speech experiments, however, the present results appear to be unequivocally interpretable as indicating a difficulty in integrating dichotically alternating inputs into a single percept.

A68-80653
FUNCTIONAL CONSEQUENCES OF AIRWAY MORPHOLOGY.
Keith Horsfield and Gordon Cumming (Birmingham U., Queen Elizabeth Hosp., Dept. of Med., Great Britain).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 384–390. 13 refs.
Contract AF 61(052)-775.

From measurements of a resin cast of the airways the dimensions and pattern of branching of the bronchial tree were found. Calculations based on these measurements indicated the site of airways resistance and the nature of gas flow in the airways, together with information on factors affecting the distribution of inspired gas. The roles of anatomy and gaseous diffusion in the genesis of the shape of the single-breath nitrogen test and the expression of respiratory dead space as a distribution function were outlined.

A68-80654
SEVRO CONTROL OF INHALED CARBON DIOXIDE.
J. Weldon Bellville, Gerald Fleischli, and George Attura (Stanford U., School of Med., Dept. of Anesthesia, Palo Alto, Calif.).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 414–415.
Grants NIH HE 05847 and NIH GM 12527.

This paper describes an automated system for controlling the concentration of CO_2 in inhaled gas. It is reliable, versatile, and easy to use. Many different varieties of CO_2 waveforms may be produced, derived from either physiological parameters or the output of a waveform generator. The system offers advantages not found in previous systems, including a reservoir at room pressure so the subject does not have to overcome the resistance of a demand valve, and an inhaled concentration that is not affected by tidal volume.

A68-80655
FACTORS AFFECTING AIRWAYS CONDUCTANCE: A STUDY OF 752 WORKING MEN.
A. R. Guyatt and J. H. Alpers (Roy. Postgraduate Med. School, Dept. of Med., London, Great Britain).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 310–316. 20 refs.
Med. Res. Council supported research.

Measurements of airways conductance (Gaw) and lung volume (Vtg) made in 752 men with a body plethysmograph were expressed as volume standardized airways and conductance, SGaw (Gaw/Vtg), after studies of the Gaw/Vtg relationship in 671 of the subjects, and this index was expressed as its logarithm for statistical reasons. Log SGaw fell as height increased in normal subjects, but there was little change in men with simple chronic bronchitis or airways obstruction. This may be due to differences in factors controlling upper and lower airway conductance which are obscured in patients by variability of the measurements. There was no advantage in considering body surface area, which combines height and body weight, as well as height alone. Log SGaw was correlated with FEV_1 only in patients with severe airways obstruction. Log SGaw fell with age, particularly in men with chronic bronchitis. The rate of fall was similar in current and ex-smokers, but nonsmokers showed no change with age. FEV_1 measurements also showed a fall with age but are probably less discriminative of slight degrees of airways obstruction.

A68-80656
MEASUREMENT OF CARDIAC OUTPUT BY THERMAL DILUTION IN MAN.
M. A. Branthwaite and R. D. Bradley (St. Thomas' Hosp., Dept. of Med., London, Great Britain).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 434–438. 8 refs.

A technique for the measurement of cardiac output by thermal dilution has been developed for use in man, particularly during acute disturbances of the circulation. A thermistor mounted at the tip of a miniature cardiac catheter is floated into the pulmonary artery, and temperature change is recorded following the injection of room temperature saline or dextrose through a catheter in the internal jugular vein. Correlation with the direct Fick technique has been shown to be highly significant. The method is particularly valuable where serial measurements at short intervals are required because the result is available immediately. Cannulation of the internal jugular vein has been found to have much wider application than the measurement of cardiac output.

A68-80657
COMPARISON OF CO_2-REBREATHING AND DIRECT FICK METHODS FOR DETERMINING CARDIAC OUTPUT.
G. Muiesan, C. A. Sorbini, E. Solinas, V. Grassi, G. Casucci, and E. Petz (Perugia U., Ist. di Patol. Spec. Med., Italy).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 424–429. 26 refs.
Grant NRC, Italy 04/130/5/3909.

A68-80658

Cardiac output values obtained with the conventional direct Fick method in 17 normal subjects at rest were compared with those simultaneously obtained with the CO_2-rebreathing method. Both the Collier's and the Defares' techniques for determining mixed venous carbon dioxide tension ($P\bar{v}_{CO_2}$(were evaluated in the same subject and an excellent agreement was found between the figures yielded by the two different rebreathing procedures ($r = 0.97$, $P<0.001$). The precision of repeated determinations in the same subject in quick succession and at different lengths of rebreathing cycles with the Collier's method was good. Though direct Fick cardiac output values were generally slightly higher ($+4.92\pm7.52\%$) than those obtained using the indirect Fick principle (Collier's rebreathing method for determination of $P\bar{v}_{CO_2}$), a very good correlation ($r = 0.94$, $P<0.001$) was found between the values yielded by the two different methods of measurement, all determinations lying within $\pm13\%$ from the line of identity.

A68-80658
CIRCADIAN OSCILLATIONS OF THREE PARAMETERS AT DEFINED LIGHT INTENSITIES AND COLOR.
C. M. Winget, D. H. Card, and J. M. Pope (NASA, Ames Res. Center, Moffett Field, Calif.).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 401–406. 18 refs.

The presence in the chicken (*Gallus domesticus*) of circadian oscillations in deep-body temperature, heart rate, and locomotor activity in white light and in red light (7,000 Å and greater) was established by periodogram and correlogram analysis. Changes in amplitude and phase angle were associated with increasing intensity of red light. A relatively rapid (less than 36 hr.) rephasing of deep-body temperature was observed in the red-light environment, following a reversal of the light-dark cycle. In continuous red light the circadian frequency of the three variables was not maintained; however, the deep-body temperature oscillations damped out more slowly in this environment than did those of heart rate and locomotor activity.

A68-80659
A THERMOREGULATORY FUNCTION TEST.
R. H. Fox, G. W. Crockford, and B. Löfstedt (Med. Res. Council, Natl. Inst. for Med. Res. and Environ. Physiol. Res. Unit, London, Great Britain; and Lund U., Inst. for Hyg., Sweden).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 391–400. 8 refs.

Ten Cincinnati students were studied during summer months using a mobile thermoregulatory function test. The test was designed to measure the normal levels of deep-body and skin temperatures, the temperature levels at sweat onset, the sweating response to a given elevation of deep-body temperature, the rate of sweat suppression, and the deep-body to skin temperature gradient. The results are compared with measurements on British soliders before and after artificial acclimatization during winter and early spring. Sweat rates in the students corresponded to the acclimatized British level. The rate of sweat suppression was significantly less than for either the acclimatized or unacclimatized British subjects. The significance of this finding is discussed. Deep-body and skin temperatures observed in the neutral environment corresponded more closely with the unacclimatized than the acclimatized British level, but at sweat onset skin temperatures were similar to the acclimatized British value. A comparison of two tests on eight subjects indicates that the test has a high degree of reproducibility.

A68-80660
STATIC VOLUME-PRESSURE CURVES OF DOG LUNGS—IN VIVO AND IN VITRO.
Mary Ellen B. Wohl, James Turner, and Jere Mead (Harvard School of Public Health, Dept. of Physiol., Boston, Mass.).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 348–354. 29 refs.
Grant PHS GM 409.

To evaluate esophageal pressure as a measure of pleural pressure in the dog and to compare the static volume-pressure characteristics of *in vivo* and excised lungs, volume-pressure curves were obtained on ten anesthetized and tracheostomized dogs. In five animals, esophageal pressure was compared to pleural pressure in the absence and presence of moderate and large pneumothoraxes. The differences were three cm. H_2O or less except at the extremes of lung volume. The presence of a pneumothorax did not systematically alter the differences. The comparison of volume-pressure curves of excised and *in vivo* lungs showed small but systematic differences. Excised lungs contained more gas on deflation at moderate distending pressures and exhibited greater static hysteresis than living lungs. Differences in smooth muscle tension or vascular pressures probably contribute to the observed differences but cannot fully explain them. If alveolar surface tension deviates less from an equilibrium value in living than in excised lungs, changes similar to those observed would result.

A68-80661
COMPARISON OF HYPOXIA, pH, AND SYMPATHOMIMETIC DRUGS ON BOVINE PUMONARY VASCULATURE.
Eric D. Silove, Takayuki Inoue, and Robert F. Grover (Colo. U., Med. Center, Dept. of Med., Div. of Cardiol., Cardiovascular Res. Lab., Denver).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 355–365. 41 refs.
Grants PHS HE-06895, PHS HE-01208, PHS 1-F2-HE-30, 250, and PHS 5-K3-HE-29, 237.

In six neonatal calves the left lower lobe pulmonary artery (Ilpa) was perfused *in situ* at constant flow. Consequently, pulmonary vascular resistance changes could be assessed by measuring pressure changes. Responses to hypoxia and to sympathomimetic drugs were compared and contrasted at normal, high, and low blood pH levels. At normal pH, hypoxia and norepinephrine (α stimulator) both increased pulmonary vascular resistance significantly, whereas isoproterenol (β stimulator) decreased it significantly. Lowering blood pH during normoxia also raised perfused pulmonary artery (Ilpa) pressure. During acidemia, pulmonary vasoconstriction with hypoxia was accentuated significantly, whereas the pressor response to norepinephrine was not increased. During the pulmonary vasoconstriction of combined acidosis and hypoxia, Ilpa pressure was reduced profoundly by either norepinephrine, epinephrine or isoproterenol. These pressure changes were significantly related to the absolute levels of Ilpa pressure when the durgs were given. Since acidosis increased the pulmonary pressor response to hypoxia, but not to norepinephrine, it is suggested that the hypoxic pulmonary pressor response is probably not mediated by circulating norepinephrine.

A68-80662
EFFECT OF INSPIRED O_2 ON CARDIOPULMONARY AND METABOLIC RESPONSES TO EXERCISE IN MAN.
Richard L. Hughes, Marie Clode, Richard H. T. Edwards, Timothy J. Goodwin, and Norman L. Jones (Roy. Postgraduate Med. School, Dept. of Med., London, Great Britain).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 336–347. 60 refs. Med. Res. Council and Presbyterian St. Luke's Hosp. supported research.

Measurements of heart rate (HR), cardiac output ($\dot{Q}$), ventilation ($\dot{V}E$), and blood gases, pH, and lactate (La) were made in four subjects during continuous exercise. Severe hypoxia (F_{O_2} 0.11) reduced maximum O_2 intake ($\dot{V}_{O_2}$) to 65% of the value obtained

at an F_{O_2} of 0.21, but at any submaximal work load V_{O_2} was independent of F_{O_2}. HR and $\dot{Q}$ were increased to an extent related to the reduction in arterial O_2 content, O_2 transport ($\dot{Q}$ X arterial O_2 content) being similar at all F_{O_2}. Maximum HR and $\dot{Q}$ were similar at all F_{O_2}. $\dot{V}_E$ was similar at the highest loads for all F_{O_2} and amounted to 65 to 90% of the sustained maximum voluntary ventilation. Although the increase in La with work varied between the subjects, the effect of hypoxia on La at any given work load was similar in all subjects. The time course of increase in La at any given work was not affected by hypoxia; a major factor influencing La at all values of inspired O_2 appears to be the rate at which cardiovascular adaptations to an increase in work load take place. Although at a given work load La was highest under hypoxic conditions, the highest levels were not found at an F_{O_2} of 0.11; maximal work of more than three min. duration under these conditions does not appear to depend on the maximal use of anaerobic metabolic processes.

A68-80663
VARIATIONS OF CERTAIN BLOOD CONSTITUENTS DURING ACUTE HEAT EXPOSURE.
Leo C. Senay, Jr. and M. L. Christensen (St. Louis U., School of Med., Dept. of Physiol., Mo.).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 302–309. 23 refs.
Grants PHS HE-07075 and PHS 1 K3 HE-25,110.

Nude males were exposed to 43.3°C. DB, 29°C. WB for four hr. In two exposures subjects rested with and without rehydration; in two exposures intermittent work was performed 10 min. of each 30 min. with and without rehydration. Hematocrits, pH, $[Na^+]$, $[K^+]$, osmolarity, total protein, albumin, α_1-, α_2-, β-, and γ-globulin concentrations were determined prior to and at 30-min. intervals during exposure. Hemodilution response to heat exposure was accompanied by 8–10% reduction in serum $[K^+]$ without detectable changes in $[Na^+]$ or osmolarity. With rehydration but not dehydration $[K^+]$ underwent a secondary decrease. Exercise prevented early $[K^+]$ decreases. Early changes in $[K^+]$ could be accounted for by either influx of K^+-poor fluid into the vascular compartment or sequestration of K^+. Secondary changes in $[K^+]$ were thought to be due to delayed absorption of K^+-poor fluid from the gut. Protein changes upon heat exposure indicated that globulins cyclically entered interstitial spaces during heat exposure. α_1-globulin fraction during rest and rehydration did not conform to changes in other globulin fractions. Increased cardiac output probably played an important role in cyclic decreases of serum globulins because of increased perfusion of areas with "leaky" capillaries.

A68-80664
ALVEOLAR-ARTERIAL GRADIENTS FOR OXYGEN AT 1, 2, AND 3 ATMOSPHERES ABSOLUTE.
D. Gordon McDowall, I. McA. Ledingham, and S. Tindal (Glasgow U., Western Infirmary, Depts. of Surg. and Anaesthesia, Great Britain).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 324–329. 37 refs.

The functioning of an unmodified, commercially produced oxygen electrode (Radiometer E 5044) at ambient pressures of two and three atmospheres absolute (Ata) was assessed and it was shown that the coefficient of variation of duplicate gas readings at these pressures was similar to that obtained at normal pressure. The response of this microcathode electrode to blood, when using a membrane of 20 μ polypropylene, was found to average 93±2% of the gas reading. When six μ polyethylene teraphthalate (Melinex or Mylar) was substituted for polypropylene, the blood-gas difference was reduced to negligible proportions. The alveolar-arterial gradient for oxygen during 100% oxygen breathing was measured in five subjects at normal barometric pressure, five subjects at two Ata, and six subjects at three Ata. The $(A\text{-}a)DO_2$ gradient was shown not to be increased above the normobaric values during short periods of exposure to hyperbaric oxygen at two and three Ata.

A68-80665
ENVIRONMENTAL FACTORS IN THE ADVERSE EFFECTS OF HELIUM ON EMBRYONIC DEVELOPMENT.
Harold S. Weiss and Ronald A. Wright (Ohio State U., Coll. of Med., Dept. of Physiol., Columbus).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 330–335. 18 refs.
NASA Grant NsG-295-62.

Embryo development remained adversely affected in a 79% He-21% O_2 gas mixture, with hatchability in 14 trials averaging 0.45±0.11 relative to air, despite manipulations of incubation conditions which were designed to compensate for He-related alterations in the physical characteristics of the environment. Elevation of relative humidity from a normal 55–60% to 75–80% (five trials) in order to counteract increased evaporation did eliminate most of the higher egg weight loss and smaller chick hatching weights seen in He-treated eggs but did not improve hatchability. Elevation of incubation temperature from a normal 37.5°C. up to 38.4°C. (five trials) in order to counteract possible loss of metabolic heat via the more rapid thermal conductivity of He also failed to improve hatchability. Experiments in which eggs were interchanged between He and air during the three-wk. incubation cycle showed that critical period of exposure to He was the first two wk. and that hatchability was independent of the ambient gas in the third wk. Embryo mortality, while twice as high in He as in air, tended to be distributed similarly in He and air over the incubation cycle. It appears that He may act through intensification of lethal factors normally operating during embryogenesis, but the mechanism remains obscure.

A68-80666
RENAL FUNCTION IN MACACA SPECIOSA.
Roberta M. O'dell, Howard M. Radwin, Leonard H. Bernstein, and Jorgen U. Schlegel (Tulane U., School of Med., Sect. of Urol., New Orleans, La.).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 366–368. 8 refs.
Grants PHS 1SO1FR537704 and PHS CTR-5057-07; John A. Hartford Found. supported research.

Certain parameters of normal renal function were determined in a series of adult, female *Macaca speciosa* monkeys. Using Hippuran-iodine 131 clearances as a measure, the average effective renal plasma flow was found to be 15.1 ml.–min. per kg. Using Hypaque-iodine 131 clearances as a measure, the glomerular filtration rate was 3.29 ml./min. per kg., giving a filtration fraction of 0.218, which is quite close to the value obtained in man. In addition, the maximal concentrating ability for the monkey was found to be 1,191 milliosmols/liter. Apparently, values for parameters of renal function in this species of monkey, at least with regard to those measured, are closer to those obtained in man than is the case with the more commonly used animals such as the dog and rat. Therefore, in studies in which renal function should be relatively comparable, this animal should be the animal of choice.

A68-80667
MORPHOLOGY OF THE BRONCHIAL TREE IN MAN.
Keith Horsfield and Gordon Cumming (Birmingham U., Queen Elizabeth Hosp., Dept. of Med., Great Britain).

A68-80668

Journal of Applied Physiology, vol. 24, Mar. 1968, p. 373–383. 16 refs.
Contract AF 61 (052) 775.

The anatomical arrangements of the air passages in the human lung was studied by preparing a cast with a thermosetting resin, followed by measurement of all the structures so delineated. The airways larger than 0.7 mm. in diameter have been measured individually; those smaller have been measured by a sampling technique. The data obtained from all these measurements and some derived quantities are presented. A method for numbering the generations of branches counting up the bronchial tree is described.

A68-80668
A CARDIAC CONTRACTILITY COMPUTER.

Harrison A. Zieske and Matthew N. Levy (Mt. Sinai Hosp., Dept. of Invest. Med. and St. Vincent Charity Hosp., Res. Div., Cleveland, Ohio).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 419–423.
Grants PHS HE-07724-05 and PHS HE-10951-01.

One quantitative index of cardiac contractility is the ratio of the maximum rate of isovolumic intraventricular pressure development, dp/dt, to the integal of that pressure development, IIT. An electronic device to obtain this ratio is described. The input is the analog of intraventricular pressure. Circuits to differentiate and integrate, in conjunction with peak reading memories, delays, switches, and holds, present dp/dt and IIT to a divider. Several additional indices of myocardial behavior are available outputs: mean heart rate, interval between beats, duration of systole, peak systolic pressure, and diastolic pressure.

A68-80669
AN IMPLANTABLE TELEMETRY UNIT FOR ACCURATE BODY TEMPERATURE MEASUREMENTS.

Robert J. Epstein, Joseph R. Haumann, and Richard B. Keener (Argonne Natl. Lab., Electron. Div., Ill.).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 439–445. 19 refs. AEC supported research.

A new system for measurement and telemetry of body temperatures has been developed. The system includes a telemetering implant and suitable receiving, signal processing, and recording equipment. The implant includes a temperature transducer and associated circuitry, a transmitter, and a silver oxide cell which provides power to operate the implant for about 18 wk. Thermal response time constant of the unit when ready for implantation is about 10 sec. Temperatures can be determined to an absolute accuracy of $\pm 0.05^{\circ}C$. over the range of $+32^{\circ}C$ to $+42^{\circ}C$. The system is designed for unattended operation and for easy expansion to multiply parameter measurement using frequency-division multiplexing.

A68-80670
REACTIONS TO COLD.

C. H. Wyndham, C. G. Williams, and H. Loots (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab., Johannesburg, South Africa).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 282–287. 13 refs.

A very fat and an average man were exposed for two-hr. periods on three different occasions at each of the air temperatures of 27, 20, 15, 10, and $5^{\circ}C$. Measurements were made of metabolic rates and skin and rectal temperatures. In these ranges of air temperatures, the average skin temperature of the fat man was lower than that of the average man. Heat conductances of the average man were twice those of the fat man. A sharp increase in metabolism occurred when the average skin temperature fell below $30^{\circ}C$. in the average man and below $25^{\circ}C$. in the fat man. This suggests that the latter became habituated to a lower average skin temperature. Heat conductances of both men fell sharply to minimum values as the average skin temperatures fell to $27^{\circ}C$. These results suggest that, in cold conditions, vasoconstriction of peripheral blood vessels is directly related to the level of skin temperature whereas the relationship between skin temperature and shivering is influenced by other factors, such as habituation to cold, depth of sleep, etc.

A68-80671
LUNG TISSUE RESISTANCE AND PULMONARY HYSTERESIS.

H. Bachofen (Berne U., Inselspital, Dept. of Med., Switzerland).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 296–301. 27 refs.
Swiss Natl. Sci. Found. and Berne U. supported research.

Using a plethysmographic method lung tissue resistance (Rlt) was determined in five healthy subjects breathing at five different breathing patterns. By measuring at a constant mean flow rate of about 0.5 liter/sec., a direct relationship between Rlt and the size of the tidal volume was found. In subjects breathing with similar tidal volumes only a slight increase of work done per breath against Rlt could be detected by doubling the mean flow rate; accordingly, Rlt, expressed in centimeters H_2O per liter per second, was considerably lower in hyperventilating subjects. Very high values of Rlt were obtained near full inspiratory position when breathing with medium-sized tidal volumes. These observations and the previously stated inverse relationship between Rlt and the vital capacity or the compliance, respectively, suggest the interpretation that Rlt is not an ohmic resistance, but that its value, as determined by the method described, mainly represents the degree of retarded elastic response of the lung. Therefore, an attempt was made to explain these findings on the basis of well-known phenomena such as nonflow resistive volume-pressure hysteresis and stress relaxation.

A68-80672
EFFECTS OF INTENSITY ON "CRITICAL BANDS" FOR TONAL STIMULI AS DETERMINED BY BAND LIMITING.

Walter T. Bourbon, Thomas R. Evans, and Bruce H. Deatherage (TRACOR, Inc., Sci. and Systems Div., Psychol. Sect., Austin, Tex.).
Journal of the Acoustical Society of America, vol. 43, Jan. 1968, p. 56–59. 19 refs.
ONR supported research.

Four subjects were run in a 2IFC psychophysical study in auditory masking. The signal consisted of a 100-msec. tone burst delivered in phase to the two ears. Signal frequencies between 250 and 400 Hz were used. The masking noise had spectrum levels of 45, 25, and 15 db. SPL. For each signal frequency, the signal level was found that produced P(c) of 0.54 in wide-band noise at each spectrum level. The high- and low-frequency cutoffs of the noise were then varied independently (band limited), and changes in detectability were observed. Detectability remained constant until the cutoff of the noise was raised or lowered to a critical value; from that point on, detectability improved. The function traced by improvement in detectability represents the "critical band" for the stimulus conditions used. The width of the critical bank was directly related to stimulus intensity for all signal frequencies.

A68-80673
LOUDNESS DETERMINATION AT LOW SOUND FREQUENCIES.

R. P. Hellman and J. J. Zwislocki (Syracuse U., Lab. of Sensory Commun., N. Y.).

Journal of the Acoustical Society of America, vol. 43, Jan. 1968, p. 60–64. 25 refs.
ONR and Natl. Inst. of Neurol. Diseases and Blindness supported research.

The validity of a previously introduced psychophysical method of numerical magnitude balance is discussed. The method is applied to loudness scaling at low sound frequencies. The results are shown to agree with loudness-matching data obtained in several investigations.

A68-80674
THE ROLE OF CARNITINE IN THE ANIMAL EXPOSED TO COLD.
G. Delisle M. W. Radomski (Defence Res. Med. Labs., Downsview, Ontario, Canada).
Canadian Journal of Physiology and Pharmacology, vol. 46, Jan. 1968, p. 71–75. 26 refs.

Changes in the concentrations of carnitine and its derivatives in the liver, heart, and skeletal muscle of rats exposed continuously to 4°C. for periods ranging up to seven wk. were studied by using a specific enzymatic assay for carnitine. In heart and muscle the concentrations of free carnitine and fatty acylcarnitine were not elevated in cold-acclimatized animals, but that of acetylcarnitine increased twofold. In the liver of cold-acclimatized rats, significant increases in all three of the carnitine fractions were observed. The concentration of fatty acylarnitine in tissues from control animals was greatly elevated by starvation or a high-fat diet but, in contrast, the level was not increased in cold-exposed animals subjected to the same nutritional variants. Normal rats maintained at 22°C. and injected with daily doses of dl-carnitine for 14 cooled more rapidly and survived for shorter times when exposed to −20°C. than animals injected with saline. Carnitine injections did not alter the oxygen consumption of normal or cold-exposed rats.

A68-80675
A TECHNIQUE FOR RECORDING ACTIVITY OF SUBCORTICAL NEURONS IN MOVING ANIMALS.
Edward V. Evarts (HEW, Public Health Serv., Natl. Inst. of Mental Health, Lab. of Clin. Sci., Bethesda, Md.).
Electroencephalography and Clinical Neurophysiology, vol. 24, Jan. 1968, p. 83–86. 10 refs.

The technique which has been described allows stereotaxic orientation of micro-electrodes for single unit recording in the intact monkey. The method provides for vertical penetrations and for minimum loss of time between completion of one penetration and reorientation of the electrode for the subsequent penetration.

A68-80676
EFFECTS OF VESTIBULAR STIMULATION DURING SLEEP.
G. R. Reding and C. Fernández (Chicago U., Dept. of Psychiat. and Physiol., Ill.).
Electroencephalography and Clinical Neurophysiology, vol. 24, Jan. 1968, p. 75–79. 13 refs.
Grants AF 41(609-2768, PHS 5-RO1-MH10828, PHS NB-1330, and PHS FR-55.

The effects of vestibular stimulation upon eye movements were studied in five sleeping children. The production of depressed nystagmus was significantly associated with the occurrence of the rapid eye movements of sleep. Slow conjugate deviation of the eyes was observed predominantly during the non-rapid eye movements phase of sleep.

A68-80677
ELECTROCORTICAL RECRUITING RESPONSES DURING CLASSICAL CONDITIONING.
Norman M. Weinberger, Ken Nakayama, and Donald B. Lindsley (Calif. U., Dept. of Psychobiol., Irvine and Calif. U., Brain Res. Inst. and Depts. of Physiol. and Psychol., Los Angeles).
Electroencephalography and Clinical Neurophysiology, vol. 24, Jan. 1968, p. 16–24. 17 refs.
(Contracts Nonr-233(32), Nonr-4756(03), Grants PHS 5-TI-MH-6415, and PHS 2-F2-MH-10,327.

The relationship between cortical recruiting responses (RRs) and arousal level was investigated using three cats trained in a classical conditioning situation. A complex schedule of 8/sec. thalamic stimulation (eliciting RRs) was superimposed upon an aversive, differential discrimination paradigm to assess the effects of presentation of a novel and conditioned stimulus (CS) and differential stimulus (DS) upon RRs. ECoGs were recorded on trials unaccompanied by thalamic stimulation. RRs were depressed initially during presentation of the CS when it provoked orientation as a novel stimulus, the effect habituating with continued CS presentation. These depressive effects were reinstated by pairing the CS with shock, but only after the CS produced a conditioned response (CR). Attenuation of RRs consisted of slight or severe delay of amplitude growth with or without the final attainment of control peak amplitudes, or complete blockade. The DS initially also caused depression of RRs, even when this stimulus no longer evoked CRs. Attenuation of RRs by the DS was abolished by increasing the interval between stimulus (CS or DS) onset and subsequent recruiting stimulation from 0.7 to 1.4 sec.; the CS continued to disrupt recruiting. ECoGs during non-recruiting trials appeared to be less sensitive indices of behavioral arousal than RR development and amplitude.

A68-80678
EEG ACTIVATION OF EPILEPTICS FOLLOWING SLEEP DEPRIVATION: A PROSPECTIVE STUDY OF 114 CASES.
Kenneth L. Pratt, Richard H. Mattson, Norbert J. Weikers, and Russell Williams (Aerospace Med. Div. (AFSC), Wilford Hall USAF Hosp., Dept. of Med., Neurol. Serv., Lackland AFB, Tex.).
(Am. EEG Soc., Meeting, Denver, Oct. 8, 1966).
Electroencephalography and Clinical Neurophysiology, vol. 24, Jan. 1968, p. 11–15. 7 refs.

One hundred fourteen epileptic patients with normal or borderline inter-ictal electroencephalograms (EEGs) were evaluated by a second recording after 24 to 26 hr. of sleep deprivation. Activation occurred in 41% of the patients. Follow-up studies indicated that 18% of the activations were explained by sampling, and another 28% by sleep or drowsiness. However, in the majority some other factors brought out by sleep deprivation appeared to be responsible for the activation. Detailed clinical correlations failed to show statistically significant differences between patients with activation and those without activation. A large number of patients, primarily from the activation group, related their usual seizures to loss of sleep. It was concluded that the simple technique of sleep deprivation is an effective method of obtaining activation of EEGs in epileptics.

A68-80679
MAGNESIUM PEMOLINE: STIMULANT EFFECTS ON PERFORMANCE OF FATIGUED SUBJECTS.
Sidney Gelfand, Lincoln D. Clark, Emily W. Herbert, Donna M. Gelfand, and Elaine D. Holmes (Utah U., Depts. of Psychol. and Psychiat., Salt Lake City).
Clinical Pharmacology and Therapeutics, vol. 9, Jan.–Feb. 1968, p. 56–60. 12 refs.
Abbott Labs. supported research.

Magnesium pemoline, 100 mg., as compared to placebo, facilitated performance of fatigued subjects required to do repetitious arithmetic problems for 5 hr. It acted like methylphenidate

hydrochloride, 20 mg., and d-amphetamine, 15 mg., by maintaining speed and accuracy near a predrug base line. Smaller doses of magnesium pemoline, 25 and 50 mg., were not significantly different from placebo.

A68-80680
THE TOLERANCE OF COFFEE DRINKERS TO CAFFEINE.

Theodore Colton, R. E. Gosselin, and Roger P. Smith (Dartmouth Med. School, Dept. of Pharmacol. and Toxicol., Hanover, N. H.).
Clinical Pharmacology and Therapeutics, vol. 9, Jan.–Feb. 1968, p. 31–39. 31 refs.
Grant NIH 1-K3-GM-31,789.

To decaffeinated coffee powder was added either caffeine or lactose, each in an amount of 150 mg. per dose. Prepared packets were issued to second-year medical students, who served as subjects. When consumed at bedtime, this modest dose of caffeine was significantly more effective than the lactose placebo at inducing a reduction in pulse rate in noncoffee drinkers, but not in those who habitually consumed caffeinated beverages. Small but significant differences were demonstrated in both frequency and intensity of response. Only noncoffee drinkers reported disturbances in sleep patterns, most consistently a delay in the onset of sleep. The relative insensitivity of coffee drinkers to these actions of caffeine presumably represents an acquired tolerance. Like that previously demonstrated to the diuretic and salivary-stimulating actions, this tolerance is probably low grade. Some of the cardiovascular effects of caffeine are reviewed. Heightened vagal tone appears to be responsible for the bradycardia, which is reportedly masked after high doses of caffeine by direct excitatory actions on the heart. Bradycardia has not been observed regularly after small doses of caffeine in man, apparently in large measure because most investigators failed to separate the responses of habitual and occasional coffee drinkers.

A68-80681
EFFECT OF GLUCOSE AND FRUCTOSE ADMINISTRATION ON LIPID METABOLISM IN THE RAT.

H. Bar-on and Y. Stein (Hadassah U., Hosp., Dept. of Med. "B", Lipid Res. Lab., Jerusalem, Israel).
Journal of Nutrition, vol. 94, Jan. 1968, p. 95–105. 36 refs.
Grant USDA FG-Is-168 and Hebrew U.-Hadassah Med. School supported research.

The effect of glucose and fructose on serum triglycerides was studied after prolonged feeding or under acute loads. In the rat, administration of fructose caused hypertriglyceridemia, but no change in serum triglyceride was found in the guinea pig in which fructose is said to be absorbed mostly in the form of glucose. This finding, as well as the low yield of labeled triglyceride in the chyle after fructose-^{14}C administration, and the lack of stimulation of lipogenesis in the intestine indicate that the absorption of unchanged fructose is operative in the induction of hypertriglyceridemia. In the liver more fructose than glucose was converted to triglycerides and secretion of triglycerides into the serum was higher after fructose than after glucose administration to Triton-treated rats. In addition, fructose, unlike glucose, did not stimulate lipoprotein lipase activity in adipose tissue. The sequence of events occurring in the rat after fructose feeding could be summarized as follows: when owing to low activity of glucose 6-phosphatase in the intestine, fructose is absorbed as such into the portal circulation and reaches the liver, it is converted to a-glycerophosphate. At the same time no repression of the outflow of free fatty acid from adipose tissue occurs, leading to increased triglyceride formation in the liver and its secretion into the serum. As feeding of fructose does not induce lipoprotein lipase activity in adipose tissue the egress of triglyceride from the serum and thus the homeostatic regulation of triglyceride levels is impaired leading to its accumulation in the blood stream.

A68-80682
MEASUREMENT OF CORONARY FLOW IN LOCAL AREAS OF MYOCARDIUM USING XENON 133.

Giorgio Brandi, Wadie M. Fam, and Maurice McGregor (Roy. Victoria Hosp., Joint Cardio-Respirat. Serv.; Montreal Children's Hosp.; and McGill U. Clin., Montreal, Canada).
(Am. Heart Assn., Meeting, New York City, Oct. 1966).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 446–450. 22 refs.
Grant MRC, Canada MT-1241 and John A. Hartford Found., Inc. supported research.

Kety's technique for measuring local flow was evaluated in the normal heart in 25 anesthetized dogs. Saline containing xenon 133 or ^{131}I antipyrine was injected into the free wall of the left ventricle and count rate over the injection site was recorded during washout by an external counter. The semilog replot of the decay was variable in the first 10–40 sec. Flow-to-volume ratios were calculated from the subsequent part of the curve which was exponential down to approximately 3% of the initial count rate. Increasing injection volume to 0.5 ml. caused no significant difference in estimates. Values were uninfluenced by temperature of injectate in the range 0–38°C. There was no significant difference between values based on xenon and antipyrine. When flow was increased, flow estimated by xenon increased less than flow indicated by a flowmeter. Following deep injection, washout was significantly slower (20%) than following superficial injection. There was no consistent difference between injections made at different sites on the left ventricle wall and for injections of the same depth the standard deviation of paired estimates of flow was 15% of the mean.

A68-80683
DYE INJECTOR FOR USE IN CARDIOVASCULAR STUDIES.

Edward J. Reininger (McGill U., Dept. of Physiol., Montreal, Canada).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 451–454. 10 refs.
Grant MRC, Canada MA-2179 and Quebec Heart Found. supported research.

A dye injector was developed to inject with precision a slug of dye followed by a saline rinse for use in the determination of cardiac output using the indicator-dilution technique. The injection rate is constant and is complete within 0.5 sec. The injector with its pneumatically driven injection syringes is operated using a remote push button or with the cardiac-output programmer so that the injection is phased with the respiratory cycle: The injection syringes are self-loading and the injected volumes of either the indicator or saline are varied easily. A saline injector is also described.

A68-80684
A GAS-TRANSFERRING DEVICE FOR THE HALDANE APPARATUS.

Edward J. Reininger (McGill U., Dept. of Physiol., Montreal, Canada).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 455–457. 11 refs.
Grant MRC, Canada MA-2179 and Quebec Heart Found. supported research.

An electromechanical instrument was developed to simplify gas analysis with the Haldane apparatus. It is used to transfer automatically, and for a preset number of times, the gas sample between the measurement burette and the absorption pipettes. To transfer the sample the mercury in the reservoir is caused to oscillate by reducing pressure when a solenoid valve connected to a water filter pump is actuated periodically. The volume of gas transferred in each cycle depends on the position of adjustable

electrodes within the mercury reservoir. Use of this instrument reduces the time required for each analysis and minimizes the hazards of accidentally drawing the absorbents into the wrong parts of the apparatus.

A68-80685
A MECHANOELECTRIC TRANSDUCER FOR RECORDING TRANSIENT MOTION IN BIOLOGICAL EXPERIMENTS.
Carl-Johan Clemedson and Arne Jönsson (Res. Inst. of Natl. Defense, Biophys. Sect., Sundbyberg, Sweden).
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 430–433.

A straight potentiometer type of motion transducer with a very light and stiff slider system especially made to facilitate attachment to biological objects is described. The transducer was originally developed for use in biological blast experiment for recording displacements of chest and abdominal walls, diaphragm, and other body parts of laboratory animals in which experimental conditions, such as difficulties in attachment, large accelerations, and pressure and temperature gradients, make demands on the recording device which usually are not fulfilled by most other types of motion transducers. The weight of the slider system attached to the object is about one g. but it can, if necessary, easily be made as light as 0.1 g. The force necessary to overcome the friction of the slider contact is between 20 and 50 gram force. Recorded amplitudes have varied between one and 60 mm. the recorded maximum velocity has been about 40 m./sec., and the maximum accelerations have been of the order of 10^4 g. Linearity and possible sources of error are discussed.

A68-80686
HEAT UPTAKE AND DERMAL CONDUCTANCE IN FOREARM AND HAND WHEN HEATED.
Eliezer Kamon and Harwood S. Belding (Pittsburgh U., Graduate School of Public Health, Dept. of Occupational Health, Pa.)
Journal of Applied Physiology, vol. 24, Mar. 1968, p. 277–281. 18 refs.
Contract DA-49-193-MD-2580 and Grant NIH 0H00048 (presently UI00040).

A water-filled calorimeter, with electrical heat input metered and controlled to maintain water temperature constant, was used to measure heat uptake by the forearm and hand while seated at rest in a room at 24°C. Plots of heat uptake as a function of skin temperature assumed two distinct slopes, one between 36 and 40°C. and a much steeper slope from 40 to 43°C., suggesting that conductance and dermal blood flow are constant within each temperature range. Conductance for both forearm and hand at calorimeter temperatures of 37–40°C. was five cal./min. 100 cm^2. Above 40°C. the conductance for forearm was 15 and for the hand was 24, in the same units. If the conductance values are converted to effective volumes of blood flow on the assumption that one ml. blood per °C. is required to remove one cal., the values five, 15, and 24 ml. agree well with those of others by venous occlusion plethysmography. Zero intercept of heat uptake with calorimeter temperature indicated that the blood reaching the forearm skin was 36.2°C. in winter and 36.7°C. in summer.

A68-80687
EDIBLE COATINGS.
Justin J. Alikonis and John V. Ziemba (Paul F. Beich Co., Bloomington, Ill.)
Food Engineering, vol. 39, Dec. 1967, p. 78–80.

A discussion of food coatings and their advantages is presented. Coatings add flexibility and versatility to food production. They provide better eating, and prolong the storage stability of food and its nutritional quality. Some coatings containing high-melting fats are used for space foods to reduce the rate at which bite-size products disintegrated in the mouth. Others retarding rancidity and moisture absorption are used to coat bite-size cubes of compressed freeze-dried fruits and vegetables. New edible coatings discovered recently are discussed.

A68-80688
AEROSPACE AND RESEARCH RELATIVE TO MILK AND FOOD.
Omar G. Werntz (Office of the Surg., Headquarters AF Logistics Command, Wright-Patterson AFB, Ohio).
Journal of Environmental Health, vol. 30, Nov.–Dec. 1967, p. 271–276. 6 refs.

New criteria and specifications to meet the sanitation requirements for food used in manned space flights were outlined. Packaging and production techniques were discussed. Tables listing microbiological safety requirements, environmental testing requisites for food and food packaging, volume, weight and nutritional parameters of space diets, bite-size food production techniques, menus, and some concepts for improvement of foods for space flight feeding systems and their potential public health significance were included.

A68-80689
VISIBILITY OF LIGHT SOURCES AGAINST A BACKGROUND OF UNIFORM LUMINANCE.
Melvin H. Horman (Boeing Co., Seattle, Wash.)
Journal of the Optical Society of America, vol. 57, Dec. 1967, p. 1516–1521. 15 refs.

Data on the positive-contrast thresholds of the human eye have been cross plotted in luminance values and incorporated into a nomogram for determining whether light sources can be seen either with the unaided eye, or with a telescope. The nomogram incorporates data for the two special cases where the light source is in front of, and beyond the source of background luminance; the former is readily applicable to the general cases and the latter is applicable to the important special cases of stars, planets, and other exo-atmospheric sources. The nomogram allows the effects of aberrations, diffraction, defocusing, and transmission losses in a telescope to be taken into account. The effects of aberrations, etc., in the eye itself are discussed.

A68-80690
OBSERVATIONS ON THE COURSE OF THE METABOLIC EVENTS ACCOMPANYING MILD EXERCISE.
P. Harris, M. Bateman, T. J. Bayley, K. W. Donald, J. Gloster, and T. Whitehead (Birmingham U., Queen Elizabeth Hosp., Dept. of Med., Great Britain).
Quarterly Journal of Experimental Physiology and Cognate Medical Sciences, vol. 53, Jan. 1968, p. 43–64. 55 refs.
Med. Res. Council supported research.

The changes which occur in blood lactate and pyruvate concentration during prolonged exercise at a constant rate, and the relationship of these changes to concentration changes of other blood constituents, and the modifications occurring during shorter periods of exercise were studied. The metabolic response was considerably more complex than the respiratory. There appeared to be three major groups of disturbances of the composition of the blood accompanying exercise—one group associated with beginning of exercise, one group which was maintained throughout exercise and one group which was specifically associated with the period of recovery. During the first 5 to 15 min. after the beginning of exercise there was an increase in the concentration of lactate and pyruvate, the latter reaching its maximum about five min. after the former. The increased concentration of lactate was associated with

a fall in pH and standard bicarbonate. At the same time there was a transient fall in the free fatty acids in the plasma. All these phenomena also accompanied exercise of shorter duration, in which case they continued to evolve after exercise had stopped and the concentration of lactate remained high long after the oxygen uptake has returned to its initial resting level. More prolonged exercise revealed a number of disturbances which seemed to continue indefinitely during the period of exertion. Immediately after the end of prolonged exercise, the concentration of lactate declined. By contrast, during the first few min. of recovery, the concentration of pyruvate showed an increase which was followed by a decrease. The concentrations of potassium, sodium and phosphorus fell at that time, and there was evidence from the literature that a sustained and substantial fall in phosphorus may occur. Immediately after the end of exercise, there was an increase in the concentration of glucose and free fatty acids.

A68-80691
THE CASE FOR EFFERENT CHANGE DURING PRISM ADAPTATION.

Gene Lester (Wheaton Coll., Dept. of Psychol., Norton, Mass.).
Fournal of Psychology, vol. 68, Jan. 1968, p. 9–13. 29 refs.

Proprioceptive-change theories of adaptation to distorted vision do not make it clear whether the postulated changes occur in the afferent or the efferent system. Evidence from the literature leads to the suggestion that the changes are in the efferent system.

A68-80692
THE EFFECT OF VOLUNTARY EXERCISE ON THE RESTING OXYGEN CONSUMPTION OF RATS.

G. C. Ring, G. H. Dupuch, and J. Creed (Miami U., School of Med., Coral Gables, Fla.).
Georontologia, vol. 13, no. 4, 1967, p. 194–199. 8 refs.
Grant PHS HD 00670-06.

The female Fischer or AxC rat often runs five km. per day in a revolving cage when 200 days of age. Her activity decreases to one-tenth of this by the time she is 700 days old. The male Fischer rat exercises about one-half as much while young as does the female. The food intake parallels the activity. In our non-exercising Fischer and AxC rats the resting oxygen consumption increases between 13 and 18% from 200 to 700 days of age. In exercising rats, the resting oxygen consumption decreases by two to three percent during this same period.

A68-80693
ALTITUDE EFFECTS ON THE HUMAN BODY. ULTRAVIOLET, COLD, AND LOW PRESSURE. PART III, CONCLUSION.

Gene W. Mason.
Northwest Medicine, vol. 66, Dec. 1967, p. 1119–1122. 66 refs.

The major changes that occur in each body system at high altitudes were outlined and the importance of altitude acclimatization was noted. Four fairly distinct stresses which confront the human organism during exposure to high altitude environments were considered to be: (1) decreasing temperature; (2) increasing ultraviolet radiation; (3) decreasing barometric pressure; and (4) decreasing partial pressure of oxygen.

A68-80694
THE NEW PSYCHOPHYSICS: SIX MODELS FOR MAGNITUDE ESTIMATION.

E. C. Poulton (Appl. Psychol. Res. Unit, Cambridge, Great Britain).
Psychological Bulletin, vol. 69, Jan. 1968, p. 1–19. 75 refs.
Brit. Med. Res. Council supported research.

Six pictorial models describe the effect upon magnitude estimation of the choices of the values of the independent variables: (a) the range of stimuli, (b) whether the range includes the threshold region, (c) the position of the standard (first stimulus) within the range, (d) the distance of the first variable (second stimulus) from the standard, (e) whether the set of numbers used is infinite or finite, and (f) the size of the modulus (the number given to the standard. (a) alone accounts for about one-third of the variance in S. S. Stevens' table of exponents. Effects are classified under headings of response bias, level of adaptation, and a mathematical artifact. They are more compatible with a learned-calibration theory than with a simple transducer theory, but neurophysiological data are too varied to decide between the two types of theory. Transfer effects within and between experiments are described. The approximately logarithmic relationship usually found between partition or category scales and magnitude scales can be explained in terms of (b) and (e). The exact form also depends on experimental design and history of the observers, and these points need more attention both in executing and reporting experiments.

A68-80695
A TEST OF THE INDEPENDENCE OF THE APPROACH AND AVOIDANCE GRADIENTS.

W. Kirk Richardson and John W. Donahoe (Ky. U., Lexington).
Psychonomic Science, vol. 9, Dec. 15, 1967, p. 569–570. 6 refs.
Grant PHS MH 10706; NASA supported research.

Varying the correlation between aversive and appetitive events produced by the terminal response of a conflict chain was found to alter the amount of response suppression during conflict but not the shape of the conflict gradient. These findings are inconsistent with the assumption of the independence of approach and avoidance gradients in conflict theory in so far as gradient height is concerned but support the theory in the more important aspect of gradient shape.

A68-80696
MODE OF ACTION OF THYROCALCITONIN.

C. J. Robinson, T. J. Martin, E. W. Matthews, and I. MacIntyre (Roy. Postgraduate Med. School, Dept. of Chem. Pathol., London, Great Britain).
Journal of Endocrinology, vol. 39, Dec. 1967, p. 71–79. 32 refs.
Med. Res. Council supported research.

The effect of nephrectomy on the response of thyrocalcitonin was studied in three groups of rats; intact animals on stock diet; parathyroidectomized rats on stock diet; and parathyroidectomized rats on high calcium, low phosphorus diet. In intact rats and in parathyroidectomized rats on a high calcium, low phosphorus diet, nephrectomy did not alter the fall in plasma calcium and phosphate produced by thyrocalcitonin. In parathyroidectomized rats on a stock diet, however, plasma calcium was not changed by the hormone, but there was an isolated fall in phosphate which was prevented by previous nephrectomy. Experiments with ^{45}Ca showed that when plasma calcium was lowered by thyrocalcitonin this was caused by inhibition of bone resorption. Since the hormone also causes phosphaturia, it was concluded that there are two sites of action: bone and kidney. The skeletal effect is usually dominant and the renal effect is the major one only when the rate of bone resorption is low.

A68-80697
MARINE PLANKTON ALGAE GROWN WITH LIGHT–DARK CYCLES. I. COCCOLITHUS HUXLEYI.

E. Paasche (Calif. U., Inst. of Marine Resources, San Diego).
Physiologia Plantarum, vol. 20, no. 4, 1967, p. 946–956. 23 refs.
Contract AEC AT(11-1)-34.

A description is given of an apparatus for semi-continuous cultivation of unicellular algae under various combinations of light intensity, temperature and daylength (photoperiod). In this apparatus growth of the coccolithophorid *Coccolithus huxleyi* was limited by light intensities below 0.05 cal./cm.^{2} min. regardless of daylength. Growth was retarded by daylengths shorter than 16 hr. out of a total of 24 hr. of light plus dark. The temperature optimum for growth was about 20°C. and showed little variation with daylength. The content of chlorophyll varied between two and 15 mg. per ml. cell volume and was greatest under low light intensities, short daylengths, and high temperatures. Cultures were synchronized by four different combinations of light intensity and daylength. In all four cases, cell division was restricted to six out of 24 hr. Synchronized cell division took place in the dark but its timing bore no simple relationship to the onset of termination of illumination.

A68-80698
THE CAROTENOID PIGMENTS OF DAPHNIA MAGNA STRAUS—I. THE PIGMENTS OF ANIMALS FED CHLORELLA PYRENOIDOSA AND PURE CAROTENOIDS.
P. J. Herring (Cambridge U., Dept. of Zool., Great Britain).
Comparative Biochemistry and Physiology, vol. 24, Jan. 1968, p. 187–203. 45 refs.

Animals fed the alga *Chlorella pyrenoidosa* were found to contain β-carotene, echinenone, canthaxanthin, one or more unidentified ketocarotenoids and astaxanthin, in addition to small amounts of lutein, the latter pigment being present only in the gut wall. Similar pigments were found in wild populations of *D. magna* and of other species of Cladocera. It was suggested that ketonic carotenoids found in the animals were metabolic products derived from ingested β-carotene, and this was confirmed by feeding pure carotenoids. The results of these experiments indicated that the animal is able to form echinenone, canthaxanthin and astaxanthin, in that order, from β-carotene. Isocryptoxanthin and isozeauxanthin are metabolized to echinenone and canthaxanthin respectively, but α-carotene and lutein are not converted to β-carotene derivatives.

A68-80699
THE CAROTENOID PIGMENTS OF DAPHNIA MAGNA STRAUS—II. ASPECTS OF PIGMENTARY METABOLISM.
P. J. Herring (Cambridge U., Dept. of Zool., Great Britain).
Comparative Biochemistry and Physiology, vol. 24, Jan. 1968, p. 205–221. 46 refs.

The accumulation and utilization of carotenoid pigments by *Daphnia magna* was examined under various conditions, and it was found that illumination up to intensities of about 1000 1x enhances pigment accumulation, although the effect is not mediated by either the compound or naupliar eye. Crowding of populations adversely effects carotenoid accumulation. Although about half the mother's carotenoid pigments are transferred to the eggs at each brood little if any of this pigment is utilized by the embryo during development. The presence of free or conjugated carotenoids did not enhance the growth, viability or fertility of eggs or adults exposed to a variety of environmental conditions.

A68-80700
THE EFFECT OF COMPATIBILITY ON GROUPING SUCCESSIVELY PRESENTED SIGNALS.
A. F. Sanders (Inst. for Perception RVO-TNO, Soesterberg, The Netherlands).
Acta Psychologica, vol. 26, no. 4, 1967, p. 373–382. 15 refs.

When subjects are instructed to group successively presented signals in that two responses must be simultaneously carried out, the total processing time is found to depend on the perceptual organization of the stimulus display and on signal–response (SR) compatibility. Response grouping is very inefficient in the case of low SR compatibility, suggesting a mutual interference process between response choices. When subjects are asked to handle the signals successively, the processes were not affected by compatibility. The instruction was difficult to obey however and delivered results that did not fit the Welford–Davis model on the psychological refractory period. The results are consistent with the conception of the reaction process as a series of successive transformations of the signal.

A68-80701
SOME THEORETICAL CONSIDERATIONS ON THE INHIBITION OF TUMOR GROWTH BY ULTRASTRONG MAGNETIC FIELDS.
F. Winterberg (Nev. U., Desert Res. Inst. and Dept. of Phys., Reno).
Archives of Biochemistry and Biophysics, vol. 122, Dec. 1967, p. 594–598.

The forces acting on the microstructure of a biological system have been derived in a systematic way starting from Maxwell's stress tensor. It is shown that with a magnetic field above 100 kilogauss and with a magnetic field gradient above 10 kilogauss/cm., the magnetic forces acting on a cell may become strong enough to disrupt cellular membranes and distort the ordered process of cellular division. Since cancer cells seem to have a smaller mechanical strength than normal cells, it might be possible to selectively damage cancer cells by this method. Strong magnetic fields can be most economically generated by a superconducting coil submerged in liquid helium. A simple experiment *in vitro* with a tissue culture could test the theoretical predictions.

A68-80702
EFFECT OF SPEED OF MOVEMENT ON TACTUAL-KINESTHETIC PERCEPTION OF EXTENT.
Seymour Wapner, Joseph Weinberg, J. A. Glick, and George Rand (Clark U., Worcester, Mass.).
American Journal of Psychology, vol. 80, Dec. 1967, p. 608–613. 7 refs.
Grant NIMH MH 00348.

Variations in speed of tactual-kinesthetic tracing a given physical extent significantly affects perception of that extent: with relatively faster (slower) speed a given extent is perceived as relatively shorter (longer).

A68-80703
SOME EFFECTS OF D-AMPHETAMINE ON THE BEHAVIOR OF PIGEONS UNDER INTERMITTENT REINFORCEMENT.
Eliot Hearst (Mo. U., Columbia) and John R. Vane (Roy. Coll. of Surgeons, London, Great Britain).
Psychopharmacologia, vol. 12, Nov. 8, 1967, p. 58–67. 12 refs.
Grants NIMH MH 25608 and NIMH MH-06635.

The effects of d-amphetamine (0.25 to 8.0 mg./kg.) were studied on key-pecking behavior under variable interval (high response rate) and DRL reinforcement (low response rate) in pigeons. Doses of 2.0 mg./kg. and above progressively decreased VI responding, as was the case for DRL with doses 4.0 mg./kg. and above. No consistent increases in response output on either reinforcement schedule were observed with any dose of the drug, even though prior studies have suggested that amphetamine ought to increase DRL behavior. When their behavior was reduced by d-amphetamine, DRL birds often earned many more grain

reinforcements than usual, but frequently did not consume them. No effects of d-amphetamine were observed on a color discrimination tested in the VI birds.

A68-80704
ACQUISITION OF PAIRED ASSOCIATES AS A FUNCTION OF INTERPAIR INTERVAL.
D. C. Rimm and Barbara Biggs (Ariz. State U., Tempe).
Psychonomic Science, vol. 9, Dec. 25, 1967, p. 611–612. 6 refs.

Two experiments are presented which replicated previously reported findings. Both experiments investigated the effect of varying interpair interval on acquisition of paired associates. In Experiment 1, subjects were exposed to either a zero or five sec. inter-pair interval. The group exposed to the five sec. interval reached the learning criterion in significantly fewer trials. In Experiment 2, subjects counted backwards over the five-sec. interval and did not learn significantly faster than a zero interval group.

A68-80705
PERSPECTIVE DURATION OF A PLANE REVERSIBLE FIGURE.
John R. Price (Western Australia U., Perth).
Psychonomic Science, vol. 9, Dec. 25, 1967, p. 623–624. 5 refs.

The reversal rate of a plane reversible figure is examined by measuring the duration of each phase separately. The mean duration of the first percept (P1) is found to decline over occasions while that of the reversal phase (P2) remains constant. It is concluded that the process underlying reversals can not apply equally to both phases.

A68-80706
AUDITORY DETECTION OF NARROW-BAND NOISE AND TONAL SIGNALS.
P. T. Cornelius, J. K. Whitmore, and W. A. Wilbanks (Miss. U., University).
Psychonomic Science, vol. 9, Dec. 25, 1967, p. 625–626. 15 refs.
Grant NIMH MH-14039-01.

The detectability of narrow-band noise and tonal signals is shown to be a function of the interaural correlation of the masking noise. The same amount of binaural release from masking is obtained with both signals. This finding is interpreted in terms of signal detection theory.

A68-80707
TWO-FLASH THRESHOLD, FLICKER-FUSION THRESHOLD, AND SKIN CONDUCTANCE.
Michael J. Maley (Minn. U., Minneapolis).
Psychonomic Science, vol. 9, Dec. 25, 1967, p. 633–634. 10 refs.

The subjective threshold of fusion of paired flashes of light (two-flash threshold), the critical flicker-fusion threshold, and tonic levels of skin conductance were measured in a sample of drug-free psychiatric patients. A significant positive correlation was found between the two-flash and flicker-fusion thresholds and both perceptual measures were significantly related to a range-corrected index of skin conductance.

A68-80708
STUDY OF THE EFFECTS OF ANTHOCYANIN GLUCOSIDES ON THE NIGHT VISION OF FLYING PERSONNEL [ETUDE DES EFFETS DES GLUCOSIDES D'ANTHOCYANE SUR LA VISION NOCTURNE DU PERSONNEL NAVIGANT].
Belleoud, Leluan, and Boyer.
Revue de Médecine Aéronautique et Spatiale, vol. 6, no. 23, 1967, p. 5 10. 9 refs. In French.

The effects of anthocyanin glucosides on the scotopic threshold of twenty fighter pilots and twenty helicopter pilots, and the subjective evaluation of their visual capacity in dim light were investigated. One-half of the pilots from each group were given anthocyanoside tablets four hr. and again at 90 min. before night flights, two at each time. The other half were given placebos. The threshold of night vision of all subjects was tested before and after flying. Results showed that the pilots having taken anthocyanoside tablets had a lower threshold of night vision, an increase of resistance to dazzle, a decrease in visual fatigue and an improvement in dark adaptation. The pilots having taken the placebos showed no tangible differences.

A68-80709
EFFECTS OF EAST–WEST AND WEST–EAST FLIGHTS ON CIRCADIAN RHYTHMS IN DIURESIS AND RENAL EXCRETION OF SODIUM AND POTASSIUM [INFLUENCE DES VOYAGES AERIENS EST–OUEST ET VICE-VERSA SUR LES RYTHMES CIRCADIENS DE LA DIURESE ET DE L'ELIMINATION URINAIRE DU SODIUM ET DU POTASSIUM].
E. Lafontaine, J. Sirot, J. Pasquet, and J. Lavernhe.
Revue de Médecine Aéronautique et Spatiale, vol. 6, no. 23, 1967, p. 11–15. 13 refs. In French.

Evaluations of diuresis and sodium and potassium excretion in the urine were made on ten subjects at periodic intervals throughout the biological day, for a week prior to intercontinental jet flight from Paris to Anchorage, during and after the flight in Anchorage, and for five days following return to Paris. From a comparison of these data and those obtained from east–west and west–east flights, conclusions showed that: (1) a significant decrease in diuresis, and sodium and potassium excretion was noted during the flight, with hypersecretion after; (2) east–west and west–east flights with a 20 hr. stop-over did not affect the excretion rhythm; and (3) a five day stop-over disrupted for five days the physiological rhythm with adaptation starting on the third day.

A68-80710
USE OF TELEMETRIC DIAGNOSIS DEVICES DURING THE TRANSPORTATION OF INJURED PERSONS [UTILISATION DU TELEDIAGNOSTIC POUR LE TRANSPORT DES BLESSES].
Revue de Médecine Aéronautique et Spatiale, vol. 6, no. 23, 1967, p. 23–26. In French.

Shown at the last Aeronautic and Space International Exhibition, this new French tele-diagnosis instrument is to be used on ambulances, helicopters and fixed-wing aircraft to bring rapid help to gravely sick and injured persons. It consists of a mobile set recording the cardiac output, respiratory rhythms and blood pressure, and then transmitting to a receiving set located at a hospital where the physiological facts can be monitored visually and graphically. It is estimated that this device will help in saving up to 20% of lives by improving medical aid.

A68-80711
THE BIOLOGY OF DREAMING.
Ernest Hartmann (Boston State Hosp., Sleep and Dream Lab., Mass.).
Springfield, Ill., Charles C. Thomas, 1967, xiii+206 p. 656 refs. $9.75.

This monographic review both summarizes and interprets the present information of the biology of dreaming in both theoretical importance and in the clinical aspects. This dream state, also called the rapid eye movement state, is discussed as to its physical and chemical nature, its ontogeny and phylogeny as well as its neurophysiological basis. Its function as one of the body's basic cycles and the psychological effects of dream deprivation are stressed. The relationships to mental illness such as schizophrenia and depressive illness are explored. Although the biological aspects of dreaming are emphasized throughout the book one chapter is devoted to a brief discussion of the psychological aspects of the dream itself. A large bibliography is given with works as recent as 1966.

A68-80712
JOSE DE ACOSTA, 1540–1600, FATHER OF THE AEROSPACE MEDICINE [JOSE DE ACOSTA (1540–1600) ANCETRE DE LA MEDECINE AEROSPATIALE].
E. Evrard.
Revue de Médecine Aéronautique et Spatiale, vol. 6, no. 23, 1967, p. 16–22. 9 refs. In French.

A short biography is given of Jose de Acosta along with an appraisal of his studies on altitude sickness. Spanish by birth, he was the first to give an objective and precise description of the symptomatology of hypoxia in altitude sickness.

A68-80713
A COMPARISON OF THE SEPARATE PACKAGE AND SPILL-OVER MODELS OF PHOTOSYNTHESIS FOR THE ALGA CHLORELLA PYRENOIDOSA.
W. P. Williams (Warwick U., School of Mol. Sci., Coventry, Great Britain).
Biochimica et Biophysica Acta, vol. 153, Feb. 12, 1968, p. 484–489. 15 refs.

A general expression for the fractional absorption of the pigment systems associated with the two photosystems of *Chlorella*, was derived on the basis of the changes in the action spectrum of O_2 evolution on partially poisoning the alga with 3-(4-chlorophenyl)-1,1'-dimethylurea. Two solutions of this expression were calculated, using previous experimental data, one corresponding to the separate package and the other to a perfect spill-over model. The values predicted on the basis of the separate package model were in much the better agreement with earlier results. The assumption of such a model seemed, however, to be irreconcilable with earlier observations on the wavelength dependence of the relative quantum yield of O_2 evolution. Two methods of determining the fractional absorptions incorporating these latter results were outlined. They gave differing results suggesting that the available data were inadequate. An attempt was made, therefore, to assess its reliability. The balance of evidence seemed to favor the separate package formulation but it was concluded that no final decision could be made until the relative quantum yield data have been carefully rechecked for the wavelengths of special interest.

A68-80714
DAILY RHYTHM IN THE NORADRENALINE CONTENT OF RAT HYPOTHALAMUS.
James Manshardt and Richard J. Wurtman (Mass. Inst. of Technol., Dept. of Nutr. and Food Sci., Cambridge).
Nature, vol. 217, Feb. 10, 1968, p. 574–575. 10 refs.
PHS supported research.

Three separate experiments were made to determine the effects of light and darkness on noradrenaline concentrations in five brain regions (anterior hypothalamus, posterior hypothalamus, striatum, midbrain, and thalamus-subthalamus) of rats. Significant daily rhythms were observed in the anterior- and posterior hypothalamus. The noradrenaline contents of both regions were greatest at the middle of the daily-dark period; in the anterior hypothalamus, the catecholamine concentration was low throughout the light period; in the posterior hypothalamus, the nadir was reached at the end of the dark period. In both regions, the magnitude of the daily change was 22–24%. Daily fluctuations of greater amplitude were found in the thalamus-subthalamus, but these changes were not statistically significant.

A68-80715
DEPTH AND MOVEMENT.
Clarence H. Graham (Columbia U., New York, N. Y.).
American Psychologist, vol. 23, Jan. 1968, p. 18–26. 27 refs.
Contract Nonr 266(46).

Various aspects of visual perception as related to space and movement are discussed. Included are the following: (1) monocular movement parallax; (2) depth by kinetic movement perception; (3) Ames' trapezoidal window; (4) differential movement and real movement; (5) velocity threshold as related to number of reference lines, length of stimulus line, and luminance; and (6) displacement thresholds, including effect of rate of displacement and luminance and effect of length of line. Some theoretical considerations are also discussed.

A68-80716
CHANGES IN SHORT-TERM MEMORY IN A GROUP OF AGING COMMUNITY RESIDENTS.
Daniel T. Peak (Menninger Found., Topeka, Kan.).
Journal of Gerontology, vol. 23, Jan. 1968, p. 9–16. 24 refs.
Grant NIH MH 8086.

A battery of tests was used to assess the effects of aging on short-term memory function. A sample of 130 healthy, active subjects, ranging in age from 40 to 89 yr., was tested. The 40- and 70-yr.-old groups contained equal numbers of college and non-college subjects but the main body of the sample were college-trained people. The sexes were equally represented. All of the sample was tested once, and half twice at 24-hr. intervals. Individual group means were compared followed by analyses of variance. The variables of age, sex, education, repeated testing over time, and the interaction of these were analyzed. When the groups were compared on a chronological basis, a general decline appeared in most of the tests. However, there was the tendency for the elderly to show a relatively greater improvement than the young on repeated testing, and also the tendency for the older subjects to fail to incorporate incidental material.

A68-80717
RETENTION OF TIME JUDGMENT IN YOUNG AND OLD ADULTS.
David Arenberg (HEW, Public Health Serv., NIH, Bethesda and Baltimore City Hosp., Md.).
Journal of Gerontology, vol. 23, Jan. 1968, p. 35–40. 5 refs.

Three retroaction studies of visual time judgment resulted in greater interference effects of interpolated judgments for old men than young. Two of these studies also included measures of discriminability, accuracy of the subjective second and context effects due to a shift in the distribution of stimuli. No age differences were found for these variables. For the young groups, these variables were uncorrulated with the interference effects in the retroaction studies. For the old groups, however, discriminability and accuracy of the subjective second did correlate with the change in errors following interpolated judgments, and the correlations

were higher for the old than the young. The old person's ability to resist and to recover from the interference effects of interpolated judgments is related to how well he can discriminate among time intervals and upon how accurate is his internal concept of one second.

A68-80718
HEAT TOLERANCE OF ELDERLY PERSONS LIVING IN A SUBTROPICAL CLIMATE.

Austin Henschel, Milton B. Cole, and Oksana Lyczkowskyj (HEW, Public Health Serv., Bur. of Disease Prevent. and Environ. Control, Natl. Center for Urban and Ind. Health, Cincinnati, Ohio).

Journal of Gerontology, vol. 23, Jan. 1968, p. 17–22. 11 refs.

The ability of elderly persons to tolerate a combined stress of heat and work was studied in a group of 38 females (average age = 69 yr.) and 62 males (average age = 72 yr.). The stress consisted of 70 min. of exposure to 92°F. dry-bulb and 82°F. wet-bulb temperatures with intermittent work on a bicycle ergometer. Each subject was tested both at the end of the summer and again at the end of the winter seasons. These elderly persons were able to tolerate the work-in-heat stress without evidence of excessive physiological strain. The physiological responses to the stress were lower at the end of the summer season than at the end of the winter. The reduced evidence of strain during the summer testing indicates that these elderly persons retained the ability to become heat acclimatized in response to exposure to the hot summer weather characteristic of the area. On both the summer and winter tests, the females had a higher work pulse rate and oxygen consumption per kg. body weight than did the males.

A68-80719
EFFECT OF NOVELTY ON TIME JUDGMENT BY YOUNG AND AGED PERSONS.

Eve Weeks McNanamy (Community Mental Health Serv. Clin., Miami, Fla.).

Journal of Gerontology, vol. 23, Jan. 1968, p. 41–44. 22 refs.

Seventy-two young and 36 aged subjects were individually presented with a filmstrip representing one of 12 experimental treatments of an orthogonal design, with two levels of age, three levels of stimulus complexity defined by the number of points in a random shape and four orders of presentation of the stimuli. Each subject reproduced the duration of a 29 sec. blank frame as a pretest and two 30 sec. intervals filled with random shapes. The two groups differed significantly on the pretest with the older group giving a smaller estimate of the duration. The pretest age difference was abolished on the two test trials filled with random shapes. Both groups gave longer estimates of the interval as the complexity of the stimuli increased. Implications of the results in terms of activity as a function of novel, complex, and varied stimuli for elderly persons were discussed.

A68-80720
AGE AND THE MATCHING OF SIGNAL FREQUENCY IN A TWO-CHANNEL DETECTION TASK.

Stephen Griew (Otago U., Dept. of Psychol., Dunedin, New Zealand).

Journal of Gerontology, vol. 23, Jan. 1968, p. 93–96. 9 refs.
Grant NIH HD-01691.

The hypothesis that older subjects will more quickly than younger subjects develop an appreciation of the statistical and sequential characteristics of sets of signals was tested in a study of two-channel auditory detection. On one channel 70% of available signals were recorded, while on the other channel only 30% were available. Subjects were required to find as many signals as possible by moving a channel selection lever at will. Only one channel could be selected at any one time. Older subjects did not appear, on the basis of the time spent per successive minute of the 20 min. task on the higher frequency channel, to select channels more rapidly than younger subjects in line with probability of signal presentation on them. However, their pattern of channel selecting during the second half of the task more closely reflected signal probability on the high frequency channel than did that of younger subjects, which suggested, once statistical structure had been appreciated, the maintenance of more stable channel selecting behavior. An analysis of channel changing per successive minute of the task suggested that younger subjects uncertainty increased throughout the task at a significantly greater rate than that of older subjects.

A68-80721
LATERAL VISUAL FIELD AS RELATED TO AGE AND SEX.

Albert Burg (Calif. U., Inst. of Transportation and Traffic Eng., Los Angeles).

Journal of Applied Psychology, vol. 52, Jan. 1968, p. 10–15.
Grant PHS AC-00015 and Calif. U.S. Bur. of Public Roads supported research.

Lateral nasal and temporal visual field measurements were obtained by means of a screening perimeter for nearly 17,300 subjects, ages 16–92. The major findings are: (a) temporal and total fields are maximum to about age 35, after which field constricts progressively with advancing age, (b) nasal fields increase to a maximum occurring about age 35 or 40, after which a progressive decline takes place, and (c) females consistently demonstrate slightly larger visual fields than men. Possible interpretations for these and other findings are presented, and additional research is suggested to explain some of the relationships obtained in the study.

A68-80722
THE LABORATORY ASSESSMENT OF ANTI-MOTION SICKNESS AND ANTI-VERTIGO DRUGS.

Hugh O. Barber, Wilma Basser, Walter H. Johnson, and Paul Takahashi (Toronto U., Depts. of Otolaryngol. and Pharmacol. and Toronto Gen. Hosp., Dept. of Otolaryngol., Ontario, Canada).

(Can. Otolaryngol. Soc., 21st Ann. Meeting, Quebec City, Jun. 12, 1967).
Canadian Medical Association Journal, vol. 97, Dec. 9, 1967, p. 1460–1465. 5 refs.
John A. Hartford Found. and Poulenc Ltd., Montreal supported research.

Poulenc RP 9965 (methysulfonyl-3[(carbamoyl-4" piperidino)-3' propyl]-phenothiazine) was given by mouth in doses of five, 10 and 15 mg. to groups of healthy volunteer subjects, to investigate its possible effect on suppression of motion sickness induced in the laboratory by strong Coriolis accelerations. Random administration, placebo comparison and double-blind control procedures were followed. The drug was ineffective in providing protection from motion sickness at intervals from one and one-half to 24 hr. after ingestion. Significant side effects were not observed.

A68-80723
PURIFICATION AND SOME PROPERTIES OF SCENDEDESMUS FERREDOXIN.

Hiroshi Matsubara (Calif. U., Space Sci. Lab., Berkeley).

Journal of Biological Chemistry, vol. 243, Jan. 25, 1968, p. 370–375. 22 refs.
NASA Grant NsG 479.

A simple procedure for purification of ferredoxin from a green alga, *Scenedesmus*, is described. Crystalline ferredoxin had

an absorption spectrum with maxima at 276, 330, 421, and 464 mμ., and with minima at 255, 293, 390, and 445 mμ. The ratios of the optical densities at 421 and 330 mμ. to that at 276 mμ. were 0.651 and 0.883, respectively. The substance was shown to be pure by disc electrophoresis and sedimentation equilibrium methods. Two atoms of iron and two moles of labile sulfur were found per mole of ferredoxin. The amino acid composition was Lys_{49}, His_1, Arg_1, Trp_0, Asp_{12}, Thr_{10}, Ser_8, Glu_{10}, Gly_7, Ala_{10}, Cys_6, Val_5, Met_1, Ile_3, Leu_7, Tyr_4, Phe_3, $(NH_3)_2$. The amino- and carboxyl-terminal sequences are ala-Thr-Tyr-Lys-Val-Thr-leu-Lys-Thr-Pro and Leu-Phe, respectively. The activity of ferredoxin was assayed by the photo-reduction of TPN with illuminated spinach chloroplasts. Ferredoxins of spinach, Swiss chard, and *Scenedesmus* were found to have identical activities.

A68-80724
QUANTITATIVE IMMUNOLOGICAL DETERMINATION OF 12 PLASMA PROTEINS EXCRETED IN HUMAN URINE COLLECTED BEFORE AND AFTER EXERCISE.

Jacques Poortmans and Roger W. Jeanloz (Mass. Gen. Hosp. and Harvard Med. School, Depts. of Biol. Chem. and Med., Lab. of Carbohydrate Res., Boston).

Journal of Clinical Investigation, vol. 47, Feb. 1968, p. 386–393. 45 refs.
Grant NIH AM-350.

Urine was collected from six healthy male adults at rest and from 20 male adults after a marathon race (25 mi.). Albumin, γA-globulin, and γG-globulin represent the major part of the plasma proteins detected in normal urine excreted by humans at rest (12, 0.3, and 2.5 mg. respectively, out of a total excretion of 17.5 mg. of plasma proteins per 24 hr.). The other plasma proteins were excreted at a lower rate (<0.4 mg./24 hr.). The relative content of tryptophan-rich prealbumin, α_1-antitrypsin, Gc-globulin, transferrin, and γG-globulin was lower in normal urine than in normal serum, whereas that of α_1-acid glycoprotein, β_2-glycoprotein I, and γA-globulin was higher. The ratio of γG-globulin to γA-globulin was 4.9:1. Strenuous exercise increased (up to 50-fold) the excretion of plasma proteins which represent 82% of the total proteins found in urine, instead of 57% in urine collected from humans at rest. There was particularly a significant rise of tryptophan-rich albumin, albumin, α_1-acid glycoprotein, transferrin, γA-globulin, and γG-globulin (0.26, 127, 11.8, 3.3, 1.2, and 2.0 μg. respectively, out of a total excretion of 167 μg. of plasma proteins per min.). The ratio of γG-globulin to γA-globulin was 16:1. After exercise, the renal clearance of proteins increased from two to 40 times, but, as for the urine of normal subjects at rest, no direct relationship between molecular weight and renal clearance could be observed.

A68-80725
TORQUE SENSITIVITY AS A FUNCTION OF KNOB RADIUS AND LOAD.

Burrton Woodruff and Harry Helson (Kan. State U., Manhattan).

American Journal of psychology, vol. 80, Dec. 1967, p. 558–571. 11 refs.
Grant NIMH MH 8359.

This paper presents results of research in which torque-sensitivity was measured as a function of knob diameter and load through the use of knobs of various diameters and loads of various amounts. It was found that for stimuli of 100-e-gm. or less, torque sensitivity is inversely related to stimulus magnitude. As stimulation increases from 8.35 to 100-e-gm., the Weber fraction decreases from 0.126 to 0.044. When different knob sizes and loads produce the same stimulus value in e-gm., the absolute and relative difference limens reflect only stimulus-magnitude and not the way in which the stimulus was produced. Thus knob-radius and loading are not important determiners of sensitivity *per se*. Their importance lies in the manner in which they produce changes in stimulus magnitude as measured in e-gm. Torque sensitivity did not show improvement with practice nor was the sensitivity of the two sexes found to be different.

A68-80726
FAT-MOBILIZING ACTION OF AMPHETAMINE.

E. J. Pinter and C. J. Pattee (Queen Mary Veterans Hosp., Clin. Invest. Unit and McGill U., Dept. of Invest. Med., Montreal, Canada). (Can. Soc. for Clin. Invest., Meeting, Toronto, 1965).

Journal of Clinical Investigation, vol. 47, Feb. 1968, p. 394–402. 31 refs.

The effects of amphetamine and methamphetamine on plasma free fatty acid (FFA), blood glucose, serum total fat, and triglyceride concentrations were investigated in 21 subjects; the effect of epinephrine were studied in an identical manner in 14 subjects. The administration of amphetamine and methamphetamine led to an increase in the plasma FFA concentration. No significant changes were found in the blood glucose, serum total fat, and triglyceride concentrations. Kinetic studies of FFA were also made in some of the subjects receiving amphetamine, methamphetamine, and epinephrine. It was shown that amphetamine, and methamphetamine lead to an augmentation of plasma FFA pool due to a primary increase of FFA production rate. Catecholamine depletion, by prolonged parenteral administration of reserpine, nearly completely abolished the adipokinetic action of amphetamine whereas the effect of epinephrine was greatly potentiated. This was interpreted as evidence for the dependence of the adipokinetic action of amphetamine on endogenous catecholamines. Estimated from a dose ratio (amphetamine: epinephrine) of 352:1, the relative adipokinetic potency of amphetamine, expressed as peak ΔFFA rise, +ΔFFA area, and ΔFFA production rate, respectively, was found to be 55, 85, and 39% in comparison with the same effects of epinephrine. The more pronounced changes in +ΔFFA area reflect the longer duration of action of amphetamine viz. epinephrine. This study demonstrates that amphetamine is an adipokinetic agent causing an increase in the plasma FFA pool of a lesser extent but of longer duration than equipressor doses of epinephrine. The mechanism of fat-mobilizing action of amphetamine is indirect i.e., dependent on endogenous catecholamine release.

A68-80727
INFLUENCE OF CENTRIFUGAL PATHWAYS ON UNIT ACTIVITY IN THE COCHLEAR NUCLEUS.

S. D. Comis and I. C. Whitfield (Birmingham U., Med. School, Neurocommun. Res. Unit, Great Britain).

Journal of Neurophysiology, vol. 31, Jan. 1968, p. 62–68. 17 refs.
Grant AF EOAR 63-115 and U.K. Sci. Res. Council supported research.

Current stimulation of the S segment of the superior olive (cat) results in facilitation of the activity of many units in the ipsilateral ventral cochlear nucleus, and in some cases, in a lowering of their threshold to sound stimuli. This effect is blocked by the local application of cholinergic blocking agents to the cochlear nucleus neuron. Stimulation of the nuclei of the lateral lemniscus influences unit activity in both the dorsal and ventral cochlear nuclei of the opposite side. It may produce either inhibition or facilitation, according to the relative positions of the stimulating and recording electrodes.

A68-80728
PYRAMIDAL TRACT EFFECTS ON INTERNEURONS IN THE CAT LUMBAR DORSAL HORN.

Eberhard E. Fetz (Mass. Inst. of Technol., Dept. of Biol. and Res. Lab. of Electron., Cambridge).

Journal of Neurophysiology, vol. 31, Jan. 1968, p. 69–80. 33 refs.
Contract AF 33(615)-3885, and Grant NIH 5 R01 NB-04879-03; Teagle Found., Inc. supported research.

The pyramidal tract (PT) of "guillotined" and decerebrate cats was stimulated at the medullary level, and the effects on the activity of lumbar dorsal horn cells investigated. Field potentials evoked in the lumbar cord by PT and cutaneous electrical stimulation were analyzed to determine their "source density distribution," defined as the negative Lapalcian of the field potential distribution. The source density of field potentials evoked by PT stimulation was greatest in laminae six and five; peripheral shocks evoked field potentials with greatest source density between laminae two and five. Negative dorsal root potentials (DRP) evoked by PT stimulation were found to correlate with inhibition of evoked responses in many layer four and five cells. A late positive phase of the DRP was regularly observed, but no evidence was found to indicate that it correlated with hyperpolarization of the afferent cutaneous fibers. Single cells of the dorsal horn were grouped into layers on the basis of their anatomical location and their responses to natural stimulation. Layer four cells were found in lamina four and responded to cutaneous stimulation over small receptive fields; two-thirds of the layer four cells were inhibited by PT volleys. Layer five cells were located in lamina five and responded to skin stimulation over large fields; about one-third were excited and one-third inhibited by PT stimulation; one-fifth responded with mixed excitation and inhibition. Layer six cells, in lamina six, often responded to joint movement as well as cutaneous stimulation on the ipsilateral limb; two-thirds of these cells were excited by PT stimulation. These results, combined with the findings of others, support the hypothesis that the inhibition seen in layer four and five cells is at least partly presynaptic and mediated by PT fibers from postcruciate cortex. The excitation of cells in layers six and five may be largely direct and evoked by PT fibers from precruciate cortex.

A68-80729
ROLE OF BRAIN-STEM AUDITORY STRUCTURES IN SOUND LOCALIZATION. II: INFERIOR COLLICULUS AND ITS BRACHIUM.

R. Bruce Masterton, John A. Jane, and Irving T. Diamond (Vanderbilt U., Dept. of Psychol., Nashville, Tenn. and Duke U., Dept. of Psychol., Durham, N. C.).

Journal of Neurophysiology, vol. 31, Jan. 1968, p. 96–108. 20 refs.
Grants NIMH M-4849 and NINDB NB-5251.

Cats were trained in a double grill box to perform a series of four auditory discriminations graded in complexity. The final two discriminations in the series required the cat to respond to the locus of a lateralized sound image. In the first of the two lateralization discriminations the cats were trained to respond when a safe signal, consisting of a train of clicks to the left ear, was replaced by a warning signal, a train of clicks to the right ear. When this left versus right discrimination (L vs. R) was mastered the cats were presented with the final task. A train of click pairs, in which the left click preceded the right click by 0.5 msec., constituted the new safe signal while the new warning signal contained the identical click pairs except the order within the pair was reversed, LR vs. RL. In cats with intact auditory systems each of the discriminations is learned quickly and training on one lateralization discrimination (L vs. R) transfers to the second (LR vs. RL). Bilateral ablation of the inferior colliculus, which is deep enough to divorce the forebrain from auditory structures in the hindbrain, renders a cat incapable of using either time or intensity cues for sound lateralization. Bilateral ablation of the apical region of the inferior colliculus, which spares a large portion of the underlying lemniscal pathways, does not impair discrimination of lateralized sounds. Lesions which sever the rostral projections of the tectum but spare the inferior colliculus itself abolish lateralization based on binaural time difference (LR vs. RL). In these cases the impairment of lateralization based on intensity differences (L vs. R) may be related to the depth to which the lesion invades the lateral tegmentum.

A68-80730
RECOVERY TIME AS A MEASURE OF CER STRENGTH: EFFECTS OF BENZODIAZEPINES, AMOBARBITAL, CHLORPROMAZINE AND AMPHETAMINE.

S. S. Tenen (Chas. Pfizer and Co., Inc., Med. Res. Labs., Groton, Conn.). *Psychopharmacologia,* vol. 12, Nov. 8, 1967, p. 1–17. 29 refs.

A procedure was presented that used recovery time (the time the rat requires to resume drinking after the conditioned stimulus (CS) presentation) as a measure of conditioned emotional response (CER) strength. This measure varied directly with two of the more important conditioning variables: unconditioned stimulus (shock) intensity and number of training trials. Since the CS is imposed upon ongoing drinking behavior recovery time is also affected by thirst motivation. Several selected drugs were tested with this procedure. The anxiety-reducing benzodiazepines (chlordiazepoxide, diazepam and nitrazepam) and amobarbital produced faster recovery times as compared with controls. In contrast, chlorpromazine produced a non-significant increase in recovery time. The stimulant, d-amphetamine, did not affect the recovery time measure in any significant way. The faster recovery times produced by chlordiazepoxide were shown not to be a result of a state-dependent (dissociated) learning effect or any increase in thirst motivation. It is believed that this simple procedure can be used to investigate drugs (or other variables) that might affect CER strength.

A68-80731
EFFECTS OF CHLORDIAZEPOXIDE AND SECOBARBITAL ON FILM-INDUCED ANXIETY.

Richard C. Pillard and Seymour Fisher (Boston U., Med. Center, Div. of Psychiat., Psychopharmacol. Lab., Mass.).

Psychopharmacologia, vol. 12, Nov. 8, 1967, p. 18–23. 8 refs.
Grants NIMH MH-7753 and NIMH MH-08954; Roche Labs. and GRS supported research.

Normal college students were given a single dose of chloriazepoxide, secobarbital or placebo 85 min. before being shown an anxiety-inducing film. Measures of sedation and of subjective anxiety were taken before and after the film. Results indicate that chlordiazepoxide and secobarbital had a measurable sedative action compared with placebo. Neither medication showed a significant anti-anxiety effect.

A68-80732
THE EFFECT OF AMPHETAMINE ON A SERIAL REACTION TASK.

R. N. Herrington (Aberdeen U., Marischal Coll., Dept. of Physiol., Great Britain).

Psychopharmacologia, vol. 12, Nov. 8, 1967, p. 50–57. 14 refs.
Med. Res. Council supported research.

The performance of three groups of subjects, receiving 10 mg. d-1 amphetamine, 25 mg. ascorbic acid and no drug respectively, on a four-choice serial reaction task was studied. Of the various aspects of behavior assessed, the amphetamine group was distinguished only in the reduced commission of errors. Among subjects not receiving amphetamine there was a significant positive correlation between the total number of errors made and the E score of the Maudsley Personality Inventory. The results are discussed in relation to Eysenck's inhibition theory.

A68-80733
THE EFFECT OF SPEED AND LOAD CHANGES ON OXYGEN INTAKE FOR EQUIVALENT POWER OUTPUTS DURING BICYCLE ERGOMETRY.
E. W. Banister and R. C. Jackson (Brit. Columbia U., Human Performance Lab., Vancouver, Canada).
Internationale Zeitschrift für Angewandte Physiologie, vol. 24, Nov. 14, 1967, p. 284–290. 12 refs.
Natl. Health and Welfare, Dept. supported research.

Investigations of the effect of speed of pedaling and load changes on oxygen intake for equivalent power were made on one high caliber athlete. It was demonstrated that the oxygen intake at low power developed at high rates against small resistance is equivalent to that at much higher power developed at slower rates and against higher resistances. These results highlighted the great disparity in the methods currently used by investigators to study physical working capability. Several limitations in the existing methodology in all rate determined work tests were noted and some criteria for establishing a standard international methodology was suggested.

A68-80734
PHYSIOLOGICAL REACTIONS OF DESERT BUSHMEN IN HOT, DRY AND HOT, HUMID CONDITIONS.
C. H. Wyndham, N. B. Strydom, C. H. van Graan, A. Heynes (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab. and Phys. Sci. Lab., Johannesburg, South Africa), and T. Hodgson (C.S.I.R., Natl. Mech. Eng. Res. Inst., Pretoria, South Africa).
Internationale Zeitschrift für Angewandte Physiologie, vol. 24, Nov. 14, 1967, p. 315–319.

A study was carried out on Bushmen in the Kalahari desert in which ten subjects were exposed to hot, humid conditions and hot, dry conditions. Sweat rates, heart rates and rectal temperatures were measured over a two-hr. period during physical exercise. The rectal temperatures and heart rates were slightly lower in the hot, dry condition and the sweat rates slightly higher. From the results, it appeared that a hot, humid environment can be used for the study of physiological reactions of desert dwellers, and they may be compared with the reactions of other populations without introducing significant errors.

A68-80735
THE EFFECT OF POSITIVE CENTRIFUGAL ACCELERATION UPON THE DISTRIBUTION OF VENTILATION AND PERFUSION WITHIN THE HUMAN LUNG, AND ITS RELATION TO PULMONARY ARTERIAL AND INTRAOESOPHAGEAL PRESSURES.
D. H. Glaister (R.A.F., Inst. of Aviation Med., Farnborough, Great Britain).
Proceedings of the Royal Society, vol. 168, Sep. 12, 1967, p. 311–334. 35 refs.

The influence of gravity on the distributions of ventilation and blood flow, as demonstrated by the effects of posture, is discussed and explained on the theoretical basis of gravitational gradients of pressure within the lung tissue and blood vessels. Ventilation and blood flow were measured using radioactive xenon and scanning the lung. In addition, pulmonary arterial pressures were monitored during acceleration, and a hydrostatic indifference plane was demonstrated lying 5 cm. below the hilum. At this level, the pulmonary arterial pressure averaged 16.3 mm. Hg systolic, 6.8 mm. Hg diastolic, and had a mean pressure of 10.7 mm. Hg. It was unaffected by accelerations of up to 3 g. A gradient in intraesophageal pressure was demonstrated by the use of a double balloon lying in the lower esophagus, and this gradient was found to be proportional to the applied acceleration. It averaged 0.37 cm. water/cm. per g. At 3 g with the subjects seated erect, the base of the lung was better ventilated than the apex (in terms of ventilation per unit alveolar volume) in the ratio of 2.6 to 1; the corresponding ratio at 1 g was 1.8 to 1. Ventilation increased linearly with distance down the lung at all levels of acceleration investigated. At 3 g, the upper 14 cm. of the vertical height of the lung were without perfusion, and perfusion increased linearly with distance down the remaining lung three times as fast as it did at 1 g. At 1 g, only the uppermost 4.5 cm. of the lung were without perfusion. The unperfused lung represented 45% of the total ventilated volume at 3 g and 13% of the total at 1 g. At 3 g, the pulmonary blood flow at the lung base was 3.3 times the average value for the whole lung, whereas at 1 g this excess was only 1.8 times.

A68-80736
THE DEPENDENCE OF THE WORK FREQUENCY AND FREQUENCY INCREASE AT A SUBMAXIMAL ERGOMETER LOAD ON AGE AND WEIGHT [DIE ABHANGIGKEIT DER ARBEITSFREQUENZ UND FREQUENZSTEIGERUNG BEI EINER SUBMAXIMALEN ERGOMETERBELASTUNG VON ALTER UND GEWICHT].
F. H. Hertle, H. Abel, and H. Heidl (II. Med. Universitätsklin. and Poliklin., Mainz, West Germany).
Internationale Zeitschrift für Angewandte Physiologie, vol. 24, Nov. 14, 1967, p. 320–332. 44 refs. In German.

Eighty-eight untrained, healthy men 30 to 60 yr. old were studied during bicycle exercising over eight min. with moderate workloads related to the body weight. All measurements were made with the subjects in the supine position. The relations between the mean working pulse rate and the mean pulse increase to age and body weight were calculated. The proved pulse rates were mean values over the last four min. in the relative steady state. Results were: (1) no certain linear relationship existed between the mean working pulse and the pulse increase to age; (2) the relationship between working frequency and body weight was for all groups together statistically significant ($P<0.05$); (3) the increase of pulse rate (as mean value in the relative steady state) was a better parameter than the (absolute) working frequency; (4) in the 50 to 60 yr. old subjects, the last parameter was statistically different to the 40 to 50 yr. old subjects with $P<0.005$ and statistically significant ($P<0.05$) to the 30 to 40 yr. old subjects; (5) there was no negative correlation between increase of pulse rate to age during submaximal working loads as it is known with maximal exercising; (6) no significant correlations were found between increase of pulse frequency to age at constant body weight and between the same parameter and body weight at constant age; and (7) only persons with a body weight below 100 kg. or within the range of +25% of normal weight (predicted from age and height) were appropriate for this body weight related exercise test. This was valid especially for persons below 45 yr. of age.

A68-80737
EFFECT OF REPEATED INTERMITTENT SO-CALLED PINK NOISE FOR FOUR HOURS ON CATECHOLAMINE SECRETION AND PULSE FREQUENCY [EINFLUSS VON WIEDERHOLTEM VIERSTUNDIGEM, INTERMITTIERENDEM, SOGENANNTEN ROSA RAUSCHEN AUF CATECHOLAMINAUSSCHEIDUNG UND PULSFREQUENZ].
Wolfgang Hawel and Hilde Starlinger (Max-Planck-Inst. für Arbeitsphysiol., Dortmund, West Germany).
Internationale Zeitschrift für Angewandte Physiologie, vol. 24, Nov. 14, 1967, p. 351–362. 38 refs. In German.

Ten human subjects took part in an experiment involving an extensive series of tests for ten successive weeks. In each case, the tests were given on the same day of the week and at the same

time of day. The experimental conditions were identical except for the noise parameter and omissions in the fifth and tenth experiments, so that increasing habituation of the subjects to the experimental conditions was assured. The noise was repeated intermittent white noise. The subject was exposed to noise on the experimental day and remained in quietness on the others. The first four experiments for each subject were not used in the evaluation. The secretion of adrenaline and noradrenaline, the pulse frequency and the psychological state of the subjects were examined. The increased adrenalin secretion during the second half of the experiment was ascertained at 5%, and a tendency for increased pulse frequency was noted. The psychological results were reported elsewhere.

A68-80738
OXYGEN CONSUMPTION, HEART RATE AND VENTILATION AT VARIATIONS OF PEDALING FREQUENCY AND TREAD FORCE DURING AEROBIC BICYCLE EXERCISE [SAUERSTOFFAUFNAHME, PULSFREQUENZ UND VENTILATION BEI VARIATION VON TRETGESCHWINDIGKEIT UND TRETKRAFT BEI AEROBER ERGOMETERARBEIT].

Karl W. Heinrich, Hans-V. Ulmer, and Jürgen Stegemann (Cologne U., Inst. für Normale and Pathol. Physiol., West Germany).

Pflügers Archiv für die gesamte Physiologie, vol. 298, Jan. 10, 1968, p. 191–199. 24 refs. In German.

Heart rate and ventilation as a function of oxygen consumption, pedaling frequency and brake setting were investigated in five subjects in the steady state of an aerobic bicycle exercise. The load was varied from 0 to 25 kg. and pedaling frequency from 10 to 130 r.p.m. In all subjects ventilation and heart rate were related only to the oxygen consumption, but were found to be independent of mechanical factors. These results showed that in muscular exercise ventilation and circulation are primarily controlled by chemoreceptors located in the muscles which are stimulated by metabolic factors. There was no evidence for effects of muscular mechanoreceptors on the control circuits for ventilation and heart rate.

A68-80739
OBSERVATIONS ON THE BLOOD PRESSURE OF TIBETANS.

A. K. Sehgal, Iqbal Krishan, R. P. Malhotra, and H. D. Gupta (Med. Coll., Depts. of Med., Amritsar and Inst. of Postgraduate Med. Educ. and Res., Chandigarh, Punjab, India).

Circulation, vol. 37, Jan. 1968, p. 36–44. 49 refs.

Observations on the blood pressure of a group of 660 displaced male Tibetans revealed striking dissimilarities in regard to the mean systolic and diastolic figures as compared to those reported for Europeans and Americans. The average Tibetan figures were lower than those of Western populations; however, a comparable variability after the fourth decade and a parallel spread of values with age and weight were found in the Tibetan data. The socioeconomic status and height bore no relation to the blood pressure levels. The results obtained from this survey on the Tibetans were compared with those of other Mongolian groups. It was suggested that the differences of blood pressure among related Mongolian groups and populations studied in the West are largely determined by environment.

A68-80740
FORM DISCRIMINATION AS A FUNCTION OF SEX, PROCEDURE AND TACTUAL MODE.

Glen M. Vaught (Albion Coll., Ohio).

Psychonomic Science, vol. 10, Feb. 5, 1968, p. 151–152. 7 refs.

Forty males and 40 females were randomly assigned to two tactual form discrimination tasks, easy and difficult under conditions of active and passive touch. Females were found to be better form discriminators than males, and increased task difficulty resulted in highlighting female superiority.

A68-80741
PRESENT STATE OF RESEARCH ON THE EFFECTS OF RADAR WAVES ON LIVING ORGANISMS AND RELATED SAFETY MEASURES. PART 1: GENERAL PRINCIPLES OF PHYSICS AND PHYSIOPATHOLOGICAL EFFECTS [NOZIONI ATTUALI CIRCA GLI EFFETTI DELLE ONDE RADAR SUGLI ORGANISMI VIVENTI ED I RELATIVI MEZZI DI PROTEZIONE. PARTE PRIMA: PRINCIPI GENERALI FISICI ED EFFETTI FISIOPATOLOGICI].

R. Busco and L. Comignani (Rome U., School of Specialization in Med. Aeron. and Space, Italy).

Rivista di Medicina Aeronautica e Spaziale, vol. 30, Jul.–Sep. 1967, p. 469–528. In Italian.

The first part of a general review of the present state of research on the biological effects of radiation is presented. Some basic concepts of electromagnetic waves, their properties, methods of transmission, emission, irradiation, and propagation are defined. Results of laboratory experiments and clinical studies on persons working on radar installation in general, are reported. Biological effects of electromagnetic radiation: hyperthermia (local over-exposure and total body exposure), chronic effects such as cataract and temporary sterility are discussed. Recent American and Soviet studies on the subject are reviewed.

A68-80742
THE EFFECT OF HYPOXIA ON THE MECHANICAL ACTIVITY OF THE CANINE SMALL INTESTINE.

Joseph Szurszewski and F. R. Steggerda (Ill. U., Dept. of Physiol. and Biophys., Urbana).

American Journal of Digestive Diseases, vol. 13, Feb. 1968, p. 178–185. 30 refs.
Grant NIH 1-F1-GM-29-523.

The effects of four hr. of hypoxia on the contractile activity of intact jejunal segments of unanesthetized animals was investigated by use of extraluminal force transducers. The frequency of contraction of the longitudinal and transverse axes was less than that in normal segments. Although spikes initiate contraction, the slow-wave frequency determines the maximal contractile frequency of both muscle layers. The myenteric plexus synchronizes the contractile patterns between muscle layers and coordinates contractile activity between adjacent intestinal segments. The plexus appears to regulate the level of intestinal tone.

A68-80743
CARBON MONOXIDE POISONING.

Glenn M. Kokame (Tulane U., School of Med., Dept. of Surg., New Orleans, La.) and Stanton E. Shuler (Ochsner Clin., Dept. of Pediat., New Orleans, La.).

Archives of Surgery, vol. 96, Feb. 1968, p. 211–215. 10 refs.
Grants PHS CA-5108-04 and PHS CA-05837-05.

Two brothers poisoned by the inhalation of carbon monoxide (CO) were treated successfully with oxygen under pressure in a hyperbaric chamber. Inhalation of oxygen at three atm. absolute pressure rapidly corrects anoxia and hastens removal of CO from the blood and tissues. Hyperbaric oxygenation for treatment of CO intoxication is an innovation that has yielded impressive, unequivocal results. The symptoms of CO poisoning by percentage saturation in the blood were given.

A68-80744
CAPILLARY FILTRATION COEFFICIENT IN THE EXTREMITIES OF MAN IN HIGH ENVIRONMENTAL TEMPERATURES.
Chester Hyman and W. H. Wong (Southern Calif. U., School of Med., Dept. of Med., Sect. of Dermatol., Los Angeles).
Circulation Research, vol. 22, Feb. 1968, p. 251–261. 27 refs.
Grant PHS HE 00352-17.

The capillary filtration coefficient was measured in human extremities by a simplified technique using the capacitance plethysmograph. The method was validated in terms of consistency of values obtained on the same individual at various times, the correspondence between values obtained on a group of normal persons, and the agreement between values reported here and those of earlier workers made under corresponding environmental conditions and duration of measurement after venous occlusion. The technique was used to evaluate the change in capillary filtration coefficient in the calves of subjects when ambient temperature was increased from 20° to 35°C. Corresponding measurements of total blood flow in this segment and determinations of the clearance of iodide ion from pretibial intradermal depots were made in both environments. Cutaneous blood flow increased by almost 170% and the capillary filtration coefficient by about 40%, whereas the clearance did not change. It is concluded that neither the capillary filtration coefficient nor the clearance of isotopes from tissue depots has been established as a valid measure of capillary surface area. The possibility that during venous occlusion, fluid accumulated primarily in the subcutaneous tissues of the extremity is suggested and discussed.

A68-80745
TOXICOLOGICAL EXPERIMENTAL WORK ON THE HYGIENIC ASSESSMENT OF LOW CONCENTRATIONS OF INORGANIC FLUORINE COMPOUNDS IN THE AIR [TOXIKOLOGISCHE EXPERIMENTALWERTE ZUR HYGIENISCHEN EINSCHATZUNG GERINGER KONZENTRATION ANORGANISCHER FLUORVERBINDUNGEN IN DER LUFT].
M. S. Sadilowa and L. N. Jelnitschnych.
Zeitschrift für die gesamte Hygiene und ihre Grenzgebiete, vol. 13, Oct. 1967, p. 741–746. In German.

The toxic effects of low concentration inorganic fluorine compounds in air were investigated. It was found that the severity of the toxic effect of different fluorine compounds depends on their concentration in the organism, as well as on the solubility in the biological media. The fluorine gases rank first in biological toxicity, and are followed by the fluorides which are soluble in the biological media. Fluorine salts manifest the poorest effect due to their poor solubility. A table of permissible concentrations of individual fluorine compounds in air was given.

A68-80746
INFLUENCE OF LOW FREQUENCY ELECTROMAGNETIC FIELDS ON THE TOXINE GENERATING POTENTIAL OF THE TETANIC BACILLUS [INFLUENTA CIMPURILOR ELECTROMAGNETICE DE JOASA FRECVENTA ASUPRA POTENTIALULUI TOXINOGENETIC AL B. TETANIC].
GH. Creteanu, N. Lascu, and V. Bejan.
Studii si Cercetări de Balneologie si Fizioterapie, vol. 8, 1967, p. 594–598. In Rumanian.

The present experimental study, studied the action of low frequency electromagnetic fields *in vitro* and *in vivo* on the tetanic bacillus. Observations showed that: (1) taking into consideration the experimental conditions the electromagnetic fields influence the metabolic activity of a culture of *Bacillus tetanicus*; (2) if in a first stage the process of toxine generation is stimulated the continuous action of electromagnetic fields on a culture of tetanic bacilli in successive generations led to progressive loss of the capacity for the elaboration of toxine; and (3) electromagnetic fields also influence the evolution of tetanic intoxication in mice.

A68-80747
A STUDY OF THE ACTION OF LOW FREQUENCY ELECTROMAGNETIC FIELDS IN GYNECOLOGICAL DISTURBANCES [STUDIUL ACTIUNII CIMPURILOR ELECTROMAGNETICE DE JOASA FRECVENTA IN AFECTIUNILE GINECOLOGICE].
I. Haimovici, A. Măcelariu, Ana Maria Zirra, P. Stănescu, Olga Cărbunescu, Margareta Fulea, Maria Boc, Irina Anton, I. Vlad, VL. Slăvescu, D. Diaconu, Lucia Bittmann, Camelia Voiculescu, and L. Agapie.
Studii si Cercetări de Balneologie si Fizioterapie, vol. 8, 1967, p. 561–566. 19 refs. In Rumanian.

The action of low frequency electromagnetic fields was investigated in 109 cases of metroannexitis with menstrual functional disturbances. One to three series of 12–18 applications each, were given of 50 and 100 Hz. electromagnetic fields, in continuous regime, by means of two selfelectrodes (cervical and lumbar) and another placed upon the lower area of the abdomen. The best clinical results, especially as regards the pain and dyspareunia, were obtained, in cases with microscopical lesions. From the viewpoint of the functional pre-menstrual syndrome good results were obtained in 85% of the investigated cases (79 out of 93 cases). At the same time the results were favorable and lasting in the functional dysmenorrhaeic syndrome as well as in the pre-menstrual and menstrual syndromes in 69% of the cases (44 out of 64 cases). In chronic cervical and uterine inflammations (chronic exo- and endocervicitis) an increase was found, at the colposcopical examination, of the amount of secretion originated in the cervical glands and subsequent draining, a fact which might explain the improvement found in the evolution of the congestive process as well as in the inflammatory exocervicitis. The underlaying lesion though is not modified.

A68-80748
RULE LEARNING AND RULE INTERFERENCE IN TRIGRAM ENCODING.
John A. Robinson (Louisville U., Ky.).
Psychological Reports, vol. 21, Dec. 1967, p. 921–927. 14 refs.
Grant AF-AFOSR-1008-66.

The discovery and use of transformational rules as well as subsequent interference among such rules was investigated. Twenty-four single-solution trigrams were permuted from their respective solution-words by a uniform letter-order rule (LOR) and assigned to one of two lists. LORs were either the same for both lists or different. Two control groups were included to assess the effects of practice on anagram solution and of prior rule-learning experience. Subjects were simply asked to discover and say aloud the solution words. There was no suggestion that rules could be formulated. Comparisons among conditions using mean median solution time for successive blocks of list-items indicated that (a) practice has no effect on solution time with nonrule materials, (b) encoding rule learning does occur, and (c) when rules are changes (List I to List II) solution time increases significantly, i.e., encoding rule interference results.

A68-80749
LUESCHER CHROMATIC TEST AND ITS PSYCHOLOGIC AND PSYCHIATRIC USE IN AIR FORCE PERSONNEL SELECTION [IL TEST CROMATICO DI LUESCHER E LE SUE APPLICAZIONI PSICOLOGICO-PSICHIATRICHE NEL PERSONALE DELL'AERONAUTICA MILITARE].

A68-80750

L. Longo.
Rivista di Medicina Aeronautica e Spaziale, vol. 30, Jul.–Sep. 1967, p. 455–467. 15 refs. In Italian.

The Luescher chromatic test was given to a group of 150 subjects, composed of members of and candidates for the Italian Air Force. In the results reported the typological and projective value of the test is stressed. The test may provide additional data in the evaluation and selection of flying personnel and can also be used as a means of psychophysiological control and medico-legal appraisal. Its use in flying personnel selection is recommended.

A68-80750
THE EFFECT OF HYPOXIA ON THE ELECTRICAL SLOW WAVE OF THE CANINE SMALL INTESTINE.
Joseph Szurszewski and F. R. Steggerda (Ill. U., Dept. of Physiol. and Biophys., Urbana).
American Journal of Digestive Diseases, vol. 13, Feb. 1968, p. 168–177. 28 refs.
Grant NIH 1-F1-GM-29-523.

The effect of four hr. of localized hypoxia on the electrical activity of intact intestinal segments of unanesthetized dogs was investigated through the use of indwelling platinum electrodes. Slow-wave activity from normal intestinal segments orad and cauded to the perfused segments was conducted only for short distances into the perfused segment. The frequency of the slow waves in the center of the perfused segment was less than the frequency in segments orad or caudad to it. When the influence of the upper duodenal pacemaker was removed from lower duodenal and upper jejunal segments by hypoxic perfusion, the direction of conduction of the slow waves in these lower, nonperfused segments was orad, caudad, or both.

A68-80751
MODIFICATIONS OF THE ELECTROCARDIOGRAPHIC QT INTERVAL DURING MUSCULAR EXERCISE. PART 2: QT DURATION DURING STRENUOUS EXERCISE [MODIFICAZIONI DELLA DURATA DELL'INTERVALLO QT NELL'ELETTROCARDIOGRAMMA DURANTE LAVORO MUSCOLARE. NOTA 2: DURATA DELL'INTERVALLO QT NELLA PROVA DI LAVORO MUSCOLARE STRENUO].
E. Busnengo and P. Rota (Centro di Studi e Ric. di Med. Aeron. e Spaziale, Aeron. Mil., Rome, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 30, Jul.–Sep. 1967, p. 425–436. 7 refs. In Italian.

The modifications of electrocardiographic QT intervals were measured and studied before, during and after strenuous physical exercise on a bicycle ergometer, in 20 healthy subjects aged 22 to 30. The duration of QT intervals were analyzed statistically and compared with standard QT values. The average values of the actual QT ranged from 0.322 sec. at rest, to 0.204 sec., after ten min. exercise, and increasing to 0.297 sec. at the ninth min. of recovery. The ratio of the average values of the actual QT to the standard QT ranged from 89.8% at rest, to 93.1% after ten min. of exercise, and 99.7% at the ninth min. of recovery. The importance of this data in evaluating cardiac response to muscular exercise is discussed.

A68-80752
CONTRIBUTION TO THE STUDY OF TRAUMATIC LESIONS ASSOCIATED WITH EJECTION AT GROUND LEVEL [CONTRIBUTO SULLE LESIONI TRAUMATICHE DA EJEZIONE A QUOTA ZERO].
P. Italiano (Aeron. Mil. "A. Mosso", Ist. Med.-Legale, Milan, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 30, Jul.–Sep. 1967, p. 437–454. 6 refs. In Italian.

A study is reported of the conditions and traumatic lesions resulting from ejection of three pilots at ground level. Two of the ejections were successful and the other resulted in the death of the pilot. The need to design more reliable ejection systems to safely clear the pilot at ground level is emphasized. In order to minimize the risks, the advantages of refresher courses, lectures and particularly training with simulators and ejection towers are stressed. In conclusion, it is pointed out that the traumatic lesions encountered in these three cases were caused by the ejection and ground impact.

A68-80753
REPLACEMENT BEHAVIOR FOLLOWING DEPRIVATION OF FOOD, WATER, RUNNING, OR LIGHT.
Robert B. Lockard (Wash. U., Seattle).
Psychological Reports, vol. 21, Dec. 1967, p. 753–769. 13 refs.
Grants NSF GB-3141 and NICHHD HD-00942.

In four separate experiments albino rats were allowed to stabilize in rate on an activity (eating, drinking, light-exposure, or running), after which they were deprived of that activity for a time ranging from two to eight days for different groups. The intent of the methodology was to apply the classical test for "drive"—increased consummatory behavior following deprivation—to four different response measures and to examine in detail the time-course to deficit elimination. Food and water deficits were replaced in an orderly fashion requiring about three wk. for completion. Deficits of running activity were not replaced. Compensation for deficits of light was intermediate, showing a little replacement on the first day after deprivation, but no clear evidence of replacement thereafter.

A68-80754
RELATIONSHIP OF DIET COMPOSITION TO SURVIVAL TIME OF CHICKS WHEN SUBJECTED TO HIGH TEMPERATURE.
J. N. Persons, H. R. Wilson, and R. H. Harms (Fla. Agr. Exptl. Sta., Gainesville).
Proceedings of the Society for Experimental Biology and Medicine, vol. 126, Nov. 1967, p. 604–606. 14 refs.

Two experiments were conducted to test the effect of diet composition on the heat tolerance of five-wk. old Single Comb White Leghorn chicks. The addition of 12% animal fat to the diet significantly reduced the survival time of chicks when they were exposed to 40.8±0.3°C. and 75±5% relative humidity. The level of protein in the diets had no effect. The birds used had been previously selected for either a high or low tolerance to heat. In the second experiment, the differences between runs and the run X diet interaction were both highly significant. The interaction obscured the main effect of diet which was not significant. This population which was unselected with regard to the heat tolerance had such great variation that large numbers of birds would be required to test effects of diet on heat tolerance.

A68-80755
EFFECT OF HYPERTHERMIA ON BLOOD PLATELETS IN MALE RATS.
Richard J. Traystman and Shirley D. Kraus (Long Island U., Brooklyn Coll. of Pharm., Res. Inst., N. Y.)
Proceedings of the Society for Experimental Biology and Medicine, vol. 126, Nov. 1967, p. 390–392. 13 refs.

Exposure of male rats to hyperthermia (55° to 57°C.) for a 15 min. period caused an immediate thrombocytosis lasting for one hr. after removal from heat stress, a delayed thrombocytosis starting three hr. after removal from heat stress and lasting through day two, and a thrombocytopenia appearing seven days after heat stress. Speculation as to the different physiological mechanisms

which might have caused the thrombocytosis at these two time periods points toward an immediate release of platelets followed by a hemoconcentration due to the pituitary–adrenal stress response. The delayed thrombocytopenia has been attributed to decreased production and/or release of new platelets.

A68-80756
SERUM ZINC LEVELS FOLLOWING EXPOSURE TO IONIZING RADIATION.

M. A. Quaife and R. E. Ogborn (Veterans Admin. Hosp., Spec. Lab. of Nucl. Med. and Biol., Omaha, Neb.).

Proceedings of the Society for Experimental Biology and Medicine, vol. 126, Nov. 1967, p. 377–379. 12 refs.
Contract AF 29-601-62-5217.

The serum zinc levels were determined in dogs following exposure to different dosages of gamma-ray radiation. The group response of the plasma zinc level was an increase over the pre-exposure level as well as over the control group. The highest dosage elicited the maximal elevation of the serum zinc level, which was sustained for a longer period of time.

A68-80757
EFFECT OF OZONE ON LIPID PEROXIDATION IN THE RED BLOOD CELL.

Bernard D. Goldstein and Oscar J. Balchum (Southern Calif. U., School of Med. and Los Angeles County Gen. Hosp., Los Angeles).

Proceedings of the Society for Experimental Biology and Medicine, vol. 126, Nov. 1967, p. 356–358. 12 refs.
Grant NIH AP 00606-01 and Contract PHS PH 86-62-162; Hastings Found. supported research.

In vitro exposure of human erythrocytes to ozone resulted in an increased osmotic fragility associated with the formation of 2-thiobarbituric acid reactants. This suggests that lipid peroxidation may be involved in the mechanism of ozone toxicity.

A68-80758
EVOLUTION OF SPACE FEEDING CONCEPTS DURING THE MERCURY AND GEMINI SPACE PROGRAMS.

Robert A. Nanz, Edward L. Michel, and Paul A. Lachance (NASA, Manned Spacecraft Center, Biomed. Res. Office, Houston, Tex.).

Food Technology, vol. 21, Dec. 1967, p. 52–54, 56, 58. 12 refs.

This report describes the evolution of the concepts of feeding used in the Project Mercury and Gemini Program missions and those envisioned for the early missions of the Apollo Spacecraft Program. Resumes are presented in tabular form for the following: (1) food eaten on Project Mercury missions; (2) typical menu for Gemini Program missions; (3) food and packaging environmental testing requirements; (4) comparison of food weight and volume; and (5) characteristics of films used for packaging space food items.

A68-80759
HEAT STRESS AND NACL CONSUMPTION IN THE RAT.

Armand J. Gold and Eliezer Bedrak (Negev Inst. for Arid Zone Res., Dept. of Environ. Physiol., Beersheva, Israel).

Life Sciences, vol. 6, Dec. 1, 1967, p. 2519–2526. 7 refs.

Two groups of 20 rats were given a water solution of 2% NaCl *ad libitum* for a period of four wk. at 35°C. (Group I) and at room temperature, 21°C. (Group II). Both were conditioned to these temperatures for two wk. immediately prior to the experiment. Two control groups of equal sample size drank distilled water at the same temperatures (Groups III and IV, respectively). Relative humidity was maintained at less than 50%. Body weights of the two salt groups were similar. Weights of the lungs, liver, heart, kidneys, adrenals, and testes were significantly lower in Group I. No pathological change was noted in the kidneys of the salt-stressed groups. However, the liver consistently disclosed extensive damage in both salt series. Although liver cells in Groups III and IV had normal and intact patterns, numerous mitotic figures were commonly seen. The mortality rate was highest in Group I animals.

A68-80760
FOCAL HEPATIC INJURY AND REPAIR PRODUCED BY LASER RADIATION.

Samuel Fine, Jules Edlow, Donald MacKeen, Larry Feigen, Enrique Ostrea, and Edmund Klein (Northeastern U., Dept. of Biophys. and Biomed. Eng., Boston; Harvard Med. School, Dept. of Pathol. and Childrens Cancer Res. Found., Boston, Mass; and Roswell Park Mem. Inst., Dept. of Dermatol., Buffalo, N. Y.).

American Journal of Pathology, vol. 52, Jan. 1968, p. 155–176. 30 refs.
Contracts DA-49-193-MD-2436, DA-49-193-MD-2437, Grants PHS C-6516, and BSS 1-RO1-RH-00361-02 RAD.

A technique is described in which laser irradiation is used to produce an *in vivo* focal necrosis of the liver of the 100-gm. rat. This has been accomplished by directing the radiation through the intact muscle of the abdominal wall, thus avoiding direct contamination of the peritoneal cavity. Some of the thermal and optical events occurring in the abdominal muscle and liver during laser radiation are presented in an effort to relate these events to the genesis of the lesion. The initial and evolving gross and histopathologic changes of the lesion are described. The use of this technique may offer some advantages in the study of *in vivo* hepatic necrosis, autolysis, and repair.

A68-80761
SEAT BELT INJURIES.

Samuel D. Porter and Edward W. Green (U. Hosp., Dept. of Surg., Iowa City, Iowa).

Archives of Surgery, vol. 96, Feb. 1968, p. 242–246. 8 refs.

The literature was reviewed with reference to the problem of seat belt injury. Case histories of three patients with seat belt injuries were reported. One had avulsion of the terminal ileum, perforation of the upper ileum and midjejunum, necrosis of the sigmoid colon, and a rotation fracture of the right iliac crest. One patient had transection of the jejunum and fracture of the lumbar spine. The third had a blowout perforation of the jejunum, avulsed mesentery, and a ruptured spleen. The importance of recognizing the clinical entity associated with seat belt injury with the insidious course of bowel perforation was emphasized.

A68-80762
SPECTRAL GENERALIZATION TESTING WITH PIGEONS USING BRIEF DISCRETE TRIALS.

Morris K. Holland and William M. Baker (Duke U., Durham, N. C.).

Psychonomic Science, vol. 10, Jan. 5, 1968, p. 1–2.
Grants NIH MH 06661 and NIH MH 08351; NASA supported research.

Spectral generalization gradients were obtained from pigeons with a brief discrete trial procedure and examined at different stages of extinction. To reduce the dependence of response probability on elapsed time in the test, interpolated noncontingent feedings were given at intervals throughout four days of testing. While responding extinguished prior to the "free" feedings, generalization gradients reappeared immediately thereafter. Extent of generalization appeared to be a function of momentary response probability.

A68-80763
SPECTRAL GENERALIZATION GRADIENTS FROM PIGEONS AS A FUNCTION OF RESPONSE LATENCY.
William M. Baker and Morris K. Holland (Duke U., Durham, N. C.).
Psychonomic Science, vol. 10, Jan. 5, 1968, p. 3–4.
Grants NIH MH 06661 and NIH MH 08351; NASA supported research.

Generalization gradients on wavelength were obtained from pigeons using a discrete trials procedure. For a group tested with three-sec. trials, it was found that gradients produced by responses of shorter latencies showed greater extent of generalization than did gradients produced by responses of longer latencies. This relationship was also shown to hold when latencies were experimentally controlled by training different groups of animals on trials of differing lengths.

A68-80764
THE EFFECT OF CARBON DIOXIDE ON SPONTANEOUS LOCOMOTOR ACTIVITY IN NORMOXIC AND HYPOXIC ATMOSPHERES.
Martin J. Gerben (U.S. Army Res. Inst. of Environ. Med., Natick, Mass.).
Psychonomic Science, vol. 10, Jan. 5, 1968, p. 17–18. 15 refs.

Eleven male Sprague–Dawley rats were run in an activity wheel for three 20-min. sessions under each of four atmospheres varying in O_2 concentration (21% or 8%) and CO_2 concentration (0% or 5%), remainder N_2. Results indicated an interaction of CO_2 and O_2 levels. The addition of 5% CO_2 to a normoxic atmosphere reduced spontaneous locomotor activity. The addition of 5% CO_2 to a hypoxic atmosphere increased the level of activity. These data are consistent with the findings of other investigators concerning the effects of CO_2 and O_2 on the central nervous system.

A68-80765
FACILITATIVE EFFECTS OF STIMULUS FAMILIARIZATION ON PAIRED ASSOCIATES VERBAL LEARNING.
Hildegard Corbet and Marilyn E. Marshall (Carleton U., Ottawa, Canada).
Psychonomic Science, vol. 10, Jan. 15, 1968, p. 43–44. 10 refs.

With girls as subjects, a paced verbal paired associate task was reliably facilitated after relevant stimulus familiarization. Discrimination familiarization resulted in significantly better performance than observation familiarization. Neither relevancy nor kind of familiarization affected the performance of boys.

A68-80766
CUE SELECTION IN PAIRED-ASSOCIATE LEARNING: MEANINGFULNESS AND POSITION.
Eugene A. Lovelace (Va. U., Charlottesville).
Psychonomic Science, vol. 10, Jan. 15, 1968, p. 45–46. 6 refs.

Twenty-four common English words were learned as responses to compound stimuli, each of which was composed of two trigrams connected by a hyphen. One trigram of each stimulus was high meaningfulness (*m*) one low *m*; half of the stimuli had the high *m* item in the left-hand position, half in the right. In a transfer task subjects responded to one trigram of each stimulus. The data obtained suggest that both *m* and position of the components determined cue selection.

A68-80767
PAIRED ASSOCIATE LEARNING OF FUNCTION WORDS.
R. Kanungo (Dalhousie U., Halifax, Nova Scotia, Canada).
Psychonomic Science, vol. 10, Jan. 15, 1968, p. 47–48. 6 refs.
Grant NRC, Canada X-12-179.

The implications of the unit and the grapnel interpretations for the associative learning of function words were tested. Results suggest that higher meaningfulness (*m*) of function words do not facilitate their associative linkage, and that they behave like low *m* nonsense words.

A68-80768
A COMPARISON OF THE EFFECTIVENESS OF WORD IMAGERY AND MEANINGFULNESS IN PAIRED-ASSOCIATE LEARNING OF NOUNS.
Padric C. Smythe and Allan Paivio (Western Ontario U., London, Canada).
Psychonomic Science, vol. 10, Jan. 15, 1968, p. 49–50. 12 refs.
Grant NRC, Canada APA-87; Western Ontario U. Res. Fund supported research.

Noun imagery (I) and meaningfulness (*m*) were varied over an equivalent range in different paired-associate (PA) lists. In each list, one variable was systematically varied on stimulus and response sides within each of three different levels of the other variable. The results showed highly significant positive effects of I, more so on the stimulus than on the response side of pairs, these effects being qualified by a stimulus by response interaction. In contrast, *m* showed only a negative response effect attributable mainly to superior recall of low *m* responses when pair I was also low.

A68-80769
OVERESTIMATION OF VERTICAL MOVEMENT.
A. A. Landauer, C. A. Rhine, and L. Rumiz (Western Australia U., Perth).
Psychonomic Science, vol. 10, Jan. 15, 1968, p. 59–60.

Forty-eight subjects tracked the movement of a dot of light which was presented in the horizontal/vertical plane under open viewing conditions but without being able to monitor visually their drawing. The vertical movement components were significantly overestimated, both when subjects tracked in the upright or level plane. These findings are believed to be a manifestation of the vertical–horizontal illusion.

A68-80770
THE EFFECT OF MAGNESIUM PEMOLINE ON LEARNING AN ACTIVE AVOIDANCE-PASSIVE AVOIDANCE DISCRIMINATION.
Thomas C. Chase and Robert A. Rescorla (Yale U., New Haven, Conn.).
Psychonomic Science, vol. 10, Jan. 25, 1968, p. 87–88. 8 refs.
Grants NSF GB-6493 and NSF GY-2758.

Magnesium pemoline failed to facilitate the learning of an active avoidance–passive avoidance discrimination. The sensitizing and stimulant properties of the drug disrupted learning of the discrimination when a buzzer was used as the cue for passive avoidance.

A68-80771
MAGNESIUM PEMOLINE AND EEG SLEEP PATTERNS IN MAN.
Frederick Baekeland and Richard Lasky (N. Y. State U., Downstate Med. Center, Buffalo).
Psychonomic Science, vol. 10, Jan. 25, 1968, p. 89–90. 10 refs.
Grant NIMH MH-23,901; Abbott Labs. supported research.

The effects of a single 25 mg. dose of the alerting agent, magnesium pemoline, on the electroencephalic sleep patterns of ten normal subjects was studied by giving them either the drug or a placebo on two occasions a week apart just before bed. Over

a six hr. sleep period magnesium pemoline had no effect on recorded sleep except to increase the frequency of rapid eye movements (REMs) within REM periods.

A68-80772
THE FUNCTION OF STIMULUS PREDIFFERENTIATION PRETRAINING IN COMPLEX PROBLEM-SOLVING.
Marvin L. Schroth (Santa Clara U., Calif.).
(Western Psychol. Assn., Conv., San Francisco, 1967).
Psychonomic Science, vol. 10, Feb. 5, 1968, p. 123–124. 6 refs.

The present experiment was designed to determine the effects of various types of stimulus predifferentiation pretraining on complex problem-solving and, in addition, the role of task complexity in transfer. Subjects were 150 second grade children assigned to six groups, including five treatment conditions, and matched for sex. Directed Attention pretraining proved to facilitate the greatest amount of transfer in solving the oddity problem, and transfer was greater from the difficult task to the easy task than in the reverse situation.

A68-80773
INPUT MODALITY AND THE SERIAL POSITION CURVE IN SHORT-TERM MEMORY.
R. Conrad and A. J. Hull (Appl. Psychol. Res. Unit, Cambridge, Great Britain).
Psychonomic Science, vol. 10, Feb. 5, 1968, p. 135–136. 7 refs.

Results are presented which confirm data already published. These show that when a sequence of letters or digits is presented for immediate recall, there is a marked difference in the serial position curve of errors according to whether presentation is auditory or visual. This difference specifically shows a virtual absence of recency in the visual presentation condition.

A68-80774
EFFECTS OF A MEMORY AID IN PROBABILITY LEARNING.
James R. Erickson, John W. O'Hara, and Mari R. Jones (Ohio State U., Columbus).
Psychonomic Science, vol. 10, Feb. 5, 1968, p. 137–138.
Contract AF 33(615)-2248.

Eighty subjects served in a probability-learning experiment where π (.70 or .90), instructions (random or problem solving), and memory aid (present or absent) were varied factorially. Memory aid consisted of lights which informed subjects which events had been correct on the three previous trials. Conditional response probabilities were closer to conditional event probabilities in memory-aid conditions, especially under problem solving instruction.

A68-80775
EFFECT OF SUCCESSIVE LISTS ON THE PARAMETERS OF A PAIRED-ASSOCIATE MODEL.
John H. Mueller (St. Louis U., Mo.) and Irwin D. Nahinsky (Mo. U., Columbia).
Psychonomic Science, vol. 10, Feb. 5, 1968, p. 145–146. 7 refs.
NASA Grant NsG (T)-74.

Each of 16 subjects was required to learn four of 16 paired-associate lists differing in the number of stimuli and response alternatives. An effect on the parameters of a duoprocess learning model was found for the number of stimuli, but not for response alternatives, or for successive lists.

A68-80776
THE TRANSMISSION OF A HIGH-POWER RUBY LASER BEAM THROUGH BONE.
Lars Högberg, Jan Stahle, and Klaus Vogel (Swed. Res. Inst. of Natl. Defence (FOA 2), Stockholm; U. Hosp., Dept. of Otolaryngol.; and Inst. of Phys., Uppsala).
Acta Societatis Medicorum Upsaliensis, vol. 72, no. 3–4, 1967, p. 223–228. 13 refs.
Folksam Insurance Co. supported research.

The energy transmittance and scattering of a Q-switched ruby-laser pulse (power density 4×10^{10} w./cm.^{2}) during its passage through bone slices 0.3–1.0 mm. thick are described. The transmittance was measured by means of a rat's-nest bolometer. The scattering was visualized by passing the laser beam through a colloidal solution. Between 15 and 25% of the pulse energy was transmitted through the bone slices without causing perforation. Moist slices had higher transmittances than dry. The possibilities of using laser pulses for producing small selective lesions in the inner ear are discussed.

A68-80777
EFFECT OF HIGH-POWER RUBY LASER IRRADIATION ON PERIPHERAL NERVE.
Lars Högberg, Staffan Reinius, Jan Stahle, Klaus Vogel, and Gunnar Wallin (Swed. Res. Inst. of Natl. Defence (FOA 2), Stockholm; U. Hosp., Dept. of Otolaryngol.; Inst. of Phys.; and Insts. of Anat. and Physiol., Uppsala).
Acta Societatis Medicorum Upsaliensis, vol. 72, no. 3–4, 1967, p. 105–119. 33 refs.
Folksam Insurance Co. supported research.

The effects of a Q-switched ruby laser with a power density of 4×10^{10} w./cm.2 on isolated sciatic nerves of the toad were studied. A tissue eruption appeared at the impact point, which under light-microscope examination showed a well-defined capsule rupture with bulging of the nerve fibers. Electron-microscope examination showed alterations in the myelin sheaths and axon. It was shown that the lesion, in most cases, caused a partial or complete block of action-potential propagation.

A68-80778
HISTOCHEMICAL STUDIES ON SOME ALTERATIONS OF THE ANIMAL ORGANISM UNDER THE ACTION OF MICROWAVES [CERCETARI HISTOCHIMICE ASUPRA UNOR MODIFICARI DIN ORGANISMUL ANIMAL SUPUS ACTIUNII MICROUNDELOR].
Ana Maria Zirra, Margareta Comnoiu, A. Voicu, Liliana Stratulat, and I. Bolohan.
Studii si Cercetări de Balneologie si Fizioterapie, vol. 8, 1967, p. 612–621. 21 refs. In Rumanian.

Forty adult guinea pigs were studied by means of histochemical methods, for the effects of microwaves in the range of 2425 MHz. on the enzymatic mechanisms and metabolic functions of irradiated tissues (skin muscle, liver). The duration and the intensity of the irradiation varied between 5 and 30 min. and 25–150 W. Enzymatic alterations (ATP-ase, phosphatase, etc.) and the metabolic changes (mucopolysaccharides PAS, SH-groups, alpha-aminoacids and lipids) showed that small doses, applied for a short time (10 min.), led to an increase of cell and tissue functions, while high doses, even when they were applied for a short time, led to profound metabolic and histoenzymatic alterations and to morphological disturbances, that determined the death of the animals when internal temperature was higher by 10°C. than the normal temperature of the body. Experimental results are discussed and interpreted in the light of data from the literature.

A68-80779
MODE OF ACTION OF THYROCALCITONIN.
J. L. H. O'Riordan and G. D. Aurbach (NIH, Natl. Inst. of Arthritis and Metab. Diseases, Metab. Diseases Branch, Sect. on Mineral Metab., Bethesda, Md.).

(Am. Federation for Clin. Res., Meeting, Atlantic City, 1966).
Endocrinology, vol. 82. Feb. 1968, p. 377–383. 21 refs.

Thyrocalcitonin was given to rats 2.5 hr. after injecting ^{45}Ca intravenously. The normal continuous fall in specific activity of blood calcium was interrupted by the action of thyrocalcitonin but there was no effect on the disappearance of radiocalcium from the circulation even though serum Ca fell 30–50%. The data were analyzed with a computer program encompassing a model for calcium exchange with compartments arranged in series. The model adequately reproduced the experimental results which led to the conclusion that thyrocalcitonin acts by inhibiting resorption of calcium from bone.

A68-80780
THE EFFECT OF GLARE ON THE ELECTRORETINOGRAM OF NORMAL HUMAN OBSERVERS.
Victor F. Feldman and Hermann M. Burian (Iowa U., Dept. of Ophthalmol., Iowa City).
(Assn. for Res. in Ophthalmol., Midwestern Sect., Iowa City, Apr. 8, 1967).
American Journal of Ophthalmology, vol. 65, Jan. 1968, p. 91–97. Grants PHS B-3354 and PHS 5TINB.

Modifications of a previously reported test to characterize the retinal sensitivity in human subjects by electroretinograms (ERG) obtained after a glare flash are presented. The test conditions are described. The amplitude of the b-wave of the ERG was increasingly depressed with glare of increasing duration. However, the amount of depression varied with different subjects. The half-amplitude recovery time also increased with increasing glare duration. These results obtained in 15 ocularly normal subjects are discussed.

A68-80781
THE MEASUREMENT OF THE PHASE COUPLING BETWEEN HEART BEAT AND RESPIRATION IN MAN WITH A NEW SIMULTANEOUS MEASURING APPARATUS [DIE MESSUNG DER PHASENKOPPELUNG ZWISCHEN HERZSCHLAG UND ATMUNG BEIM MENSCHEN MIT EINEM NEUEN KOINZIDENZMESSGERAT].
P. Engel, G. Hildebrandt, and H.-G. Scholz (Marburg/Lahn U., Inst. für Arbeitsphysiol. und Rehabilitationsforsch., West Germany).
Pflügers Archiv für die gesamte Physiologie, vol. 298, Jan. 10, 1968, p. 258–270. 31 refs. In German.

Based on new experimental findings on phase coordination between heart beat and respiration in man, a new digital instrument for measurement of phase coordination was developed. Construction and function of the Synchromet are described. Besides a greater time resolving power for determination of phase correlation, the instrument makes possible a simultaneous measurement of heart-period dispersion. The heart rhythm is registered by the R peak of the electrocardiogram, while the respiration phases are recorded by measurement of the changing temperature in the nostrils. However, it is also possible to put in any other desired signals for determination for phase correlationship. The quantitative determination of the coupling rate by the x^2 method with reference to heart-rate dispersion is shown by a measurement example. For comparison purposes a relative coupling rate C is given. The coupling rate shows a diurnal rhythm; therefore, in studying phase coupling between heart beat and respiration, the time of day has to be considered.

A68-80782
ON THE FREQUENCY DEPENDENT ELLIPTIC PHENOMENON DURING ELECTRICAL STIMULATION OF THE BRIGHT ADAPTED HUMAN EYE [UBER EIN FREQUENZABHANGIGES ELLIPSENPHANOMEN BEI ELEKTRISCHER REIZUNG DES HELLADAPTIERTEN MENSCHLICHEN AUGES].
E. Welpe (Tech. Hochscule, Inst. für Tech. Elektron., Münich, West Germany).
Pflügers Archiv für die gesamte Physiologie, vol. 298, Jan. 10, 1968, p. 225–240. 46 refs. In German.

The paper dealt with the elliptic phenomenon (EP) in man, accidentally found by the author. This EP was caused by watching a shining surface (e.g. a lighted opal glass) and by periodical electrical stimulation of the eye by impulse currents within small frequency ranges (81 to 104 c.p.s., 29 to 38 c.p.s., 17 to 22 c.p.s., 13 to 16 c.p.s., 10 to 12 c.p.s., 9 to 10 c.p.s.) and only above a certain luminance (About 80 a.s.b.) of the opal glass. The EP was perceived as a dark elliptic ring (seldom as a dark elliptic area) with a large diameter lying horizontally. By raising or lowering the stimulus frequency over the limits of the frequency ranges the EP disappeared (in the periphery or in the center of the visual field). It only reappeared, if the frequency has reached a certain value (limit of another frequency range). Within such a frequency range the EP increased with increasing frequency, but decreased with decreasing frequency. If at the frequency f (81 c.p.s. $\leq f \leq$ 104 c.p.s.) a certain diameter of the ellipse (determined by marks on the opal glass) was adjusted, the diameter of the ellipse reached nearly the same size with frequencies f/3, f/5, f/7, f/9 and f/11. A frequency of 81 c.p.s. corresponded to a large diameter of about 3° and a frequency of 104 c.p.s. to a large diameter of about 21°. At a large diameter of 9.2°, the ratio of the small to the large ellipse diameter was about 0.64. Except alterations of the stimulus frequency (and of the distance between the opal glass and the observer), alterations of other stimulus parameters (e.g. amplitude and pulse duty factor of the stimulus pulses, site of the electrodes, luminance and color of the opal glass) influenced the size of the ellipse at most up to 50%.

A68-80783
RESPONSE OF CORONARY BLOOD FLOW TO SOME NATURAL STRESSES OF EXCITEMENT IN THE CONSCIOUS DOG.
G. Marchetti, L. Merlo, and V. Noseda (Ist. di Cardiol. Sper. della Simes S.p.A., Milan, Italy).
Pflügers Archif für die gesamte Physiologie, vol. 298, Jan. 10, 1968, p. 200–212. 9 refs.

The effect on aortic pressure, phasic coronary blood flow and heart rate of some natural stimuli were investigated in conscious dogs in which electromagnetic flowmeters were chronically implanted on the coronary vessels. All the tested stimulations (sight and ingestion of food, sexual excitement, auditory and cold stimuli, spontaneous excitement) gave rise to a marked increase in the coronary blood flow. Aortic pressure and heart rate also increased though to a lesser extent. In the same animals adrenalin, noradrenalin and isopropylnoradrenalin were administered by intravenous route. The results obtained showed some analogies with those observed after the tested stimulations. These latter also resembled those reported by another investigator following electrical stimulation of the sympathetic nervous system. It was suggested that the natural stresses of excitement may result both in considerable activation of sympathetic nerves and release of catecholamines in the blood stream.

A68-80784
ESTIMATIONS OF MAXIMAL OXYGEN UPTAKE BY THEIR DETERMINATION WITH INDIRECT METHODS [FEHLEINSCHATZUNGEN DER MAXIMALEN SAUERSTOFFAUFNAHME BEI IHRER BESTIMMUNG MIT INDIREKTEN METHODEN].

J. Eichhorn, H. Brüner, K. E. Klein, and H. M. Wegmann (Deut. Versuchsanstalt für Luft- und Raumfahrt e. V., Inst. für Flugmed., Bad Godesberg, West Germany).
Internationale Zeitschrift für Angewandte Physiologie, vol. 24, Nov. 14, 1967, p. 275–283. 20 refs. In German.

The maximal oxygen uptake of 19 untrained young males (21 to 28 yr. old) was measured by stepwise increase of exercise on a bicycle ergometer (direct method). The average value was 3.03 l./min., the maximal heart rate for the group was at the same time 186/min. Moreover, the maximal oxygen uptake was estimated by different indirect methods, using the well-known linear relationship between heart rate and oxygen uptake: (1) Åstrand's nomogramm; (2) the extrapolation on the upper value (195/min.); and (3) the extrapolation on the lower value (180/min.) of the maximal heart rate given in literature for comparable groups. All indirect methods proved useful in so far as they showed a statistically significant correlation to the direct method. But by extrapolating to a heart rate of 180/min., the $\dot{V}O_2$ max was underestimated; by the use of Åstrand's nomogramm or by extrapolating to a heart rate of 195/min. the maximal oxygen uptake was overestimated. Though none of the mean differences was higher than 10%, they all were statistically significant. The individual deviations in the results obtained with the direct and indirect methods ranged from +19% to −18%.

A68-80785
IMPROVEMENTS IN AIRLINE SAFETY CAN COME FROM CONSIDERATION OF PSYCHOLOGICAL FACTORS.
Jerome I. Berlin (United Air Lines, Inc., San Francisco, Calif.).
SAE Journal, vol. 76, Feb. 1968, p. 49.

Airline safety depends on psychological factors relating to employees as well as factors relating to reliability of equipment and the skill of the people operating it. Some of the qualities that make a person dangerous are: anger, low motivation, overanxiety, lack of respect for oneself, and degradation. Positive conditions are: emphatic understanding, value, and genuineness. Management and organizational policies are discussed as they relate to these psychological factors. It is suggested that management policies often violate psychological findings concerning interpersonal relationships. However, a few companies have already committed their organizational policies to a climate of trust and collaboration in their employee relations.

A68-80786
SIEVE AUDIOMETRIC INVESTIGATIONS OF AUDITORY INJURIES [SIEBAUDIOMETRISCHE UNTERSUCHUNGEN VON LARMARBEITERN].
M. Jönsson (Betriebgesundheitsschutz Bergbau, Zwickau, East Germany).
Das Deutsche Gesundheitswesen, vol. 22, Nov. 30, 1967, p. 2286–2289. In German.

A method of screening persons suffering from auditory injuries (the so-called sieve audiometry) was applied to 2,000 miners of a pit-coal mine during a mass examination. The miners were exposed to loud noise underground. The relationship between the results and the miners' age and type of work was given. It was found that noise control and care of the mining workers is urgently required, and problems concerning control and care were discussed. Methods for examination, detection and recording were also discussed.

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ON THE QUESTION OF THE REDUCTION OF LIFE EXPECTANCY AFTER IONIZING RADIATION [ZUR FRAGE DER VERMINDERUNG DER LEBENSERWARTUNG NACH IONISIERENDER BESTRAHLUNG].
W. Angerstein (Forschungsinst. für Tuberk. und Lungenkrankh., Berlin, East Germany).
Das Deutsche Gesundheitswesen, vol. 22, Oct. 19, 1967, p. 1987–1992. 17 refs. In German.

The life expectancy of white mice decreased after a single X-ray irradiation (100 kv.) with doses ranging from 21 to 543 r. A linear correlation between dose and expectation of life may be assumed. The decrease of the latter amounted to about four %/100 rad. A threshold value was not detected within the dose range examined. The results were discussed together with the results of other authors. The importance of the somatic–stochastic radiation effect for X-ray diagnostics was indicated.

A68-80788
THE BODY IMAGE OF THE AVIATOR.
G. J. Tucker (Yale U., School of Med., Dept. of Psychiat., New Haven, Conn.), R. F. Reinhardt, and N. B. Clarke (Naval Aerospace Med. Inst., Div. of Psychiat. and Neurol., Pensacola, Fla.).
British Journal of Psychiatry, vol. 114, Feb. 1968, p. 233–237. 12 refs.

This study explores the concept of the body image in aviation through analysis of projective inkblot tests. The group Rorschach was administered to three experienced groups (30 helicopter pilots, 26 propeller pilots, and 14 jet pilots) and one group of 30 non-pilots and one group of relatively inexperienced pilots who were having flight difficulty. The responses were scored in a blind manner by two independent raters with a high degree of reliability. All data were statistically analysed. Using this technique, it was possible to differentiate jet and helicopter pilots from all other groups. These results are discussed in terms of perceptual factors relating to the environment of the aviator and his own body, individual personality factors, and social factors.

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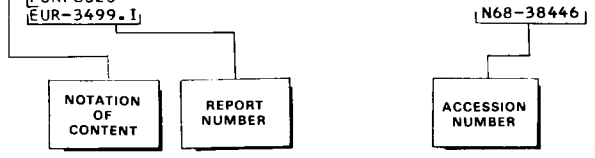

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