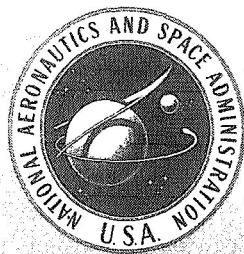


N76-40134  
NASA SP-7011 (79)



# AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY  
WITH INDEXES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA SP-7011 (79)

AEROSPACE MEDICINE AND BIOLOGY

AUGUST 1979

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NASA SP-7011 (79)

# 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 Scientific and Technical Information System during July, 1970.



*Scientific and Technical Information Division*

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

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*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 American Institute of Aeronautics and Astronautics (AIAA) and NASA Scientific and Technical Information Facility. 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.

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- b. AIAA entries identified by their *IAA* accession numbers (A70-10000 series).

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

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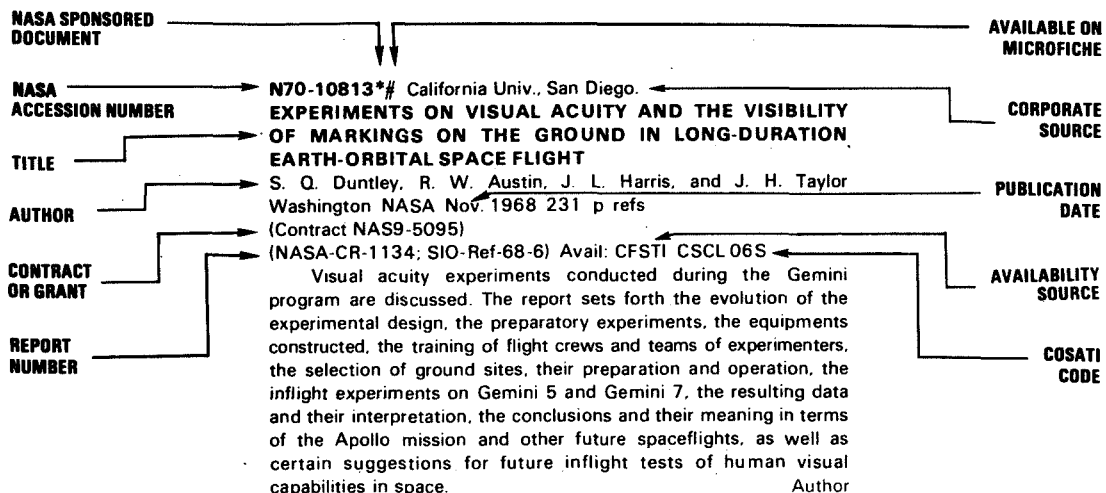
Technical Information Service  
American Institute of Aeronautics and Astronautics, Inc.  
750 Third Avenue, New York, N.Y. 10017

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

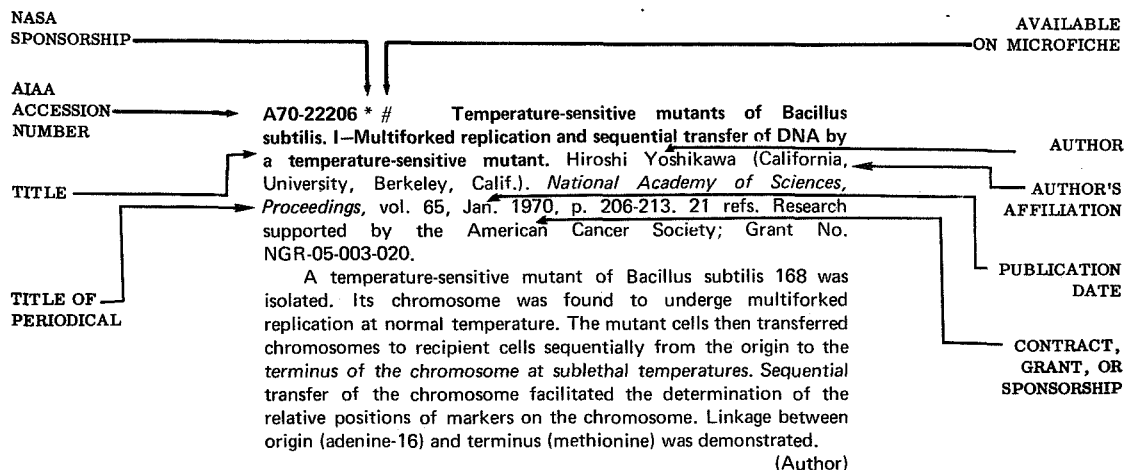
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## TYPICAL CITATION AND ABSTRACT FROM STAR



## TYPICAL CITATION AND ABSTRACT FROM IAA







# AEROSPACE MEDICINE AND BIOLOGY

*a continuing bibliography*

AUGUST 1970

## STAR ENTRIES

**N70-26505\*#** Perkin-Elmer Corp., Pomona, Calif.  
**TWO GAS ATMOSPHERE SENSOR SYSTEM (MASS SPECTROMETER), PHASES 2a AND 2b, JUNE 1966 - MARCH 1969**

Washington NASA Apr. 1970 592 p refs  
(Contract NAS1-6387)

(NASA-CR-1546) Avail: CFSTI HC\$10.00 CSCL 20F

This report covers the two principal phases of an effort to design, fabricate, and test a mass spectrometer in a miniaturized, flight prototype configuration. The report is divided into two parts: (1) the design of the sensor and the fabrication of an Engineering Test Model (ETM) to demonstrate the correctness of the overall sensor design; and (2) the fabrication and acceptance testing of four sensors, subsequently modified to incorporate additional design, fabrication, and test efforts for a ball leak inlet system, a miniaturized ion pump, and the installation of one of the instruments on a 4-man, 60-day closed chamber test for monitoring and control of the atmosphere within the chamber. Included is the basis for the design, details of the modified reliability and quality assurance efforts, details of the fabrication and assembly, drawings of the components and electronic subsystems, and results of the acceptance testing accomplished.

Author

**N70-26545#** Radiobiological Inst. TNO, Rijswijk (Netherlands).  
**MEASUREMENTS OF ABSORBED DOSES DUE TO EXPOSURE OF ORGANS OF DIFFERENT COMPOSITION TO FAST NEUTRONS OF DIFFERENT ENERGIES Final Report**

J. J. Broerse and G. W. Barendsen Brussels EURATOM 1970 28 p refs

(Contract EURATOM-065-66-10 BION)

(EUR-4465.e) Avail: CFSTI

The absorbed dose in cells exposed to fast neutrons will depend on their atomic composition and on the composition of the materials surrounding the cells. Large dose variations may therefore occur at the interface of different tissues. The perturbations of secondary particle equilibrium at such interfaces were investigated with an ionization chamber and a cell culture system. In view of the complex character of the energy dissipation by fast neutrons, the variations in absorbed dose and in biological damage were first studied for the most extreme situations, i.e. cells adjacent to material containing no hydrogen at all or material containing the maximum amount of hydrogen which is found in some mammalian tissues. However, in the irradiation of an intact animal the variations will be smaller. In subsequent experiments the variations in absorbed dose and biological effects, resulting from the same exposure, were

studied for cells directly adjacent to bone and for cells surrounded by soft tissue. For X irradiations and 15 MeV neutron irradiations survival curves were determined for cells irradiated on muscle-equivalent plastic and on bone-equivalent plastic. These results were related to the occurrence to the bone-marrow syndrome and the intestinal syndrome in mice after neutron and X irradiation.

Author

**N70-26554\*#** GCA Corp., Bedford, Mass.  
**STUDY OF THE APPLICATION OF A PHOTOIONIZATION MASS SPECTROMETER TO ANALYSIS OF CONTAMINANT GASES, JUNE 1968 - NOVEMBER 1969**

Peter Warneck, J. N. Driscoll, and C. Matthews Washington NASA May 1970 68 p refs

(Contract NAS1-7794)

(NASA-CR-1589; GCA-TR-69-10-N) Avail: CFSTI CSCL 20F

Thirty-two gases and vapors were investigated with the photoionization mass spectrometer described previously. Fragmentation patterns were determined at four ionizing wavelengths: 803, 950, 1048, and 1216 Å, respectively, making use of strong line sources. The possibility of discriminating between isometric substances by varying the wavelengths was found to exist for the butenes, and butylalcohols, but not for the xylenes. In addition to fragmentation patterns, the mass spectrometric sensitivities and detection limits were determined to evaluate the potential of the photoionization mass spectrometer technique for trace gas analysis. It is shown that with presently available light sources average detection limits are about 10 ppm, in agreement with previous results. As assessment is made to show that the detection limits can be improved. Finally, the feasibility of utilizing photoionization mass spectrometry for the analysis of space cabin atmospheres, using solar ionizing radiation, is demonstrated.

Author

**N70-26581\*#** Stanford Research Inst., Menlo Park, Calif.  
**AWAKENING EFFECTS OF SIMULATED SONIC BOOMS AND SUBSONIC AIRCRAFT NOISE ON SIX SUBJECTS, 7 TO 72 YEARS OF AGE**

Jerome S. Lukas and Karl D. Kryter Washington NASA May 1970 62 p refs

(Contract NAS1-7592)

(NASA-CR-1599) Avail: CFSTI CSCL 06S

Six persons aged 7, 8, 41, 54, 69, and 72 years were exposed during sixteen experimental nights to simulated sonic booms and recorded noise (101 to 113 PNdB) from a subsonic aircraft. The results, considered tentative because of the small number of subjects, showed that the oldest subjects were awakened about 70% of the time by sonic booms, and about 45% of the time by the subsonic aircraft noise; the middle-aged group were awakened about 3% of the time by booms, and 7% of the time by the noise; the children were not awakened by the boom, and about 2% of the time by the aircraft noise.

Author

N70-26590

**N70-26590#** System Research, Ltd., Richmond (England).  
**RESEARCH INTO THE ADAPTIVELY CONTROLLED  
INSTRUCTION OF COMPENSATORY TRACKING SKILLS  
Final Scientific Report**  
Gordon Pask and B. C. E. Scott Oct. 1969 66 p refs  
(Contract F61052-68-C-0071)  
(AD-698817; AFOSR-69-3086TR) Avail: CFSTI CSCL 5/9

The report describes a number of experiments designed to compare the acquisition of a compensatory tracking skill in adaptively controlled and open loop conditions. It covers one dimensional tracking and two dimensional tracking. Several one dimensional tasks were employed in order to control the degree of subskill interference and memory load. Typical learning curves for the principal conditions are presented. Author (TAB)

**N70-26629#** Edgerton, Germeshausen and Grier, Inc., Goleta, Calif.

**MULTIPLE-SOURCE ARRAYS FOR LARGE - AREA  
IRRADIATION Technical Report**  
W. Quam and C. Rainbolt Mar. 1969 24 p refs  
(Contract AT(29-1)-1183)  
(EGG-1183-2205; TR-S-450-R) Avail: CFSTI

Irradiation systems capable of providing a uniform dose rate over relatively large land areas are required for investigating the ecological effects of ionizing radiation on plants and small animal populations. In this study, simple computational methods were used to obtain approximations of the effectiveness of multiple-source arrays made up of Co-60 and Cs-137 sources atop thin poles spaced at regular intervals. Dose rate distributions, efficiencies, and figures of merit are presented in tabular and graphical form for two basic array configurations and ninety different source-height and spacing arrangements. Author (NSA)

**N70-26650\*#** National Aeronautics and Space Administration, Washington, D.C.  
**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING  
BIBLIOGRAPHY WITH INDEXES**  
Mar. 1970 152 p refs  
(NASA-SP-7011(74)) Avail: CFSTI CSCL 06E

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. This is the March 1970 edition. Author

**N70-26651\*#** National Aeronautics and Space Administration, Washington, D.C.  
**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING  
BIBLIOGRAPHY WITH INDEXES**  
Dec. 1969 164 p refs  
(NASA-SP-7011(70)) Avail: CFSTI CSCL 06E

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. This is the December 1969 edition. Author

**N70-26693#** Akademiya Nauk URSR, Kiev.  
**PORTABLE HYDROACOUSTIC TRANSMITTER FOR  
TRACKING TAGGED FISH**  
G. N. Vasilyev, D. V. Zdanevich, S. M. Kidun, and V. M. Saroyga  
*In its Appl. Acoustics and Vibration Technol.* 1968 p 125 129  
refs In RUSSIAN (See N70-26676 13-34)  
Avail: CFSTI

The measurement circuit and design of the transmitter are described. The transmitter is intended for studying the migration routes of Volga sturgeon and their behavior near dams and hydraulic installations. The transmitter is saddle-shaped and made of lightweight plastic. It is fastened directly to the body of the fish. Transl. by H.W.

**N70-26728#** Illinois Univ., Urbana, Biological Computer Lab.  
**ANALYSIS AND SYNTHESIS OF COGNITIVE PROCESSES  
AND SYSTEMS Final Report, 1 Sep. 1967 - 31 Aug. 1969**  
Heinz Von Foerster 15 Dec. 1969 209 p refs  
(Grant AF-AFOSR-7-67)  
(AD-701072; AFOSR-70-0319TR) Avail: CFSTI CSCL 6/4

The study aims at the comprehension of cognitive processes on three levels: (i) An epistemology of cognitive processes which has as a goal a rigorous penetration of the logic of descriptions, of the concept of self-reference and of the emergence of sensory modalities. (ii) Theoretical investigations of cognitive processes in terms of mathematical models of complex regulatory and control systems, and of the amount of information that must flow between identifiable parts of such systems in order to maintain its regulatory powers are proposed. (iii) Experimental studies in electrophysiology of neural activity along sensory channels, in higher nuclei and in motor control areas of vertebrates are contemplated in as much as they are commensurate with the needs of the epistemological and theoretical investigations. Author (TAB)

**N70-26799\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.  
**SPACE SUIT HAVING IMPROVED WAIST AND TORSO  
MOVEMENT Patent Application**  
Hubert C. Vykukal, inventor (to NASA) Filed 23 Mar. 1970 13 p  
(NASA-Case-ARC-10275-1; US-Patent-Appl-SN-21644) Avail:  
CFSTI CSCL 06K

The improved suit has a rotating joint at the mid region of the torso. The rotary joint is canted at an angle of about 30 degrees to the horizon with the lowest portion of the joint towards the front of the suit. The low-friction rotary joint has a disconnect mechanism. The seal is placed on the outside of balls so as to protect them from dirt and dust. The suit also includes a double bellows in the pelvic region; namely, an upper bellows and a lower bellows joined together by an intermediate portion. By employing the canted rotary joint, many bending and stooping operations are facilitated, particularly those in which one shoulder is normally raised above the other. The double joint in the pelvic portion of the suit gives greater bending freedom so that the suit can conform more nearly to the natural bending and twisting movements of the spine. The invention is equally adaptable to either hard suits or soft suits. NASA

**N70-26838#** Louisville Univ., Ky. Performance Research Lab.  
**RESEARCH IN PERFORMANCE ASSESSMENT AND ENHANCEMENT Interim Technical Report**  
 Earl A. Alluisi Aug. 1969 27 p refs  
 (Contracts DAHC19-69-C-0009; DA-49-193-MD-2567)  
 (AD-701089; ITR-69-12) Avail: CFSTI CSCL 5/10

Results of prior studies on work behavior are presented and interpreted with regard to the equivalence of different durations of work, depending on the constraints and demands of the non-work or rest periods of the work-rest schedule; the effects on performance of the underlying psychophysiological diurnal rhythms and certain characteristics of such rhythms; the combined effects of sleep loss and demanding work-rest schedules; and the effects of infectious diseases on work behavior. Author (TAB)

**N70-26869#** School of Aerospace Medicine, Brooks AFB, Tex. Environmental Systems Div.  
**GROWTH POTENTIAL OF RADISH IN A CONTROLLED ENVIRONMENT Final Report, 1968-1969**

Syrrel S. Wilks Nov. 1969 17 p refs Submitted for publication  
 (AD-700741; SAM-TR-69-72) Avail: CFSTI CSCL 6/3

Under optimized conditions (culture chamber and plant-supportive matrix, nutrients, elevated P(CO<sub>2</sub>), continuous light, etc.) the radish plant can produce significantly large masses of edible plant material in a relatively short period of time. Certain strains of radish (HV White Icicle and Chinese Celestial) have yielded 10 to 12 liters O<sub>2</sub>/(sq m)(hr) at 15 through 35 days postplanting. At 30 days the dry weight yield (tuberous roots plus foliage) was 2.5 kg./sq m or a daily average of 82.5 gm/sq m. The food value of the total dry plant material was approximately 3 kcal/gm or 247.5 kcal/sq m 1 day. Cyclic growth of 4 to 5 sq m could provide the O<sub>2</sub> requirements of one man, and an increase in planted surface to 8 to 10 sq m would provide the caloric requirement of one man and the O<sub>2</sub> requirement of 2 to 3 men. This approach should provide background information for the possible utilization of plant systems in aerospace missions of extended duration. Author (TAB)

**N70-26895#** Bunker-Ramo Corp., Canoga Park, Calif.  
**RESEARCH REQUIREMENTS FOR THE HUMAN ENGINEERING DESIGN OF VISUAL DISPLAYS**  
 Dennis J. Sullivan and David Meister 1 Dec. 1969 31 p refs  
 (Contract N00014-68-C-0278)  
 (AD-701790; H0069-9U6) Avail: CFSTI CSCL 5/5

A review was made of all available literature describing the human factors affecting display design. In addition to serving as source material for a handbook, the review was made to indicate areas in which human factors research on display parameters was lacking and should be performed. Author (TAB)

**N70-26916#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.  
**PROBABILITY LOGIC CONSTRUCTION OF AN AUTODIDACTIC DIAGNOSTIC PROCESS ON MATHEMATICAL MACHINES**

M. L. Bykhovskii 3 Oct. 1969 19 p refs Transl. into ENGLISH from Eksp. Khir. Anesteziol. (USSR), v. 7, no. 1, 1962 p 3-11  
 (AD-700601; FTD-HT-23-243-68) Avail: CFSTI CSCL 6/5

The paper describes the logic of construction of the diagnostic process, based on probability criteria and the mandatory mathematical relations. It introduces the conception of quality in the work of a diagnostic system. The author considers the organization of an autodidactic system, i.e., of automatic improvement of the quality of the diagnostic progress in an electronic mathematical machine. TAB

**N70-26926#** Army Natick Labs., Mass. Food Lab.  
**THE MICROBIOLOGICAL WHOLESOMENESS OF SPACE FOODS**

Hamed M. El-Bisi and Edmund M. Powers Jun. 1969 34 p refs  
 (AD-701861; FL-93; USANLABS-TR-70-41-FL) Avail: CFSTI CSCL 6/8

The microbiological requirements for space foods were established in 1964 to safeguard the health of the astronauts during a space mission. These requirements are: the total aerobic plate count shall not exceed 10,000 per gram; the total coliform count shall not exceed 10 per gram; the fecal coliforms shall be negative in one gram; the fecal streptococci shall not exceed 20 per gram; the coagulase positive staphylococci shall be negative in five grams; and the Salmonellae shall be negative in ten grams of food. During 1967 and 1968, 88 per cent of the space foods tested had total plate counts of less than 10,000 per gram; 96 percent had less than 10 coliforms per gram and 99 percent were negative for fecal coliforms; 86 percent has less than 20 streptococci per gram; and 100 percent were negative for staphylococci and Salmonellae. This report discusses the scientific and technical rationale behind these microbiological requirements. These requirements and the methodology prescribed for determining compliance therewith are documented. Both are under continued review and amendment, in keeping with up-to-date scientific knowledge and technical experience. Author (TAB)

**N70-26928#** School of Aerospace Medicine, Brooks AFB, Tex. Biomedical Engineering Branch.

**TWO ELECTRONIC STETHOSCOPES FOR USE IN HIGH-NOISE ENVIRONMENTS Final Report, May-Nov. 1968**

James E. Allred, Homer L. Brammell, and Maureen A. Hunt Oct. 1969 12 p refs  
 (AD-700734; SAM-TR-69-61) Avail: CFSTI CSCL 6/12

Two electronic stethoscopes were designed for use with litter and ambulatory patients on domestic and overseas aeromedical evacuation flights. The first, a frequency-translating stethoscope, utilizes both a frequency shift of the Korotkoff sounds and the elimination of all acoustic coupling. The second stethoscope, a direct electronic device, eliminates all acoustic coupling. Evaluation in high-noise environments and under actual flight conditions has demonstrated that the instruments are reliable and practical. The stethoscopes are useful in any noisy area where it is necessary to obtain heart sounds or indirect measurements of blood pressure. Author (TAB)

**N70-26960** National Lending Library for Science and Technology, Boston Spa (England).

**ACCELERATED METHODS OF STUDYING BIOCHEMICAL PROPERTIES OF BACTERIA [USKORENNYE METODY IZUCHENIYA BIOKHEMICHESKIKH SVOISTV BAKTERII]**

Yu. B. Popov Feb. 1970 6 p refs Transl. into ENGLISH from Lab. Delo (Moscow), v. 10, 1967 p 621-624  
 (RTS-5581) Avail: Natl. Lending Library, Boston Spa, Engl.: 10s or 1 NLL photocopy coupons

Rapid and economical micromethods were used for splitting urea, forming indole, and fermenting carbohydrates. Typical cultures of Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Bacillus cereus, Bacillus mesentericus, Micrococcus pyogenes var. aureus, and Bacillus megatherium were used in the experiments. R.B.

**N70-26968#** Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.

**INFORMATION AND DATA USED IN EVENT OF AN ACCIDENT [INFORMATIONS ET DONNEES UTILES EN CAS D'ACCIDENT]**

## N70-26987

H. Jammet [1969] 5 p In FRENCH Presented at the Symp. on the Handling of Radiation Accidents, Vienna, Austria, 19-23 May 1969  
(CEA-CONF-1337; CONF-690509-5; SM-119/51) Avail: AEC Depository Libraries

An inventory of essential data both in the physics and in the medical domains is presented. The physics information covers the nature, modality, and importance of the irradiation for accidental external irradiation and radioactive contamination. The medical information covers diagnostic, therapeutic, and prognostic data for accidental external irradiation and for accidental radioactive contamination. NSA

**N70-26987\*#** Bolt, Beranek, and Newman, Inc., Van Nuys, Calif.  
**STUDY OF THE AUDIBILITY OF IMPULSIVE SOUNDS**  
Sanford Fidell and Karl S. Pearsons Washington NASA May 1970 63 p refs  
(Contract NAS2-4963)  
(NASA-CR-1598) Avail: CFSTI CSCL 06S

Six experiments were performed in an anechoic chamber to investigate the effects of various physical parameters on the perceived noisiness of impulsive signals. The parameters investigated included phase, duration, intersignal interval, repetition, and frequency. All data were collected by a computer based adaptive psychophysical procedure called Parameter Estimation by Sequential Testing (PEST). The experiments show that: (1) the phase spectrum of an impulsive signal is irrelevant to its perceived noisiness, (2) the ear's sensitivity to noisiness of impulsive signals resembles an energy summation process, and (3) the common correction contours may undercorrect in the low frequency regions, and thus should be applied with caution to impulsive signals with appreciable low frequency content (for example, sonic booms). Author

**N70-27002#** School of Aerospace Medicine, Brooks AFB, Tex.  
**DESIGN AND PRELIMINARY EVALUATION OF A MAN-RATED PHOTOSYNTHETIC EXCHANGER Interim Report, Mar. 1967-Jun. 1968**

Richard L. Miller, George W. Rose, III, Herman J. Kilian, Hazel E. Wickline, and Cara L. Martinez Oct. 1969 14 p refs  
(AD-700735; SAM-TR-69-64) Avail: CFSTI CSCL 6/11

Algal photosynthesis may be used to provide part of mans expendable needs for life support in long-duration space missions. Feasibility has been demonstrated in model experiments, but the extrapolation of laboratory data to the design of prototype life support systems can only be made within wide limits. The USAF School of Aerospace Medicine has developed a large-scale algal photosynthetic exchanger to study the logistics of operation of a man-rated system. The hardware consists of a closed-loop continuous algal propagator using artificial illumination. Unicellular algae are cultured in aqueous inorganic media, contacted with cabin gas, and exposed to fluorescent light in thin layers. Inputs to the process are carbon dioxide, fresh culture medium, and light energy. The products are oxygen and raw foodstuff in the form of algal harvest. The apparatus is instrumented to monitor and control the important parameters affecting algal growth. Culture density is automatically controlled by a photodiode densitometer which regulates the addition of fresh medium and the harvest of culture. System performance has been tested using three different species of algae. Author (TAB)

**N70-27042#** School of Aerospace Medicine, Brooks AFB, Tex.  
**PHYSICAL-CHEMICAL ASPECTS OF BUBBLE FORMATION Final Report, Feb. 1968-Jun. 1969**

Kenneth G. Ikels Oct. 1969 16 p refs  
(AD-700730; SAM-TR-69-60) Avail: CFSTI CSCL 6/19

Biophysical concepts regarding the production and growth

of bubbles in gas-supersaturated solutions were considered with reference to the problem of decompression sickness. It was demonstrated that solutions, including blood, which are free of gas nuclei do not form bubbles in response to decompression alone, despite the presence of large amounts of dissolved gas. Such findings emphasize that the comprehensive understanding of decompression sickness requires elucidation of the basic physical-chemical factors responsible for cavitation or initiation of nuclei in solutions. Observations were made on a mechanism for producing nuclei by continuous contact and separation of surfaces (tribonucleation). Unlike several other possible mechanisms, tribonucleation was shown to be capable of producing nuclei from which bubble growth occurs under the relatively mild experimental conditions that can be encountered in vivo. Author (TAB)

**N70-27048\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Space Sciences Div.

**SURVIVAL OF MICROORGANISMS IN DESERT SOIL EXPOSED TO FIVE YEARS OF CONTINUOUS VERY HIGH VACUUM**

R. E. Cameron, F. A. Morelli, and H. P. Conrow 15 Mar. 1970 16 p refs  
(Contract NAS7-100)

(NASA-CR-109763; JPL-TR-32-1454) Avail: CFSTI CSCL 06M

Survivability of indigenous aerobic, anaerobic, and microaerophilic bacteria, fungi, algae, and protozoa occurring as a microbial community in a desert algal soil crust was determined after 4 to 5 years of exposure to continuous very high vacuum. Aerobic and microaerophilic bacteria show some decrease in survivability (approximately 1 log unit) after 4 and 5 years. In the sieved and powdered samples, there were not survivable thermophiles after 4 years and the number of algae were reduced from 1,000,000 to 100 per g of soil. No protozoa survived after 5 years in vacuum, but they did survive after 4 years. In the sieved sample, viable microaerophilic bacteria had decreased from 1,000,000 to 100,000 per g of soil, and there were no survivable anaerobes or molds. Results of survivability of microorganisms in powdered samples were more variable than in sieved samples. The reduction in abundance of various groups of microorganisms exposed to vacuum shows some similarity to survivable microbial groups occurring in the naturally harsh, cold Antarctic desert. Author

**N70-27053#** Bernice P. Bishop Museum, Honolulu, Hawaii.  
**STUDIES OF AIR-BORNE ORGANISMS RETRIEVED BY LARGE AIRCRAFT Final Technical Report, 1 Feb. 1967-31 Jul. 1969**

Linsley J. Gressitt and Eugene Holzapfel Jul. 1969 17 p refs  
(Contract AF-AFOSR-1240-67)

(AD-701440; AFOSR-70-0334TR) Avail: CFSTI CSCL 6/3

The main objective of the studies was to operate a trapping program, utilizing an air plankton retriever and other special collecting devices installed in a WV-2 aircraft of the Pacific Missile Range Facility, based at Pt. Mugu, California, for the purpose of collecting all types of air-borne organisms and particles in the Pacific area. The primary interest was trapping air-borne arthropods to further test the theory of natural air dispersal of arthropods to oceanic islands. TAB

**N70-27086#** Louisville Univ., Ky. Performance Research Lab.  
**STUDIES OF PERFORMANCE ASSESSMENT AND ENHANCEMENT Annual Progress Report, 1 Sep. 1968-31 Aug. 1969**

Earl A. Alluisi and Glynn D. Coates 30 Sep. 1969 39 p refs  
(Contract DAHC19-69-C-0009)

(AD-701092; PR-69-13) Avail: CFSTI CSCL 5/10

An annual progress report presents brief summaries of research activities under six major headings: Studies of sustained performance; psychophysiological and biomedical correlates; personality, social, and subjective correlates; technical studies and supporting laboratory research; methodological and theoretical formulations; and liaison activities. Author (TAB)

**N70-27089#** School of Aerospace Medicine, Brooks AFB, Tex. **CALIBRATION AND EVALUATION OF THE USAFSAM WHOLE-BODY COUNTER Final Report, May 1968—Feb. 1969** John Taboada Nov. 1969 18 p refs (AD-700721; SAM-TR-69-67) Avail: CFSTI CSCL 6/12

A large volume 4 pi geometry liquid scintillator whole-body counter was installed at the USAF School of Aerospace Medicine (SAM). The counter was designed for the low-level detection and assay of the radionuclides present, naturally or otherwise, in the human body. Presented are system description, adjustment, and calibration technics employed in preparing the counter for assaying cesium-137 (137Cs) and potassium-40 (40K) in the human body. Included in this report is a brief comparison of the SAM counter with similar whole-body types. Author (TAB)

**N70-27123#** Oakland Univ., Rochester, Mich. Inst. of Biological Sciences.

**KINETICS OF PUMP-LEAK SYSTEM OF TRANSPORT IN THE OCULAR LENS, DERIVED FROM CLASSIC ENZYME KINETICS AND DIFFUSION THEORY**

Ian Mc Lean, V. Everett Kinsey, and Richard Conley La Force (Mayo Found.) [1969] 16 p refs (Contract AT(11-1)-2012; Grant NIH NB-08339) (COO-2012-1) Avail: CFSTI

A relationship is derived between the transfer coefficient of the pump and the concentration of substrate and inhibitor ions in the media using classic Michaelis-Menten kinetics. The leak is described not only in terms of the chemical gradient but of the electric gradient and permeability characteristics of the lens as well. A method is outlined whereby these relationships can be used to interpret lens culture data in terms of the various pump and diffusion parameters. Author

**N70-27124#** Georgia Univ., Athens. Dept. of Biochemistry. **ENERGY TRANSFER IN CHEMICAL AND BIOLOGICAL SYSTEMS Final Report, 1964—1969**

John Lee 1969 12 p refs (Contract AT-(30-1)-3401) (NYO-3401-6) Avail: CFSTI

Chemiluminescence of luminol, bioluminescence of bacteria, and bioluminescence of marine dinoflagellates were studied. Although some of the bacterial work was done on in vivo systems this work did not progress as rapidly as the in vitro studies which are now being prepared for publication. The dinoflagellate study was in vivo and was much more successful. Funding reduction however required curtailment of this program in midstream. A study of the luminescence properties of protein was also made and although no direct publication resulted it provided a firm foundation for the spectral study of bacterial luciferase. Author

**N70-27135\*#** Mayo Association, Rochester, Minn. **STUDIES OF THE EFFECTS OF GRAVITATIONAL AND INERTIAL FORCES ON CARDIOVASCULAR AND RESPIRATORY DYNAMICS Semiannual Status Report, 1 Nov. 1968—1 Nov. 1969**

1 Oct. 1969 35 p refs (Grant NGR-24-003-001) (NASA-CR-109727) Avail: CFSTI CSCL 06S

Accomplishments of the continuing study are reported and included the following: (1) The operational readiness was completed of a biplane X-ray image intensifier video system plus a video quantizer and flying -spot scanner assembly for electronic recognition and measurement of the diameters of the opacified left ventricular chamber at each horizontal line of its biplane video image. In addition, techniques were developed for the transfer of data from this system to the juxtaposed CDC 3200 computer and the processing of these data. (2) The use of telemetered flow pulses for ultrasonic flowmeters chronically implanted on the right, left, and main pulmonary arteries for the study of the effect of the direction and magnitude of the force environment on the distribution of pulmonary blood flow was attempted in three dogs. (3) Progress continued on the development of the computer controlled scintiscanning system and associated computer processing techniques for study of regional distribution of blood flow. (4) An investigation was conducted on the effects of breathing liquid fluorocarbons on regional differences in intrathoracic pressures, pulmonary blood flow, and blood oxygenation. D.L.G.

**N70-27137\*#** Serendipity Associates, Arlington, Va. **OFF-DUTY ACTIVITY EQUIPMENT AND FACILITIES FOR ADVANCED SPACECRAFT (PRELIMINARY DESIGN)**

John W. Eberhard and Frederic A. Hooper, Jr. Mar. 1970 150 p refs (Contract NAS9-9338) (NASA-CR-108410) Avail: CFSTI CSCL 05E

Preliminary designs for off-duty activity equipment and facilities for space stations and space bases were developed. The general objective was to identify feasible off-duty activities, equipment, and facilities to support anticipated missions in such vehicles. Off-duty activities performed by confined individuals and differences in off-duty activities due to crew size and composition were identified. Author

**N70-27180#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.

**THE EFFECT OF PHYSICAL FITNESS ON THE WORK CAPACITY AT ALTITUDE [DER EINFLUSS DES TRAININGSZUSTANDES AUF DIE KOERPERLICHE LEISTUNGSFAEHIGKEIT IN DER HOEHE]**

Arno Rimpler (Ph.D. Thesis—Bonn Univ.) Mar. 1970 77 p refs In GERMAN; ENGLISH summary (DLR-FB-70-08) Avail: CFSTI; Zentralstelle fuer Luftfahrtokumentation und Inform. (ZLDI), Munich: 21.40 DM

In 12 healthy, untrained students physical performance was evaluated at a total pressure of 750 mm Hg, 578 mm Hg, and 515 mm Hg with a stepwise increasing work load on a bicycle-ergometer. The results were compared with those obtained under the same conditions from a group of 12 highly trained athletes. At an altitude of 2,250 m both groups did not differ significantly in their hypoxia induced alterations of heart rate, breathing volume, oxygen uptake, oxygen pulse, ventilation equivalent and respiratory quotient—except, however, the maximal values of respiratory volume and oxygen uptake. The reduction of the highest possible duration and quantity of work was significantly more marked in athletes than in non-athletes, the observed reduction of the corresponding maximal oxygen uptake being 10.1% and 8.7%, respectively. For the correlation between the aerobic work capacity and its reduction under hypoxia a positive coefficient ( $r = 0.62$ ) was found which was statistically significant. Furthermore, utilizing our own data and data from the literature, correlation was calculated

**N70-27227**

between performance reduction and altitude in the range of 2,000 to 4,000 m separately for both groups. With increasing altitudes the regression lines show a progressively higher increment of performance reduction in athletes than in non-athletes.  
Author (ESRO)

**N70-27227#** Johns Hopkins Univ., Baltimore, Md. Dept. of Psychology.

**THE EVOLUTION OF PERCEPTUAL FRAMES OF REFERENCE Technical Report**

Howard Egeth, William Beven, Stanley C. Collyer, and John Jonides  
Feb. 1970 107 p refs  
(Contract N00014-67-A-0163-0001)  
(AD-702478; TR-61; TR-62) Avail: CFSTI CSCL 5/10

The purpose is to provide an up-to-date account of the empirical and theoretical status of the concept of attention, with emphasis on the selective and intensive properties of attention that are manifested in studies of human perceptual processes.  
Author (TAB)

**N70-27231\*#** Case Western Reserve Univ., Cleveland, Ohio. Digital Systems Lab.

**A COMPUTER AIDED TELEOPERATOR SYSTEM Final Report**

H. W. Mergler, Peter Hammon, Richard Taylor, Jon Beckett, and Norman Diederich Feb. 1970 194 p refs Sponsored in part by AEC  
(Grant NGR-36-003-042)  
(NASA-CR-109769; FR-1-70-80) Avail: CFSTI CSCL 05H

An experimental teleoperator system is presented which utilizes a general purpose digital computer to assist the operator in performing various tasks. A specific task was selected to test the system. This task involves the use of the teleoperator in the disassembly of a model of a nuclear reactor. Several pieces of equipment were constructed to permit the operator to communicate with the teleoperator system through the computer. These devices are described and their use is detailed. The computer aided teleoperator system utilizes a series of algorithms to perform the necessary control functions. These algorithms along with other special functions can be initiated by the operator from the teletype control console. This function is permitted by a teletype executive control routine which handles this selection. By means of this teletype executive routine the operator can indicate the mode of operation desired including manual, semi-automatic, and fully automatic under the control of another executive routine which is controlled by paper tape.  
Author

**N70-27296\*#** Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N.Mex.

**EXPOSURE LIMITS FOR CHIMPANZEES AT NEAR VACUUM FOLLOWING RAPID DECOMPRESSION Final Report, Jul. 1964 - Dec. 1969**

Alfred G. Koestler, ed. Dec. 1969 92 p refs  
(NASA Order T-61022-G)  
(NASA-CR-108444; ARL-TR-69-6) Avail: CFSTI CSCL 06S

Six chimpanzees were decompressed from 179 mm Hg (breathing 100 percent oxygen) to less than 2 mm Hg in 0.8 seconds and remained at this pressure altitude 180 or 240 seconds. Following repressurization within 30 seconds, using 100 percent oxygen, to 179 mm Hg, subjects were maintained at this pressure altitude for a minimum of 4 hours. Four subjects did not survive the experimental conditions. Results of these decompressions demonstrate that a 3-minute tenure at near vacuum constitutes the maximum safe exposure limit. Complex behavioral tasks, physiological parameters (ECG, respiration, and skin temperature) cortical and deep implant EEG data, as well as detailed physical

examinations seem to confirm previous findings, that exposure to near vacuum either results in death or in complete recovery with no apparent long term detrimental effects as determined by behavioral tasks.  
Author

**N70-27370\*#** Webb Associates, Malibu, Calif.  
**LIMITS OF ENDURANCE FOR HEAT STRESS ARISING FROM WORK WHILE TOTALLY INSULATED**

Herman P. Roth and W. Vincent Blockley Apr. 1970 79 p refs  
(Contract NAS9-8871)  
(NASA-CR-108419) Avail: CFSTI CSCL 06S

Ten healthy, physically-fit male subjects, ranging in age from 23 to 39 years, walked on a treadmill in an environmental chamber, at four incremental levels of energy expenditure, in a clothing/environment combination which assured near-zero heat exchange and compelled storage in the body of all metabolically-produced heat. Each test was carried to the limit of the subject's endurance, at which time he was rapidly cooled. Heart rate and temperatures of the ear canal, rectum, and 9 skin surface locations were continuously recorded, and oxygen uptake was continuously monitored. Great differences in tolerance time at each metabolic level were found, which were not correlated with physical fitness as measured by a standard work tolerance test given each subject three times during the program. Rate of rise of ear canal temperature proved to be the best predictor of average tolerance time. Judged by increase in mean body temperature, heat storage of about 1000 Btu in the high-tolerance group of 5 men, and about 800 in the low-tolerance group of 5, brought subjects near to the collapse point, though some tolerated as much as 1400 Btu increase in body heat content. These storage tolerance values for exercising subjects are from about 50 to 100% higher than an average of 584 Btu determined in a previous study of seated subjects in very hot environments. It appears that the difference may represent the change in heat content which is normally associated with the change to a new thermal equilibrium during the first hour of work in a moderate to warm climate.  
Author

**N70-27375#** Aerospace Medical Lab. (Clinical), Lackland AFB, Tex.

**MOL BIOMEDICAL CREW MEASUREMENT PROGRAM: HEMATOLOGIC MEASUREMENTS Technical Report, Jan. - Jun. 1968**

Charles A. Coltman, Jr. Mar. 1969 31 p refs  
(AD-701041; AMLC-TR-69-4) Avail: CFSTI CSCL 6/19

Space flight is associated with alterations in red cell, white cell and plasma protein composition, but the exact mechanism involved is unknown. Each parameter is exposed to a large variety of stresses, any of which could conceivably act independently, in an additive manner, or even synergistically to produce changes observed thus far. The potential stresses that may influence hematologic homeostasis during manned space flight are weightlessness, atmosphere, transverse acceleration forces, vibration irradiation and exercise. Complete bed rest is the best available experimental model to test mans potential response to zero gravity. A detailed analysis of the available literature revealed that methodologies differed, but the investigators obtained strikingly consistent results. The red cell mass decreased erythropoiesis. However, data on the Gemini IV, V and VII astronauts suggested need for identifying another mechanism. Use of the diisopropylfluorophosphonate 32 technique to measure survival of erythrocytes is recommended for experiments simulating space flight conditions, because it is more accurate than chromium 51 and other methodologies used. For short-term studies, use of endogenous carbon monoxide production is recommended to approximate more closely the rate of destruction of erythrocytes.  
Author (TAB)

**N70-27377\*#** Agence Tunisienne de Public-Relations, Tunis.  
**THE DEPENDENCE OF SLEEP MOVEMENTS OF PHASEOLUS MULTIFLORUS ON VARIOUS OTHER EXTERIOR FACTORS [DIE ABHAENGIGKEIT DER SCHLAFBEWEGUNGEN VON PHASEOLUS MULTIFLORUS VON VERSCHIEDENEN AUSSENFAKTOREN]**

Rose Stoppel Washington NASA May 1970 89 p refs Transl. into ENGLISH From Z. Botan. (Stuttgart), v. 8, 1916 p 608 684 Prepared for NASA and NSF

(NASA-TT-F-12613; TT-70-58014) Avail: CFSTI CSCL 06C

The results of the experiments with *Phaseolus* leaves cultivated in darkness were absolutely identical, by the fact that the leaves reached their lowest position in the early morning hours, between 2:00 a.m. and 4:00 a.m., and showed a periodicity of 24 hours in their movements. Normal leaves would never obtain the height of their downward movement at noon or in the evening hours. The momentaneous fixation of the movement cannot be based on a hereditary periodicity. Light and temperature change were eliminated as potential factors able to regulate the movements and changes of humidity and air pressure are without visible influence on the movements. Only the very small day-periodical oscillations of the earth's gravity or the electrical phenomena in the atmosphere could possibly have an influence in this direction. The result is the circular movement of energy in the plant. Author

**N70-27435\*#** Union Carbide Corp., Tarrytown, N.Y. Linde Div.  
**DECOMPRESSION PROCEDURES FOR THE SAFE ASCENT OF AEROSPACE PERSONNEL FROM GROUND LEVEL TO ALTITUDE, SUPPLEMENT A Final Report**

H. R. Schreiner 28 Feb. 1970 43 p

(Contract NAS9-6978)

(NASA-CR-108420) Avail: CFSTI CSCL 05E

Manned altitude flight records were subjected to a theoretical analysis to determine the parameters affecting construction of decompression tables for aerospace personnel. For flights in which nitrogen was the only inert gas breathed, the maximum tissue nitrogen tensions in the slowest hypothetical gas exchange compartment of a decompression model are developed which permit safe ascent and exposure to a given target altitude for up to 10, 60, and 120 minutes, respectively. The resulting information was used to compute the preoxygenation time at ground level required for safe ascent to several target altitudes as a function of the duration of the intended exposure to altitude. Based on the ascent-limiting nitrogen partial pressures, decompression tables are constructed for ascent to total pressures ranging from 500 to 150 mm Hg after saturation with nitrogen at partial pressures ranging from 600 to 50 mm Hg. The information is displayed as preoxygenation time required to ascent to the target total pressure within 60 seconds. See also N70-27436. Author

**N70-27408#** Uniroyal, Inc., Wayne, N.J. Research Center.  
**RESEARCH AND DEVELOPMENT ON A PASSIVELY PRESSURIZED FLIGHT UNIFORM Final Report, Jul. 1966 - Oct. 1968**

Robert A. Fowkes and Mark W. Olson Dec. 1969 35 p

(Contract AF 33(615)-5261)

(AD-702537; AMRL-TR-69-56) Avail: CFSTI CSCL 6/17

A high altitude protection suit was developed of the partial pressure type that utilizes 40 sealed cells each containing a small air charge so they expand in accord with Boyles law when the atmospheric pressure is reduced. These independently acting, expandable, tubular cells are restrained within a stretch resistant but porous coverall in a manner to allow them to pressurize the body of the wearer. When the coverall is worn with pressure gloves, boots and a pressure helmet, it is possible to pressurize the entire body sufficiently for altitude exposure up to 100,000 feet for at least several minutes. The suit is fabricated of NOMEX material, with pleated cells of polyurethane, and an inner comfort liner. The experimental suits were evaluated through actual wear in the altitude chambers at the USAF School of Aerospace Medicine. Results of these tests confirm the potential of this approach for providing aircrew protection. Further refinement is needed to obtain a design more suitable for use in the field and to assure balanced respiratory pressures. Author (TAB)

**N70-27409#** Antioch Coll., Yellow Springs, Ohio. Behavior Research Lab.

**THE PHYSICAL CHARACTERISTICS AND FACTOR STRUCTURE OF A SELECTED SET OF RANDOM SHAPES**

Ronald L. Knoll and Herbert J. Clark (AMRL, AFSC) Jun. 1969 29 p refs

(Contract F33615-67-C-1280)

(AD-702517; AMRL-TR-69-8) Avail: CFSTI CSCL 5/10

One hundred and twenty uncurved random shapes frequently used in studies of form perception are described in terms of 12 nearly orthogonal physical measures of shape. Calculation of the measures is described and their unique characteristics are pointed out. Although random shapes were examined in this investigation, techniques developed and conclusions arrived at are equally relevant to the specification of some of the characteristics of targets in the real world. Author (TAB)

**N70-27436\*#** Union Carbide Corp., Tarrytown, N.Y. Linde Div.  
**DECOMPRESSION PROCEDURES FOR THE SAFE ASCENT OF AEROSPACE PERSONNEL FROM GROUND LEVEL TO ALTITUDE, SUPPLEMENT B Final Report**

H. R. Schreiner 28 Feb. 1970 19 p refs

(Contract NAS9-6978)

(NASA-CR-108421) Avail: CFSTI CSCL 05E

A single repetitive diving/flying decompression table was developed to enable astronauts to determine the surface intervals required, breathing either air or oxygen, before making a safe ascent to cabin pressure altitudes. The table considers hyperbaric exposures to air at depth increments from 0 to 47 feet of sea water for durations up to 40, 80, and 120 minutes at a frequency of up to 2 exposures per day separated by surface intervals of at least 120, 180, or 240 minutes. Using the developed mathematical model of decompression and the analyzed decompression experiences obtained from manned altitude flight records, the table is expected to be capable of predicting the outcome of experimental diving/flying exposures. See also N70-27435. Author

**N70-27463#** Innsbruck Univ. (Austria). Inst. fuer Psychologie.  
**INVESTIGATIONS INTO THE ADAPTATION OF CONTOUR-DETECTORS IN THE HUMAN VISUAL SYSTEM THROUGH ANALYSIS OF AFTERIMAGES OF ALTERNATING STIMULUS PATTERNS**

Gerhard Luecke 1968 32 p refs

(AD-698882) Avail: CFSTI CSCL 5/10

Following a brief introduction into some recent results of psychophysical and neurophysiological studies of contour-perception, a new situational aftereffect, which shows binocular interaction, is reported. It is shown that alternating stimulation with two gratings, consisting of parallel black and white stripes, results after each stimulus in alternating afterimages, and that the latency of the first of these afterimages is a function of the orientation of the two gratings. After reporting some further new afterimage phenomena connected with this situational aftereffect, the findings are discussed in relation to some aspects of information-processing in the human visual system. Author (TAB)

**N70-27472\*#** Sandia Corp., Albuquerque, N.Mex. Planetary Quarantine Applied Science Div. 1742.

**N70-27475**

**THE FEASIBILITY OF THERMORADIATION FOR STERILIZATION OF SPACECRAFT A Preliminary Report**

Marcel C. Reynolds Dec. 1969 24 p refs

(NASA Order W-12853)

(NASA-CR-109871; SC-RR-69-857) Avail: CFSTI CSCL 06M

Initial tests indicate that, utilizing relatively low levels of heat and radiation, the technique provides effective bacterial sterilization. The applicability of the technique to a selection of other resistant bacteria, the optimization of temperature/radiation exposures, and the effectiveness on actual spacecraft hardware are listed for future study. Author

**N70-27475#** Tennessee Univ., Oak Ridge. U-T-AEC Agricultural Research Lab.

[RESEARCH ACTIVITIES] Annual Progress Report, 1 Jan. 31 Dec. 1968

Oct. 1969 191 p refs

(Contract AT-40-1-GEN-242)

(ORO-672) Avail: CFSTI

Research activities covered the general groups of prenatal studies, reproduction, late effects, early effects, metabolism, soil chemistry, plant studies, laboratory herd health, and pathology. A bibliography is also provided. NSA

**N70-27494#** Defense Documentation Center, Arlington, Va.

**FREEZE DRYING, VOLUME 1 BIBLIOGRAPHY, JUN. 1954-OCT. 1969**

Feb. 1970 135 p refs

(AD-702700; DDC-TAS-70-11-Vol-1) Avail: CFSTI CSCL 6/8

The annotated references to reports in the bibliography contain information on freeze drying used in chemical and biological research, and in food preservation. Author (TAB)

**N70-27504** National Lending Library for Science and Technology, Boston Spa (England).

**CLINICAL SYMPTOMS OF ACUTE ATTACKS BY SUPER HIGH FREQUENCY ELECTROMAGNETIC WAVES**

F. A. Kolesnik et al [1969] 7 p refs Transl. into ENGLISH from Voenno-Med. Zh. (Moscow), no. 4, Apr. 1967 p 21 23

(NLL-Trans-2628-9022.81) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 photocopy coupons

Two cases of acute attacks by high intensity super high frequency electromagnetic waves are examined. Cause, symptoms, treatment, and response of the patients were noted. X-rays, blood analysis, EEG, blood pressure, cholesterol, glycaemia coefficients, and the Quick's test data are reported. S.S.

**N70-27533#** Battelle Memorial Inst., Columbus, Ohio.

**A PRELIMINARY MATHEMATICAL MODEL FOR PREDICTING THE TRANSPORT OF RADIONUCLIDES IN THE MARINE ENVIRONMENT**

S. G. Bloom and G. E. Raines 20 Nov. 1969 20 p refs

(Contract AT(26-1)-171)

(BMI-171-123) Avail: CFSTI

Expressions for the internal radiation dose to standard man following the consumption of sea foods are derived. The potential internal radiation dose is discussed and compared with radiation protection guides to determine the necessity of radiological safety measures. The model derivation starts with an instantaneous point source solution to a partial differential equation of the physical dispersion process in the ocean. An expression for the radionuclide concentration in the ocean resulting from a fallout input is developed and indicates that vertical diffusion is the controlling mechanism for dispersion soon after the fallout deposition, and that convection

controls dispersion later. Simpler expressions for describing dispersion of a fallout input are used to define a mixing volume which then is considered to be the receptor of both the fallout and the terrestrial radionuclide inputs, which are due to direct ground water contamination and terrestrial fallout. An expression is derived for the radionuclide concentration in the mixing volume which is combined with a seawater-seafood-man food-chain model to arrive at expressions for the infinite internal radiation dose to man.

Author (NSA)

**N70-27543#** Albert Einstein Medical Center, Philadelphia, Pa.

**[STUDY OF THE IN VITRO EFFECTS OF IONIZING RADIATION ON GERMINAL EPITHELIUM OF HUMAN TESTIS AND ON STEROID BIOSYNTHESIS OF LEYDIG CELLS, UTILIZING TISSUE CULTURE METHODS] Progress Report**

[1969] 27 p

(Contract AT(30-1)-4034)

(NYO-4034-1) Avail: CFSTI

Methods of preparing histologic sections of tests for radio-autography are described. Cultures of fresh tissue were exposed to 225 R of gamma radiation and tissues were fixed at intervals from 24 hr to 10 weeks later. Cytological changes in germinal cells are described and photographs of typical cells are presented. From the fourth to the tenth week there was a gradual decline in the total cell count affecting both spermatogonia and the Sertoli cells. A discussion is presented of relative degeneration and proliferation of spermatogonia, spermatocytes, and spermatids. Studies were conducted on effects of in vitro irradiation on steroid biosynthesis in Leydig cells. NSA

**N70-27563#** National Physical Lab., Teddington (England). Aerodynamic Div.

**PROPOSED VALUE OF RETSPL FOR THE IEC ARTIFICIAL EAR**

M. E. Delany Jul. 1969 10 p refs

(NPL-AERO-Ac-42) Copyright. Avail: CFSTI

With the acceptance by the International Electrochemical Commission of a new artificial ear designed to be used for calibrating earphones used in audiometry, there is now a basis for the International Organization for Standardization to unify the existing values of reference equivalent threshold sound pressure level (RETSPL). It is shown that a single specification of threshold is possible which would be valid for a variety of earphones currently used in audiometry. Explicit proposals are made for the numerical values of RETSPL for the I.E.C. artificial ear. Author (ESRO)

**N70-27573#** Michigan Univ., Ann Arbor. Dept. of Psychology.

**HUMAN INFORMATION HANDLING PROCESSES Semiannual Report, 1 Jun.-30 Nov. 1969**

Arthur W. Melton Dec. 1969 33 p refs

(Contract AF 49(638)-1736; ARPA Order 461)

(AD-702475; MR-11; AFOSR-70-0774TR; Rept-08773-55-SA) Avail: CFSTI CSCL 5/10

This is a semi-annual report of research carried out on human performance in information processing and memory at the Human Performance Center, Department of Psychology, University of Michigan, under Contract No. AF 49(638)-1736. The report lists 13 publications and 3 in press articles that are products during the 6 month period 1 Jun 1969 to 30 Nov 1969. Recent accomplishments and future plans are summarized under the headings: Selective information handling, information storage and retrieval (memory). TAB



**N70-27574#** Michigan Univ., Ann Arbor. Sensory Intelligence Lab.

**STATISTICAL DECISION PROCESSES IN RECOGNITION AND DETECTION Final Report**

Wilson P. Tanner, Jr. Feb. 1970 15 p

(Contract F44620-68-C-0090)

(AD-702477; AFOSR-70-0783TR; Rept-01774-1-F) Avail: CFSTI CSCL 5/10

The report summarizes research on measurement of the time involved in input data processing and decision making in psychoacoustics, the acquisition of sensory abilities, sensory function in multimodal signal detection, the processing of complex inputs over multiple channels, and binaural masking. Author (TAB)

**N70-27739#** Columbia Univ., New York. Dept. of Biochemistry. **THE EFFECT OF CHEMICAL MODIFICATION OF DNA ON ITS MACROMOLECULAR STRUCTURE Progress Report, 1 May 1969 - 31 Jan. 1970**

Alvin I. Krasna 1970 9 p refs

(CU-3957-6) Avail: CFSTI CSCL 06A

Results for the denaturation by acid, alkali, and heat are described. Besides elucidating the mechanism of denaturation, these results confirm previous findings on native DNA that high angle scattering (> 30 deg) measurements underestimate the molecular weight of the native material by at least a factor of two. The low angle curvature observed with native DNA is shown to be an inherent property of the molecule and not due to experimental artifacts. In all the denaturation studies, it was found that the molecular weight decreased by somewhat more than a factor of two which is in contrast to all previous high angle light scattering studies from other laboratories which reported no change in molecular weight on denaturation. Author

**N70-27751#** Buenos Aires Univ. (Argentina). Facultad de Medicina.

**RADIATION DAMAGE TO THE ELECTROCHEMICAL AND BIOCHEMICAL ACTIVITIES OF MUSCLE MEMBRANE Final Progress Report, 1 Apr. 1968 - 31 May 1969**

Carlos Perez 31 May 1969 94 p refs

(Contract AT(30-1)-3467)

(NYO-3467-2) Avail: CFSTI

This research work is divided into two major approaches for studying the effects of radiation on membrane organization and functions: biophysical properties of the electrical and chemical excitable membranes and biochemical studies of the organized membranes, including the cell membrane, mitochondrial and microsomal membranes. In experimental animals with distinct differences in radiosensitivity, (rats and frogs) it is possible to ascertain some of the elements involved in biological responses to ionizing radiation. The goal of this research can be indicated by the work in progress during the recent years: membrane systems and control mechanisms; maintenance of membrane systems; the vectorial character of membrane systems; the permeability of membrane systems; membranes and metabolic sequences; and modification of the form of complexes by action of enzymes, activators, inhibitors, blocking agents and radiation. Author (NSA)

**N70-27809#** Mayo Clinic, Rochester, Minn. Cardiovascular and Human Centrifuge Labs.

**SCINTISCANNING SYSTEM FOR STUDY OF REGIONAL DISTRIBUTION OF BLOOD FLOW Final Report, Jan. 1968 - Sep. 1969**

Earl H. Wood, Craig M. Coulam, William Dunnette, James F. Greenleaf, David Nathan et al Feb. 1970 206 p refs

(Contract F41609-68-C-0022)

(AD-702421; SAM-TR-70-6) Avail: CFSTI CSCL 6/12

The effect of changes in the direction and magnitude of the gravitational-inertial force environment on the regional distribution of impacted 35-micron diameter microspheres has been measured in the lungs of six anesthetized chimpanzees. These distributions were determined by two computer-controlled scintiscans at 780 sites covering the dorsal and ventral surfaces of the thorax at 1 G subsequent to four injections of differentially isotope-tagged microspheres into the right ventricular outflow tract. Pulse-height analysis at each site allowed separation of count values for the isotopes, and, after correction for collimator distortion, these values were assumed to be proportional to the respective blood flows which were present below each site at the respective time of injections. Computer-generated 3-dimensional and contour map displays of the scintiscan and related physiologic data indicate that pulmonary blood flow tended to redistribute toward the midthoracic region during acceleration exposures concomitantly with large decreases in arterial oxygen saturation presumably from pulmonary shunting via the dependent regions of the lung. The decrease in blood flow to the superior regions of the lung coupled with the finding of no change or decreases in flow to the dependent regions of the lung suggests that selective increases in resistance to blood flow to the dependent, presumably anoxic, region of the lung occurred which were responsible for the reduction in level of physiologic shunt frequently found in these animals toward the end of the exposure to 5.8 Gy. Author (TAB)

**N70-27814#** School of Aerospace Medicine, Brooks AFB, Tex. **ACCEPTABILITY AND EFFECTIVENESS OF AN INGESTIBLE TOOTHPASTE Final Report, Jan. 1964 - Jun. 1967**

Gaylord L. Hall, Albert C. Jerman, and Cecil E. Brown, Jr. Dec. 1969 10 p refs

(AD-702154; SAM-TR-69-84) Avail: CFSTI CSCL 6/5

An ingestible toothpaste was tested during the course of a simulated space flight conducted to study the effect on man of living in an atmosphere of approximately 100% oxygen. Four young male adults spent 43 days in a space cabin simulator at a pressure equivalent to 27,000 ft. of altitude. The dental phase was to determine the acceptability of the ingestible toothpaste and whether any change in the oral health of the subjects took place as a result of the flight. The ingestible toothpaste was acceptable; however, because of the small number of subjects, results were inconclusive as to the effectiveness of the oral hygiene protocol. Author (TAB)

**N70-27832#** School of Aerospace Medicine, Brooks AFB, Tex. **REDUCTION OF RADIATION HAZARD IN TRITIUM METHOD OF MEASURING TOTAL BODY WATER Final Report, Jul. - Sep. 1969**

Donald F. Logsdon, Jr., James F. Green, and John W. Harper Nov. 1969 11 p refs

(AD-702155; SAM-TR-69-82) Avail: CFSTI CSCL 6/18

The current procedure for measurement of total body water in vivo using a 250 microcurie dose of tritiated water produces 18.98 mrad of total body radiation. It was found that the amount of radiation activity (number of counts) necessary for usable test results could be achieved as effectively by extending the counting time or increasing the amount of serum sampled. These changes in procedure allowed for a reduction in the total amount of tritiated water administered to 25 microcuries. Increasing the counting time reduced the exposure dose by a factor of 5; doubling the serum sampled decreased the exposure dose by a factor of 2; combining these two procedures decreased the total body exposure by a factor of 10. If a lower degree of test accuracy can be accepted, the amount of activity measured can be reduced and the dose of tritiated water correspondingly decreased. Author (TAB)

**N70-27833**

**N70-27833#** School of Aerospace Medicine, Brooks AFB, Tex.  
**ENDOCRINE HOMEOSTASIS IN DOGS UNDER  
NONHYPOXIC-HYPOBARIC CONDITIONS Final Report,**  
**Feb. Oct. 1969**

Gordon L. Coppoc and Shelton J. Leger Dec. 1969 12 p refs  
(AD-702156; SAM-TR-69-91) Avail: CFSTI CSCL 6/19

Plasma insulin concentration, 17-hydroxycorticosteroid (17-OHCS) secretion rate, and norepinephrine (NE) secretion were studied in dogs anesthetized with sodium pentobarbital and exposed to 100% oxygen at 259 torr. The 17-OHCS secretion rate was also studied in dogs breathing 100% oxygen at 760 torr. The secretion rates of NE and 17-OHCS were estimated by direct measurements on blood collected from a cannula inserted into the left lumboadrenal vein of each dog. No change was detected in plasma insulin concentration. Slight increases in NE secretion were noted in 2 of 3 dogs exposed to the low pressure. The secretion rate of 17-OHCS increased to about 25% of maximum values during exposure to 100% oxygen at 760 torr and at 259 torr. However, the values over time were different for the two pressures. Peak 17-OHCS secretion occurred after 15 minutes at 259 torr (90 minutes on 100% oxygen), but not until 135 minutes on oxygen at 760 torr. This indicates that dogs may be mildly stressed by breathing 100% oxygen and that there is a stress associated with hypobarism that cannot be attributed to hypoxia. Author (TAB)

**N70-27838#** School of Aerospace Medicine, Brooks AFB, Tex.  
**STRONTIUM METABOLISM WITH SPECIAL  
CONSIDERATION OF GENETIC EFFECTS Final Report,**  
**Sep. Oct. 1969**

John D. Crissman and John H. Kirk Jan. 1970 28 p refs *Its*  
*Aeromed. Rev. No. 1 70*  
(AD-702029; SAM-TR-70-3) Avail: CFSTI CSCL 6/18

Strontium metabolism is reviewed to determine possible correlations between Strontium-90, fallout and decreased decline in infant mortality rates. Strontium fallout characteristics, metabolism and reproductive tract kinetics are discussed. Articles making positive correlations between Strontium-90 fallout and the apparent decrease in expected continued decline in infant mortality rates are present. Strontium-90 was found to be capable of producing lethality and genetic mutations. The significances of strontium, however, as the sole or predominant influence on infant mortality is questioned due to lack of knowledge concerning strontium reproductive kinetics and absence of studies with parameters such as magnitude of dose and route of administration which are comparable to those produced at current fallout levels. Author (TAB)

**N70-27840#** School of Aerospace Medicine, Brooks AFB, Tex.  
**D-AMPHETAMINE MORTALITY AND RELATED LEVELS  
IN TISSUE OF RATS EXPOSED TO ALTITUDE Final Report,**  
**Feb. May 1969**

Albert T. Bernardini Dec. 1969 12 p refs  
(AD-702032; SAM-TR-69-75) Avail: CFSTI CSCL 6/15

Two groups of Sprague-Dawley rats were injected with d-amphetamine sulfate and the number of dead animals was recorded after 2 hours. One group of rats was exposed to a simulated altitude of 12,000 ft. in a low-pressure chamber for 1 hour; the other, the control group, was observed at ground level for the 2-hour duration. After an approximate LD50 dosage of d-amphetamine sulfate (20 mg./kg.) was established at ground level, three dose levels were administered within each group--10 mg. /kg., 15 mg. /kg., and 20 mg. /kg. Mortality observed in the altitude group was approximately one-third greater than that in the control group. Doses which showed equivalent mortality were then administered to separate groups--10 mg. /kg. to an altitude group and 20 mg. /kg. to a ground-level group. A combination of labeled

14C-d-amphetamine and unlabeled amphetamine sulfate was used. The data suggest that the potency of amphetamine increases at altitude, and that the difference in mortality may be due to mechanisms dependent on tissue concentration of amphetamine. Author (TAB)

**N70-27844\*#** Exotech, Inc., Washington, D.C.  
**ANALYTICAL TECHNIQUES IN PLANETARY QUARANTINE  
Final Report**

May 1970 139 p refs  
(Contract NASw-1734)  
(NASA-CR-109886; TRSR-70-13) Avail: CFSTI CSCL 06F

Results of work done in the areas of planetary quarantine requirements, microbial survival, analytical techniques, and planetary chemical contamination are presented. Separate discussions center on microbial resistance to sterilization, estimation buried contamination, and microbial release through fracture and erosion. J.M.C.

**N70-27845\*#** Exotech, Inc., Washington, D.C.  
**POTENTIAL EFFECTS OF RECENT FINDINGS ON  
SPACECRAFT STERILIZATION REQUIREMENTS**

S. Schalkowsky, L. B. Hall, and R. C. Kline *In its* Anal. Tech. in  
Planetary Quarantine May 1970 18 p refs (See N70-27844  
14-04)  
(Contracts NASw-1558; NASw-1666)  
Avail: CFSTI CSCL 06F

An evaluation is made of the probability of release of viable organisms from the spacecraft as a function of: (1) impact velocity magnitudes and the probability of their occurrence; (2) the degree of equipment fracturing at impact velocities; and (3) the number of viable organisms in spacecraft materials. Work being done to quantify each of three types of contamination, i.e. that on open surfaces, mated surfaces and buried contamination, is described in the context of seeking an approach to spacecraft sterilization that would be most compatible with the implementation of planetary missions. It is concluded that the results of work now in progress on spacecraft material fracturing, on the estimation of buried contamination loads and on microbial resistance on mated surfaces may lead to less severe dry heat sterilization of planetary spacecraft than was considered necessary in the past. Author

**N70-27846\*#** Exotech, Inc., Washington, D.C.  
**INVESTIGATIONS INTO A DIFFUSION MODEL OF DRY  
HEAT STERILIZATION Interim Report**

M. J. Barrett *In its* Anal. Tech. in Planetary Quarantine May  
1970 refs 18 p (See N70-27844 14-04)  
(TRSR-041) Avail: CFSTI CSCL 06M

The analytical model described in this study formalizes the hypothesis that dry heat inactivation of microorganisms is closely related to the water content of the spore and its micro-environment. Experimental data are examined relative to this model and it appears to be valid. This model is aimed at overcoming the well known deficiencies of the logarithm model. Author

**N70-27847\*#** Exotech, Inc., Washington, D.C.  
**AN ANALYTICAL BASIS FOR ASSAYING BURIED  
BIOLOGICAL CONTAMINATION Interim Report**

Robert C. Kline and Phillip L. Randolph *In its* Anal. Tech. in  
Planetary Quarantine May 1970 30 p refs (See N70-27844  
14-04)  
(TRSR-036) Avail: CFSTI CSCL 06M

Presented herein is an analysis of a procedure for assaying biological contamination buried or embedded in spacecraft materials.

The procedure requires the controlled fracture of representative samples of a material whose buried loading is of interest. Each sample is tested for biological contamination on the totality of surfaces exposed as a result of the fracturing process. The basic datum or observation consists of the proportion of samples which yield contamination upon culturing. Conventional statistical techniques, combined with an assumed relation between the mean concentration of organisms buried within the material and the observed datum, produce an upper bound estimate for the unknown mean concentration, expressed to any prescribed level of confidence. In principle, the conservativeness of the resulting estimate is directly related to the sample size and the amount of surface area exposed by fracture; as the sample size and/or exposed area increase(s) the difference between the estimate and the unknown mean load tends to decrease. Author

N70-27848\*# Exotech, Inc., Washington, D.C.

**THE RELEASE OF BURIED MICROBIAL CONTAMINATION BY AEOLIAN EROSION**

Matthew J. Barrett and J. Lyndon Woodall *In its Anal. Tech. in Planetary Quarantine* May 1970 16 p refs (See N70-27844 14-04)

(TRSR-70-14) Avail: CFSTI CSCL 06F

The implications of fracturing and exposing of surfaces which might instantaneously or subsequently release viable spores are considered. The relatively slow process of erosion is examined although the fracture and the erosion phases are not necessarily independent. The fracture-ratio is defined as the area exposed through fracture divided by the volume of the sample. An expression for the erosion of spherical shaped particles and an expression for the probability of release given that a quantity of the sample erodes in the quarantine period were derived. Calculations based on experimental data were made for the erosion rate. Author

N70-27849\*# Exotech, Inc., Washington, D.C.

**IMPLEMENTATION OF A CHEMICAL CONTAMINANT INVENTORY FOR LUNAR MISSIONS**

*In its Anal. Tech. in Planetary Quarantine* May 1970 35 p refs (See N70-27844 14-04)

(TRSR-70-07) Avail: CFSTI CSCL 06F

The detailed procedures and tasks to be undertaken to collect, evaluate, store, and disseminate data which will serve anticipated needs of lunar sample investigators, consistent with the requirement that costs associated with implementation and operation of the inventory be consistent with known needs for this information are considered. A set of recommendations for implementing the chemical materials inventory in accordance with the guidelines set forth is also included. Author

N70-27850\*# Sandia Corp., Albuquerque, N. Mex. Planetary Quarantine Systems Studies Div.

**A MATHEMATICAL MODEL FOR THE THERMORADIATION INACTIVATION OF DRY BACILLUS SUBTILIS VAR. NIGER SPORES**

Virgil L. Dugan Apr. 1970 21 p refs

(NASA Order W-12853)

(NASA-CR-109885; SC-RR-70-203) Avail: CFSTI CSCL 06M

This paper first presents the development of an empirically based kinetic model which describes the synergistic inactivation of dry *Bacillus subtilis* var. *niger* spores by a combined heat and gamma radiation environment. The mechanism of this inactivation is investigated by comparing the resulting empirical model parameters with analogous parameters of a free-radical mediated polymerization reaction. A theoretical chemical kinetic model of bacterial inactivation is then derived assuming a free radical reaction. This theoretical model demonstrates the same form as the

empirically based model and is capable of predicting a method for obtaining additional synergistic gain. This predicated method was subsequently tried and the prediction was experimentally verified, lending additional credence to the theoretical kinetic model.

Author

N70-27851\*# National Aeronautics and Space Administration. Manned Spacecraft Center, Langley Station, Va.

**CREW MICROBIOLOGY EVALUATION FOR APOLLO MISSION 101 Test Plan**

C. P. Truby 29 Aug. 1968 42 p

(NASA-TM-X-62930) Avail: CFSTI CSCL 06M

Bacteriology and mycology tests were performed to evaluate the microbiological profiles of crew members from Apollo Earth Orbital Mission 101. Postflight and preflight tests were performed in order to determine if pathogenic organisms were present and the effects of space flight on the microbiological flora of astronauts. Other efforts were geared toward cataloging data of the normal flora of astronauts so that possible lunar contaminants can be isolated and identified during the Apollo mission to the moon.

J.M.C.

N70-27852\*# Sandia Corp., Albuquerque, N. Mex. Planetary Quarantine Dept.

**AN INTERACTIVE COMPUTER INFORMATION SYSTEM FOR PLANETARY QUARANTINE FOR LUNAR PROGRAMS**

A. L. Roark and A. L. Wyer Jul. 1968 87 p

(NASA Order R-09-019-040)

(NASA-CR-109863; SC-RR-68-545) Avail: CFSTI CSCL 06F

A data management system is described which gathers and stores spacecraft biocontamination data with respect to lunar exploration programs. The major elements of the system are described with emphasis on the software system. Specifications for a software package are listed as follows: a routine to establish the data files, a routine to store information in the data files, a routine to update the lunar inventory, and a communication system. Flow charts are provided to explain the purposes of these routines. A number of incomplete subroutines are also included in defining the details of the system. J.M.C.

N70-27856# Bureau of Commercial Fisheries, Seattle, Wash. Technological Lab.

**GROWTH AND TOXIN PRODUCTION OF CLOSTRIDIUM BOTULINUM TYPES E, NONPROTEOLYTIC B, AND F IN NONIRRADIATED AND IRRADIATED FISHERIES PRODUCTS IN THE TEMPERATURE RANGE OF 38 F TO 50 F Annual Progress Report**

M. W. Eklund and F. T. Poysky Jul. 1969 33 p refs

(Contract AT(49-7)-2442)

(TID-25231) Avail: CFSTI

Following treatment with mitomycin C, cell lysates were examined with the electron microscope and bacteriophages were found for each of the different types of *Clostridium botulinum*. Procedures are outlined for isolation of bacteriophage for non-toxicogenic organisms resembling C, botulinum types B, E, and F and detection of phage using the agar overlay technique. Experiments were conducted on curing nonproteolytic type F C, botulinum, of its lysogenic state with ultraviolet light. Studies were conducted on factors in raw irradiated oysters that prevent production or destroy botulinum toxin. NSA

**N70-27872# School of Aerospace Medicine, Brooks AFB, Tex. A DICHOTOMIZING SPEECH DISCRIMINATION TEST Final Report, 1 Jul. 1967 15 Feb. 1968**

Roy Danford, Jr. and Vernon C. Bragg Dec. 1969 12 p refs

(AD-702031; SAM-TR-69-90) Avail: CFSTI CSCL 6/16

## N70-27876

A new speech discrimination test was formulated by extracting selected words from recordings of the Harvard PB-50 lists. Fifty words were chosen which had been found to be significantly more difficult for patients with sensorineural hearing losses to recognize than for those with normal hearing. Three groups of subjects were tested with the dichotomizing speech discrimination test.

Author (TAB)

## N70-27876# School of Aerospace Medicine, Brooks AFB, Tex. ESTIMATION OF ARTERIAL BLOOD PRESSURE BY VISUAL OBSERVATION OF SPHYGOMOMANOMETER NEEDLE OSCILLATION Final Report, Jan. Apr. 1969

N. Bruce Chase Dec. 1969 15 p refs  
(AD-702030; SAM-TR-69-86) Avail: CFSTI CSCL 6/16

A study of the needle oscillation method of blood pressure measurement was made using 6 normotensive adult females as subjects and observers. The mean systolic values for this method were found to be higher and the mean diastolic values lower than with the conventional (Korotkoff) method and, therefore, apparently closer to true (direct method) values. By correcting the average of 2 needle oscillation readings by the difference of the means, it was predicted with 90% confidence that one could expect 75% of the needle oscillation determinations to be within 7.5 mm. Hg systolic and 10.0 mm. Hg diastolic; or that 90% would be within 10.7 mm. Hg systolic and 14.7 mm. Hg diastolic of the conventional value. These values are less than, or do not greatly exceed, the acceptable limit of 8 mm. Hg difference established by the American Heart Association for two separate conventional readings. It would appear, therefore, that the oscillation method may have considerable potential value for use in environments with high noise levels where the conventional method cannot be used. A difference was found in the ability of different observers to use this method. The two most accurate observers each made 10 errors in 40 determinations, while the least accurate observer made 17 errors in 40 determinations.

Author (TAB)

## N70-27882# School of Aerospace Medicine, Brooks AFB, Tex. HUMAN BODY EFFECT ON SIGNAL PATTERNS OF PERSONAL TELEMETRY TRANSMITTERS Final Report, Mar. Sep. 1969

Henry Buchanan, Willis F. Moore, and Calvin R. Richter Jan. 1970 16 p refs  
(AD-702033; SAM-TR-70-4) Avail: CFSTI CSCL 6/2

Measurements of radio frequency signal radiation were made on personal telemetry transmitters within the frequency band of 6 to 280 MHz; first, in free space, and then with the unit on a subject. With the transmitter inductor used as a radiator, horizontally polarized signal radiation patterns were plotted at discrete frequencies throughout the band. The results, obtained by comparing free-space signal patterns with unit-on-subject signal patterns, indicate that the human body has little effect on the radiated signal pattern from 6 to 10 MHz; it operates like an antenna director element from 16 to 60 MHz; it produces a radiated pattern with bidirectional characteristics from 67 to 90 MHz; and it behaves like an antenna reflector from 103 to 230 MHz. Above 230 to 280 MHz, the body seems to have little or no effect on the radiated signal.

Author (TAB)

## N70-27890# Central Electricity Generating Board, Berkeley (England). Research and Development Dept. BIOLOGICAL ASPECTS OF SKIN IRRADIATION. PART 2: SKIN THICKNESS CORRECTIONS TO DOSE ESTIMATES

J. T. Whitton Nov. 1969 14 p refs  
(RD/B/N-1480) Avail: AEC Depository Libraries

The reliability of skin dose measurements depends critically on values assumed for the depth below the skin surface and the thickness of the skin layer occupied by the biologically sensitive

tissue (basal layer). The main errors in using skin dosimeters, employing both lithium fluoride in powder form and in teflon discs, arise through discrepancies between the thicknesses of the containing sachet window and phosphor layer when compared with the thicknesses of the protective and sensitive skin layers. Preliminary results from an experimental survey of probable skin dimensions at various body sites are quoted and data are presented by which skin dose estimated using these new parameters differs from that measured by a thermoluminescent skin dosimeter. The conclusions may be used to indicate the magnitude and direction of errors in dose estimations.

Author (NSA)

## N70-27907# Battelle Memorial Inst., Columbus, Ohio. US NAVY DIVING-GAS MANUAL

Washington US Navy Supervisor of Diving 1 Oct. 1969 198 p refs  
(Contract N00014-66-C-0199)  
(AD-701566; RR-3-69) Avail: CFSTI CSCL 6/11

The concept of saturation diving has, for the first time, provided promise that practical undersea work can be carried out at depths approaching 1000 feet. The principal objective of this manual is to provide the best available information on gas properties in a form convenient for use in diving research, engineering, and operations. All of the data in this manual are based upon calculation from theoretical relationships, substantiated where experimental information can be found in the literature (as for pure gases), and unsubstantiated where such information does not exist (as for helium-oxygen mixtures). It is felt that the data presented are the best that can be generated today, and that they will be generally satisfactory in the pressure range up to about 500 psi. For the higher pressures used in storing of diving gases, errors are indeterminate and may be significant. Future experimental research is needed to improve the state of knowledge of mixture properties at very high pressures, and to explore the properties of helium-oxygen-nitrogen mixtures. A second objective of this manual is to summarize the present practice regarding choice of breathing-gas mixtures and some of the calculation procedures used in design and operation of diving equipment. An attempt has been made to present these procedures in such a manner that they can be used by both designers and operating personnel.

Author (TAB)

## N70-27912# Northrop Corp., Hawthorne, Calif. INVESTIGATION OF VIBRATION AND IMPACT PROTECTION OF THE HUMAN HEAD AND NECK Final Report, 1 Jun. 1966 15 Nov. 1967

T. E. Mattingly, J. W. Felder, and C. F. Lombard Dec. 1969 89 p refs  
(Contract AF 33(615)-5119)  
(AD-702124; NCL-67-70R; AMRL-TR-69-112) Avail: CFSTI CSCL 6/17

A summary of the investigation leading to the fabrication of a prototype model of a head and neck protective system for aircrew members is presented. The system provides impact, vibration and environmental protection for the wearer from 0 to over 82,000 feet altitude. The system consists of a helmet and a pneumatically operated neck restraint device which is used to stiffen the coupling between the helmet and the wearers torso during vibration and acceleration environments.

Author (TAB)

## N70-27933# Case Western Reserve Univ., Cleveland, Ohio. MOTIVATIONAL ENGINEERING FOR PILOT TRAINING Final Report, May 1968 Aug. 1969

Frederick I. Herzberg, Erik K. Winslow, and Melvin S. Majesty Oct. 1969 51 p refs  
(Contract F33615-68-C-1535)  
(AD-702123; AFHRL-TR-69-3) Avail: CFSTI CSCL 5/9

The study was an investigation of student pilot motivation for, and attitudes toward, the Air Training Commands undergraduate pilot training (UPT) program. The motivation-hygiene approach was used to systematically identify the motivational factors operating in the UPT program. This approach has been used extensively in industry and with success in a non-training military situation. The purposes of the study were: to employ motivation-hygiene theory and critical incident interview methodology for investigation of motivation in a military training situation, specifically, undergraduate pilot training; and to compare the findings from the undergraduate pilot trainee sample with another Air Force sample and samples from industrial organizations. Author (TAB)

**N70-28007\*#** General Electric Co., Philadelphia, Pa. Space Div.  
**DEVELOPMENT OF A PROTOTYPE WASTE COLLECTION SYSTEM (THE HYDRO-JOHN)**

J. J. Reville and R. W. Murray 25 Feb. 1970 80 p  
 (Contract NAS9-9741)  
 (NASA-CR-108463) Avail: CFSTI CSCL 061

A prototype waste collection system for spacecraft type sanitary urine and feces collection techniques for male personnel is described. The system features a manually initiated, automatically controlled anal wash and dry cycle after defecation as well as a feces/ wash water blending and discharge cycle. It also features an adjustable urinal which is designed to collect urine while preventing spillage during micturition. Both the feces and urine collection techniques are designed for use in either a zero or one gravity environment. Overall reactions to the system by eight users were favorable. Author

**N70-28066#** Hawaii Univ., Honolulu. Dept. of Physics and Astronomy.  
**METHODOLOGIES OF PATTERN RECOGNITION Final Scientific Report**

Satosi Watanabe Apr. 1969 480 p refs  
 (Grant AF-AFOSR-1379-68)  
 (AD-701524; AFOSR-70-0513TR) Avail: CFSTI CSCL 6/4

The book presents the papers that were given at a conference on methodologies of pattern recognition. The titles include: implications of interactive graphic computers for pattern recognition methodology; statistical analysis as a tool to make patterns emerge from data; descriptive pattern analysis techniques, potentialities and problems; sequential pattern recognition systems; biological and mechanical pattern recognition; the automatic classification of fingerprints; cluster formation at various perceptual levels; recognition, machine recognition and statistical approaches; pattern recognition applied to the counting of nerve fiber cross-sections and water droplets; recognition by imitating the process of pattern generation; and the evaluation of the statistical classifier. Author (TAB)

**N70-28086#** Washington Univ., Seattle. Dept. of Psychology.  
**PROBABILITY LEARNING: RESPONSE PROPORTIONS AND VERBAL ESTIMATES**

Lee Roy Beach, Richard M. Rose, Yutaka Sayeki., James A. Wise, and William B. Carter 14 Feb. 1970 26 p refs  
 (Contract N00014-67-A-0103-0011)  
 (AD-701363; Rept-70-1-02) Avail: CFSTI CSCL 5/10

At various points in a two-choice probability learning experiment, Ss were interrupted and asked to estimate the probability of the most frequent of the two stimulus events. The Ss estimates were compared with the proportion of trials on which other Ss predicted the events. The estimates change as a function of training in a manner consistent with a simple Bayesian revision model. Author (TAB)

**N70-28091\*#** General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.

**BIOSATELLITE ENVIRONMENTAL CONTROL COOLANT LOOP SYSTEM DESIGN**

Robert Ebersole 1970 18 p Presented at AFOSR Symp., Palo Alto, Calif., 21 Mar. 1970  
 (Contract NAS2-1900)  
 (NASA-CR-73401) Avail: CFSTI CSCL 06K

A functional description of the environmental control coolant loop system design is presented for the 30-day mission NASA Biosatellite program. A two-loop system is described which provides temperature control for the fuel cell power source, cryogenic subsystem, water and urine storage, and the gas management system. The latter provides control of the gaseous environment in the recovery vehicle. It controls temperature, relative humidity, recirculation and filtration of the atmosphere, build up of toxic and/or non-toxic gases and odors, and partial and total pressure of the standard 14.7 psi nitrogen/oxygen atmosphere. Comparison of experimental and flight results with analytical predictions are presented. Extensive thermal vacuum system testing was performed to verify design predictions; good agreement with analysis was achieved. Author

**N70-28097#** Texas Christian Univ., Fort Worth. Inst. for the Study of Cognitive Systems.

**PYTHAGOREAN DISTANCE AND THE JUDGED SIMILARITY OF SCHEMATIC STIMULI Technical Memo**

William C. Rankin, Robert P. Markley, and Selby H. Evans Dec. 1969 28 p refs  
 (Contract DAAD05-68-C-0176)  
 (AD-702250; HEL-TM-25-69) Avail: CFSTI CSCL 5/10

Independent groups of Ss rated the similarity of pairs of patterns belonging to the same class, either before or after a discrimination task of schematic concept formation (SCF). Average judged similarity is related to SCF pretraining. A linear relationship was investigated between a Pythagorean-distance measure on the patterns and subjective similarity of pairs of stimuli ( $r = .88$ ). Pythagorean distance between pairs of patterns was measured by summing the squared differences between their corresponding physical attributes. A secondary analysis of the discrimination judgments in the SCF task indicated Pythagorean-distance measure as predictive of judgments on pairs of stimuli from the same schema family. Author (TAB)

**N70-28107#** Infoton Inc., Burlington, Mass.  
**ASPECTS OF STOCHASTIC PROCESS IDENTIFICATION USING WIENER CANONICAL FORMS Technical Report**

Ernest G. Henrichon, Jr. Dec. 1969 22 p refs  
 (Contract AF 49(638)-1631)  
 (AD-702118; TR-19) Avail: CFSTI CSCL 9/4

The Wiener Canonical Expansion (WCE) procedure of Bayes decision rule is considered from a pattern recognition standpoint in the form of a phi machine. This approach provides some insight about the roles which the various stages and parameters of the expansion assume. Experiments conducted previously for speaker discrimination using the WCE procedure were reperformed in order to correct for a processing error. The conclusions of these revised experiments were the same as in the previous work; speaker identification was not realized with any degree of certainty by processing raw speaker data as if it were representative of some stationary random process. Author (TAB)

**N70-28109#** Texas Christian Univ., Fort Worth.  
**THE RANDOM ADAPTIVE MODULE RAM: A FORMAL SYSTEM FOR S-R MODELING WITH APPLICATIONS TO SCHEMA THEORY Technical Memo**

## N70-28115

Selby H. Evans Dec. 1969 27 p refs  
(Contract DAAD05-68-C-0176)  
(AD-702249; HEL-TM-24-69) Avail: CFSTI CSCL 6/4

A method of model construction is proposed to facilitate the achievement of relatively complex processes by combinations of basic stimulus-response (S-R) units. A basic process resembling stimulus-response learning is used to construct a model capable of learning to recognize and reproduce a pattern or schema. In the context of schema theory, this model is further developed to simulate the process of learning to distinguish one schema from another (schematic concept formation). Results of a computer simulation and comparison with human performance are reported; substantial correspondence is demonstrated between the human performance and that of the model. Author (TAB)

## N70-28115\*# Bell Aerosystems Co., Buffalo, N.Y. ASTRONAUT MANEUVERING UNIT BRASSBOARD Final Report

Mar. 1970 48 p  
(Contract NAS9-9368)  
(NASA-CR-108462; SSD-206) Avail: CFSTI CSCL 06B

The configuration and operating characteristics are presented of a simple astronaut maneuvering unit brassboard, designed to evaluate the utility of a first generation maneuvering unit in accomplishing future EVA tasks. Initially, the scope of the program was for the development of a unit controlled in the acceleration command mode. This scope was subsequently revised to incorporate an acceleration/rate command system, with the mode of control selected by the operator. Author

## N70-28140# Georgia Univ., Athens. Dept. of Physics and Astronomy.

### INTEGRATION OF THEORY AND EXPERIMENT INTO A UNIFIED CONCEPT OF VISUAL PERCEPTION Final Report, 1 Mar. 1966 -30 Apr. 1969

Heinz Von Foerster and Humberto R. Maturana Dec. 1969 120 p refs  
(Contract AF 49(638)-1680)  
(AD-700782; AFOSR-70-0281TR) Avail: CFSTI CSCL 6/16

The study postulates the functional and organizational unity of living organisms and demonstrates this unity through mathematical models and neurophysiological investigations. Experimentally, color vision is interpreted through neural organization of the retina. A model with a multi-level goal structure is described whose main organizational feature is a nonpredictive heterarchy of decision systems in which no one of the goals always predominates. Its activity is determined by a competitive interaction among the goals. Author (TAB)

## N70-28157\*# Southwest Research Inst., San Antonio, Tex. DIGITAL THERMOMETER, PART 2 Final Report

Richard Lorenz and J. W. Fogwell Nov. 1969 21 p  
(Contract NAS9-7852; SwRI Proj. 16-2327)  
(NASA-CR-108423) Avail: CFSTI CSCL 06B

A prototype digital thermometer demonstrated accuracies of better than  $\pm 0.2$  F for temperatures measured between 74 F and 115 F. The application of digital techniques allowed the use of integrated circuitry along with minimum power requirements.

Direct temperature readout by means of incandescent displays provided precise information without requiring interpolation of scales. The digital technique allowed the use of miniature sensing devices which yielded rapid thermal-response times. Interchangeability of probe devices maintaining the desired accuracy was also accomplished. The digital thermometer was constructed as a prototype unit with primary effort devoted to the establishment of high accuracy. With this success in hand, the miniaturization and refined accuracy through rigorous calibrating techniques could now proceed. Author

## N70-28158\*# Southwest Research Inst., San Antonio, Tex. METABOLIC RATE MEASUREMENT SYSTEM, PART 1 Final Report, Apr. 1968 - Nov. 1969

J. W. Fogwell, P. F. Law, V. R. Sturdivant, and R. B. Curtin Nov. 1969 46 p  
(Contract NAS9-7852; SwRI Proj. 16-2327)  
(NASA-CR-108422) Avail: CFSTI CSCL 06B

The Metabolic Rate Measurement System (MRMS) was conceived as an improved means of accomplishing rapid and accurate measurements of oxygen consumption, carbon dioxide generation, and total ventilation of a human subject during a one-minute interval. The MRMS is intended to replace the more cumbersome conventional methods of measuring these quantities, methods which require the use of several dissociated instruments and many cumbersome calculations. It combines all the necessary instruments and transducers into one equipment rack and includes a special purpose hybrid computer to perform the necessary calculations. Author

## N70-28163# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

### A COMPARISON OF VOICE AND TONE WARNING SYSTEMS AS A FUNCTION OF TASK LOADING Technical Report, 10 Oct. 1968 -10 Jan. 1969

Paul Kemmerling, Richard Geiselhart, David E. Thorburn, and James Gary Cronburg Sep. 1969 53 p  
(AD-702459; ASD-TR-69-104) Avail: CFSTI CSCL 1/2

The study was designed to create a flight condition that would be sufficiently stressful, and at the same time, require the pilot to direct his attention out of the cockpit for relatively long periods, so that an adequate comparison could be made between voice and tone warning. Author (TAB)

## N70-28165# Texas Univ., Austin: Electronics Research Center. AN APPLICATION OF SPECTRAL ANALYSIS AND DIGITAL FILTERING TO THE STUDY OF RESPIRATORY SINUS ARRHYTHMIA

D. Graham Galloway and Baxter F. Womack 7 Aug. 1969 181 p refs  
(Contract F41609-68-C-0020; Grant AF-AFOSR-0766-67)  
(AD-701731; TR-71; AFOSR-69-2048TR) Avail: CFSTI CSCL 6/2

Several mathematical techniques were applied to a study of respiratory sinus arrhythmia, the phenomenon by which respiration modulates heart rate in normal humans and in many animals. Data taken from human subjects was used to develop computer processing methods which are useful in simulation studies and in the interpretation of monitored heart rate from remote subjects. The investigation was divided into the following three categories: (1) the development of a mathematical model relating respiration to those variations that it causes in heart rate, (2) the use of digital filtering techniques to attenuate fluctuations in heart rate which are due to respiration, and (3) the development of methods which use only heart rate to get information about respiration. Author (TAB)

## N70-28176# Joint Publications Research Service, Washington, D.C.

SPACE BIOLOGY AND MEDICINE, VOLUME 4, NO. 1  
28 Apr. 1970 123 p refs Transl. into ENGLISH of the publ. "Kosmicheskaya Biologiya i Meditsina" Moscow, Med. Publishing House, 1970 p 1-88  
(JPRS-50408) Avail: CFSTI

The articles presented pertain to the effects of space flight stress and radiation on animals and plants. For individual titles, see N70-28177 through N70-28198.

**N70-28177#** Joint Publications Research Service, Washington, D.C.

**DYNAMICS OF GRANULOCYTIC RESERVE CHANGE IN THE BONE MARROW OF ANIMALS EXPOSED TO CHRONIC GAMMA-IRRADIATION**

E. S. Zubenkova et al *In its Space Biol. and Med.*, Vol. 4, No. 1 28 Apr. 1970 p 1 - 5 refs (See N70-28176 14-04)

Avail: CFSTI

A pyrogenal test is used to study leukopoiesis during chronic gamma irradiation. Experimental procedures are described, along with test results showing insignificant variations in the level of granulocytes in dog bone marrow. J.A.M.

**N70-28179#** Joint Publications Research Service, Washington, D.C.

**PLANT CULTIVATION USING KERAMZIT IN CLOSED ECOLOGICAL SYSTEMS**

I. V. Tsvetkova et al *In its Space Biol. and Med.*, Vol. 4, No. 1 28 Apr. 1970 p 15 - 21 refs (See N70-28176 14-04)

Avail: CFSTI

Plants were cultivated by the hydroponics method using keramzit or alumoferrisilicate as a solid substrate. The chemical composition of keramzit was found to change after use four times in the cultivation of higher plants. As a result of long-term use of the substrate it became degraded, losing certain elements, such as aluminum, to the nutrient solution. This reduced the crop yield and changed the chemical composition of the biomass. Author

**N70-28180#** Joint Publications Research Service, Washington, D.C.

**ACTIVITY OF SOME ENZYMES IN THE BLOOD SERUM OF RATS DURING PROLONGED IMMOBILIZATION**

Ye. Ye. Simonov et al *In its Space Biol. and Med.*, Vol. 4, No. 1 28 Apr. 1970 p 22 - 25 refs (See N70-28176 14-04)

Avail: CFSTI

The activities of some enzymes in the blood serum during hypokinesia with a duration up to 6 days are studied. Impairments were reflected in the enzymatic spectrum of the blood serum and led to shifts characterizing the disturbance of metabolic processes, as well as the intensity of atrophic and dystrophic changes during prolonged restriction of motor activity. Author

**N70-28181#** Joint Publications Research Service, Washington, D.C.

**HEAT TOLERANCE OF ALBINO MICE AT DIFFERENT RATES OF AMBIENT TEMPERATURE CHANGE**

I. P. Scherbachev *In its Space Biol. and Med.*, Vol. 4, No. 1 28 Apr. 1970 p 26 - 31 refs (See N70-28176 14-04)

Avail: CFSTI

Study of the effect exerted on the body by a number of extremal factors reveal that the rate at which the factor changes determines the body reaction to it and the nature of the effects from exposure to acceleration, hypoxia, or change in atmospheric pressure. When there is a rapid rise in the ambient temperature the animals die more rapidly than when there is a slow increase, death occurring at a higher body and ambient temperature. When there is a rapid decrease in the ambient temperature the animals also die more rapidly than when there is a slow decrease but death occurs at a lower ambient temperature. Author

**N70-28182#** Joint Publications Research Service, Washington, D.C.

**THEORETICAL AND EXPERIMENTAL PROBLEMS IN STUDYING THE MECHANISMS OF VESTIBULAR NYSTAGMUS**

A. N. Razumeyev et al *In its Space Biol. and Med.*, Vol. 4, No. 1 28 Apr. 1970 p 32 - 42 refs (See N70-28176 14-04)

Avail: CFSTI

A possible mechanism of vestibular nystagmus is outlined in the form of a mathematical model. The mechanism underlying the development of vestibular nystagmus, the reworking of afferent information from the periphery into controlling signals, and the actuating components of the oculomotor apparatus are discussed. Arguments supporting the formulated concepts of nystagmus genesis are presented. Anatomical and physiological correlates of units in the model are described. Experiments are suggested which may help to modify the model and better establish a correlation between model components and cerebral structures responsible for nystagmus. Author

**N70-28183#** Joint Publications Research Service, Washington, D.C.

**HUMAN TOLERANCE TO HEAT STRESS**

S. M. Gorodinskiy et al *In its Space Biol. and Med.*, Vol. 4, No. 1 28 Apr. 1970 p 43 - 48 refs (See N70-28176 14-04)

Avail: CFSTI

The information content of various physiological parameters used to determine heat tolerance limits is discussed. With significant heat elimination from the body surface and heat production, rectal temperature appears to be an inadequate index for evaluating the thermal state of the body. It is shown that human tolerance to heat stress can be changed by the local application of cold. Author

**N70-28184#** Joint Publications Research Service, Washington, D.C.

**COMPUTING THE MINIMUM NECESSARY VENTILATION VOLUME FOR INSULATING SUITS**

V. V. Selivanov *In its Space Biol. and Med.*, Vol. 4, No. 1 28 Apr. 1970 p 49 - 53 (See N70-28176 14-04)

Avail: CFSTI

A method for computing the ventilation volume of special suits is described. The dependence of the concentration of toxic contaminants on gas flow direction, location of gas elimination sources and escape points and sites of concentration measurement is considered. Equations are derived for determining the ventilation volume; these are applied for single and mixed toxic impurities. A criterion is proposed for evaluating the effect of a nonstationary state of gas release on the concentration. Author

**N70-28185#** Joint Publications Research Service, Washington, D.C.

**STANDARDIZATION OF ADMISSIBLE LIMITS FOR HIGH-INTENSITY NOISE**

Ye. M. Yuganov et al *In its Space Biol. and Med.*, Vol. 4, No. 1 28 Apr. 1970 p 54 - 59 refs (See N70-28176 14-04)

Avail: CFSTI

The effect exerted on humans by noise of 114 - 116 and 125 - 126 db with an acoustic energy of 500 cps was studied. The auditory thresholds, blood pressure values, and time of response to light stimuli were measured. Sixty-four healthy male test subjects were used in 152 experiments. Adverse changes in the acoustic-analyzer, cardiovascular system, and locomotor analyzer were detected during an exposure of 125 - 126 db noise. Taking into account the changes in the thresholds of skin vibrosensitivity when the ear was protected, it is concluded that the skin becomes a second gage for acoustic energy beginning with 125 - 126 db. Author

## N70-28186

N70-28186# Joint Publications Research Service, Washington, D.C.

### PECULIARITIES OF HUMAN METABOLIC RATES DURING SIMULATION OF MODIFIED GRAVITY

A. V. Yeremin et al *In its* Space Biol. and Med., Vol. 4, No. 1 28 Apr. 1970 p 60 66 refs (See N70-28176 14-04)

Avail: CFSTI

Metabolic rates of four healthy male subjects were measured while walking and running in an erect position on a treadmill and in a supine position. Under normal gravity conditions the metabolic rates of the subjects in a horizontal position were higher than in a vertical position due to the additional work performed by the leg muscles. However, as the gravity was reduced to 1/6 of the body weight the metabolic rates during walking and running decreased by 24 and 28 percent, respectively. This suggests that lowered gravity requires reduced metabolic rates. Author

N70-28187# Joint Publications Research Service, Washington, D.C.

### POSSIBILITIES OF USING CLINICAL DATA FOR VALIDATING ADMISSIBLE RADIATION DOSES DURING EXTENDED SPACE FLIGHTS

A. I. Guskova *In its* Space Biol. and Med., Vol. 4, No. 1 28 Apr. 1970 refs (See N70-28176 14-04)

Avail: CFSTI

Basic sources of information concerning the biological effect of irradiation of human subjects under conditions similar to those which would prevail during extended space flights are evaluated. On the basis of such data the maximum admissible doses of irradiation for cosmonauts, clinical validation of these doses, and the degree of hazard are discussed. The most important work which must be done for clarifying the admissible doses is outlined and the purposes of clinical investigations are specified. The formulation of precise parameters required for extrapolating experimental data for clinical use is considered. Author

N70-28188# Joint Publications Research Service, Washington, D.C.

### MENTAL PERFORMANCE OF SUBJECTS AFTER EXPOSURE TO ACCELERATIONS OF 5 G

A. L. Narinskaya *In its* Space Biol. and Med., Vol. 4, No. 1 28 Apr. 1970 p 72 - 75 refs (See N70-28176 14-04)

Avail: CFSTI

The effect of an exposure to radial accelerations of 3 to 5 g was investigated in 30 pilots of fighter aircraft in the age range from 25 to 33 years. The test subjects performed psychological tests (attention, memory, sensorimotor reactions) before and immediately after exposure to radial accelerations of 3 to 5 g (in the Gell classification) for 30 seconds (for every acceleration magnitude). The results reveal that an exposure to accelerations impaired accomplishment of the task by 50 percent on an average in over half the subjects. Exposure to accelerations hinders the formulation or re-arrangement of mental work habits. Author

N70-28189# Joint Publications Research Service, Washington, D.C.

### POSSIBLE CHARACTERISTICS OF THE BASIC STOMATOLOGICAL DISEASES IN THE SIMULATION OF SOME CONDITIONS PREVAILING DURING LONG SPACE FLIGHTS

T. V. Nikitina *In its* Space Biol. and Med., Vol. 4, No. 1 28 Apr. 1970 p 76 80 refs (See N70-28176 14-04)

Avail: CFSTI

The physiological reactions of the human body to exposure to a combination of spaceflight factors are considered.

Recommendations are made with respect to medical supplies to be carried aboard spaceships for treating the major stomatological diseases. R.B.

N70-28191# Joint Publications Research Service, Washington, D.C.

### PERFORMANCE OF OPERATORS DURING PROLONGED BED CONFINEMENT

Ye. S. Zavyalov et al *In its* Space Biol. and Med., Vol. 4, No. 1 28 Apr. 1970 p 87 - 92 refs (See N70-28176 14-04)

Avail: CFSTI

The efficiency of the control-scanning activity of operators exposed to a 100-day bedrest was examined. Exposure to hypokinetic conditions was shown to reduce greatly the efficiency in systems requiring fine well-coordinated movements. The efficiency revealed the greatest decline on the 40th day of the bedrest experiment. The number of resulting errors increased by a factor of 5 to 6 in comparison with the initial level. This decline was much less for operators who performed physical exercises during the experiment. Author

N70-28192# Joint Publications Research Service, Washington, D.C.

### ULTRAVIOLET FLUORESCENCE OF BIOLOGICAL OBJECTS EXPOSED TO IONIZING RADIATION

S. N. Aleksandrov et al *In its* Space Biol. and Med., Vol. 4, No. 1 28 Apr. 1970 p 93 102 refs (See N70-28176 14-04)

Avail: CFSTI

Experiments using changes in ultraviolet fluorescence of biological tissue to determine the effects of irradiation are reviewed. Irradiated living bone marrow cells and blood leukocytes of rats were found to have increased fluorescence. Ascitic tumors in rats and mice were irradiated and transplanted into nonirradiated organisms repeatedly each 8 - 10 days, and the descendants also showed increased fluorescence. Studies of descendants of irradiated rats demonstrated the hereditary transmission of the changes. It was further found that ultraviolet fluorescence increases with increased dose and exposure conditions. Two types of radiation changes were noted: one exerts its effect on fluorescent intensity only when cell vital activity is maintained, and the other has as its basis a type of impairment manifested in both living and dead cells. Changes arising during the irradiation of surviving or dead tissue outside the body were also investigated. N.E.N.

N70-28193# Joint Publications Research Service, Washington, D.C.

### NATURE OF THE EEG FOR FLIERS (COMMUNICATION 1)

A. N. Litsov et al *In its* Space Biol. and Med., Vol. 4, No. 1 28 Apr. 1970 p 103 - 104 refs (See N70-28176 14-04)

Avail: CFSTI

Cerebral bioelectric activity in subjects at rest in a semireclining position was investigated. In 96% of air personnel, a well-expressed alpha rhythm was noted. In the other 4% the EEGs exhibited a predominance of rapid fluctuations. A high or moderate activity of the alpha rhythm was observed in most of the subjects. With a decrease in degree of the alpha rhythm there was a clearly expressed shift in the direction of predominating frequent EEG potentials and a decrease in slow waves. N.E.N.

N70-28194# Joint Publications Research Service, Washington, D.C.

### EFFECT OF CHANGE IN DAILY SCHEDULE ON THE DYNAMICS OF ELECTROLYTE EXCRETION



V. P. Krotov et al *In its Space Biol. and Med.*, Vol. 4, No. 1  
28 Apr. 1970 p 105-109 refs (See N70-28176 14-04)  
Avail: CFSTI

The urine of two human subjects was collected in fractional portions at four hour intervals. The flame photometry method was used in determining the potassium, sodium, and calcium contents. The results were analyzed by periods based on the duration of changes in the daily schedule. These results based on social sensors were compared with those based on ecological time sensors.  
J.A.M.

**N70-28195#** Joint Publications Research Service, Washington, D.C.

**EFFECT OF SOME DRUGS ON ANIMAL TOLERANCE TO EXTREME STRESS**

V. Ye Belay et al *In its Space Biol. and Med.*, Vol. 4, No. 1  
28 Apr. 1970 p 110-113 refs (See N70-28176 14-04)  
Avail: CFSTI

A comparative study of neurotrophic drugs effecting acute hypoxic hypoxia, prolonged transverse accelerations, and maximum physical loads is reviewed. The dosage and pharmacological properties of the drug affecting animal tolerances are analyzed. Experimental results are summarized, including tests on psychosedative drugs and tranquilizers.  
J.A.M.

**N70-28196#** Joint Publications Research Service, Washington, D.C.

**EFFECT OF THE SOMATOTROPHIC HORMONE AND ESCULAMINE ON THE VIABILITY OF RATS UNDER THE INFLUENCE OF ACCELERATIONS**

V. G. Ovechkin et al *In its Space Biol. and Med.*, Vol. 4, No. 1  
28 Apr. 1970 p 114-115 ref (See N70-28176 14-04)  
Avail: CFSTI

The effect of hormonal drugs on animals during acceleration was studied in rats with injections of STH solution of 1 mg per 100 g of weight, and subjected to accelerations of 20 g in the head-pelvis direction. It was found that human STH considerably increases viability during acceleration of male rats, but reduces the tolerance in female rats. Measurement of pulse and respiration rates during rotation and a 25-minute after-effect period revealed a positive effect of STH on the autonomic functions.  
F.O.S.

**N70-28197#** Joint Publications Research Service, Washington, D.C.

**CHANGE IN THE CONTENT OF TOTAL PROTEIN AND PROTEIN FRACTIONS IN THE BLOOD SERUM OF RATS IN THE HIGH MOUNTAINS**

T. M. Tukhtayev et al *In its Space Biol. and Med.*, Vol. 4, No. 1  
28 Apr. 1970 p 116-117 ref (See N70-28176 14-04)  
Avail: CFSTI

Determinations of the dynamics of the content of total protein and protein fractions in the blood serum of rats were made in the high mountains (3500 m above sea level). The rats were decapitated on the 1st, 3d, 5th, 7th, 10th, 12th, and 15th days after they had been transported to the high mountains. In the valley + or - (850 m above sea level) the concentration of total protein in the serum was 6.8 + or - 0.2 g percent and the protein fractions were determined. A day after the animals were moved to the high mountains there was a decrease in the concentration of total protein. After three days an investigation revealed further changes in the blood protein content. There was a decrease in the total quantity of protein to 5.9 + or - 0.5 g percent against the initial 6.8 + or - 0.2 g percent. There was a reliable decrease in the alpha sub 1 and alpha sub 2-globulin fractions. On the fifth day the content of total protein was also reliably lower than the initial level. There was a continued reduced concentration of alpha sub 1- and alpha sub 2-globulin fractions (0.5 + or - 0.02 and 0.5 + or - 0.02 g percent respectively).  
Author

**N70-28198#** Joint Publications Research Service, Washington, D.C.

**ELECTROLYTE COMPOSITION OF CEREBROSPINAL FLUID AND CEREBRAL BLOOD IN RABBITS AFTER EXPOSURE TO ACCELERATIONS**

A. G. Kuzovkov et al *In its Space Biol. and Med.*, Vol. 4, No. 1  
28 Apr. 1970 p 118-121 refs (See N70-28176 14-04)  
Avail: CFSTI

The experiments were conducted to determine the role of the hemato-encephalic barrier in the mechanism of the observed central nervous system changes. The cerebrospinal fluid from the cisterna magna, plasma of the arterial blood from the femoral artery, plasma of venous blood from the cerebral sinus, and the content of sodium and potassium ions were investigated. The pH of the fluid and the venous and arterial blood was also determined. The coefficient of redistribution of the cations between the fluid and the blood was computed for evaluating the permeability of the hemato-encephalic barrier. The studies indicate that impairment in the functioning of the central nervous system due to exposure to acceleration is associated not only with afferent influences, homodynamic shifts, and cerebral hypoxia, but also with changes in functioning of the hemato-encephalic barrier.  
Author

**N70-28236\*#** TRW, Inc., Cleveland, Ohio. Mechanical Products Div.

**AIRCREW OXYGEN SYSTEM DEVELOPMENT: FLIGHT BREADBOARD SYSTEM. FLIGHT AND ENVIRONMENTAL TESTS**

R. J. Kiraly, A. D. Babinsky, and J. D. Powell Apr. 1970 97 p  
(Contract NAS2-4444)  
(NASA-CR-73393; TRW-ER-7256-18) Avail: CFSTI CSCL 06K

The program objective is the development of a safe, reliable, compact system which would replace the LOX system currently in use, thereby minimizing logistics, service and facilities required. The Flight Breadboard System (FBS) used in the flight testing is the first packaging of the laboratory type components into a complete oxygen system allowing operation outside of the laboratory. The aircrew oxygen system, flight breadboard system, consists of four primary subsystems: 1) water electrolysis, 2) carbon dioxide concentrator, 3) rebreather and 4) electrical control. Major conclusions reached as a result of the flight and environmental test program are: 1) the objectives of the flight test program were successfully met; 2) the aircraft flight environment does not adversely affect system operation; 3) system operation, service and maintenance can be accomplished without laboratory support equipment; 4) the flight test program has successfully demonstrated the operation of an electrochemical aircrew oxygen system; 5) no limitations or design flaws were found which would negate the concept of this system for further development; and 6) the system is not adversely affected by large variations in operating environment.  
Author

**N70-28253\*#** Naval Aerospace Medical Inst., Pensacola, Fla.  
**MOTION SICKNESS PRODUCED BY HEAD MOVEMENT AS A FUNCTION OF ROTATIONAL VELOCITY**

Earl F. Miller, II and Ashton Graybiel 5 Mar. 1970 13 p refs  
(NASA Order T-81633; NASA Order R-93)  
(NASA-CR-109891) Avail: CFSTI CSCL 06S

Results of tests to measure the stressor stimulus effect of rotational velocity in terms of the number of the standardized head-tilt movements required to evoke a common severity level of symptoms characterizing motion sickness are presented. The accumulative number of standardized head tilts (approximately 90 deg) within the frontal and sagittal planes that were executed in reaching the specific test end-points of either moderate or severe malaise was recorded at each test velocity. Sixteen young healthy subjects were rotated in a laboratory chair at various velocities within a range suitable for each subject and the limits of 1.0 to 30.0

## N70-28266

rpm. When individual ability to make head movements without evoking symptoms was exceeded, the average relative stressor effect (E factor) of each head movement varied directly and, in log-log terms, linearly with rotational velocity. These data provide the basis for grading individual susceptibility to the Coriolis type of motion sickness with a single numerical score as well as define the high rate of change of Coriolis stressor effect as a function of rotational velocity, which may find practical application in specifying rotational rates of space stations. Author

**N70-28266#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

### **HUMAN ABILITY TO ESTIMATE TARGET LOCATIONS WITH RESPECT TO TWO POINTS Final Report, May 1968 Mar. 1969**

Nils M. Aume Nov. 1969 23 p refs  
(AD-701389; AMRL-TR-69-44) Avail: CFSTI CSCL 5/5

Two coordinate systems, polar and rectangular, were compared in an experiment in which undergraduate students estimated the coordinates of a target on an unstructured map showing the target point and two reference points. The reference points were oriented either conventionally (i.e., horizontally or vertically) or randomly. Both gross errors (e.g., wrong quadrant) and inaccuracies, exclusive of gross errors, were analyzed. Author (TAB)

**N70-28280#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Human Engineering Div.

### **THE EFFECT OF THE NUMBER OF ALLOWED TARGET CHOICES UPON THE TARGET-REPORTING BEHAVIOR OF RADAR OBSERVERS**

Herschel C. Self and Almon J. Bate Nov. 1969 47 p refs  
(AD-701382; AMRL-TR-69-96) Avail: CFSTI CSCL 15/7

Studies which impose no limit upon the number of responses an observer can make usually find high false-positive rates. The present study examines observer performance when limits are imposed. Forty-two bombardier-navigators were divided into three target choice groups: 20, 40, and no limit. They examined a moving strip of side-looking radar imagery rear-projected onto a 14 by 14-inch display screen. The displayed image covered a 25-mile wide strip of terrain, simulating a 1320-knot mission lasting 27 minutes. Author (TAB)

**N70-28324#** Gt. Brit. National Inst. for Research in Nuclear Science, Chilton. Rutherford High Energy Lab.

### **DEPTH DOSE AND DEPTH DOSE EQUIVALENT DATA AS FUNCTIONS OF NEUTRON ENERGY**

K. B. Shaw, G. R. Stevenson, and R. H. Thomas Sep. 1968 15 p refs  
(RHEL/M-149) Avail: AEC Depository Libraries

Depth dose and depth dose equivalent data as functions of neutron energy are reported from various authors. Smooth curves were drawn through the sets of data and values for specific tissue depths of dose and dose equivalent per unit fluence as a function of neutron energy from thermal to several GeV are listed. Author (NSA)

**N70-28398#** National Bureau of Standards, Washington, D.C.  
**A STATISTICAL STUDY OF PHYSICAL CLASSROOM EXPERIMENTS**

John Mandel *In its* Precision Meas. and Calibration, Vol. 1 Feb. 1969 p 187 - 203 reprinted (See N70-28376 14-19)  
Avail: SOD \$5.50

An illustration of how the same set of data can be scrutinized on the basis of eight different assumed models is presented. The method of least squares for linear regression is used to show

students that the general linear hypothesis is an elegant and powerful tool for answering fundamental questions. The data are also analyzed with a control chart type of analysis to obtain information about the results of each individual student. It is felt that the experiment provides an opportunity for discussing the relationship between experimental design and analysis. N.E.N.

**N70-28441#** Systems Research Labs., Inc., San Antonio, Tex.  
**A VISUAL RESPONSE SYSTEM FOR RESEARCH WITH PRIMATES Final Report, Feb. - Aug. 1969**

W. E. Rothe Dec. 1969 15 p  
(Contract F41609-69-C-0029)  
(AD-702158; SAM-TR-69-77) Avail: CFSTI CSCL 5/10

A device was developed that permits measurement of performance of primates, through the visual modality, before and after application of pulsed ionizing radiation. Two platforms were constructed, each featuring 2 degrees of freedom. One accommodates the primate and provides him with a response stick to counteract disturbances or fly the platform in relation to a horizon displayed by the second platform. The second platform carries a large hollow sphere that encircles the primate and displays the horizon as the borderline of dark and translucent segments. This platform can be moved about two axes intersecting at a common center with those of the first platform. The shock-signal circuitry is variable in its basic parameters and adjusts automatically to the magnitude of the error committed. Author (TAB)

**N70-28458#** General Electric Co., Daytona Beach, Fla. Apollo Systems Dept.

### **STUDY FOR APPLYING COMPUTER-GENERATED IMAGES TO VISUAL SIMULATION Final Report, Jan. Jul. 1969**

Robert A. Schumacker, Brigitta Brand, Maurice Gilliland, and Werner H. Sharp Sep. 1969 146 p refs  
(Contract F33615-69-C-1280)  
(AD-700375; AFHRL-TR-69-14) Avail: CFSTI CSCL 5/9

The report describes the results of a system design study for applying digital image generation techniques to visual simulation for pilot training. The computer generated images are to provide out-the-window scenes for a flight simulator which is to be used for training Air Force pilots. No existing visual system can provide all of the capabilities which are desired in a flight simulator. Digitally generated scenes do overcome many of the shortcomings associated with more conventional approaches but have had limited application because of the difficulty of computing enough image detail. The ability to generate images of more complex and realistic environments is closely tied to advances in digital device technology. The study assesses the impact of recent developments in this area on the design of an image generating system. The conceptual design of an image generator is described. The principles of operation, the system configuration and operational characteristics are discussed. Several key problem areas are explored in depth. Feasible methods of implementation with presently available hardware are examined and an estimate of the hardware complexity is given. Author (TAB)

**N70-28468\*#** Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.

### **ESTIMATION OF POOL SIZES AND KINETIC CONSTANTS**

K. L. Zankel and B. Kok [1970] 39 p refs  
(Contracts NASw-1592; AT(30-1)-3706)  
(NASA-CR-109958) Avail: CFSTI CSCL 06C

Various methods were used to investigate the nature and number of electron transport components in chloroplasts. Interpretation of kinetic data is given for the dozen or more components in the electron transport chain in terms of chlorophyll. The primary photochemical donors and acceptors and the pools of components in the chain are discussed. S.S.

**N70-28478#** Advisory Group for Aerospace Research and Development, Paris (France).

**HUMAN FACTORS IN THE GROUND CONTROL OF AIRCRAFT**

V. David Hopkin (RAF Inst. of Aviation Med., Farnborough, Engl.)  
Apr. 1970 183 p refs

(AGARDograph-142; AGARD-AG-142-70) Avail: CFSTI

The actual and potential contributions of human factors to the smooth and efficient functioning of systems for the ground control of aircraft are described and discussed. These systems are concerned with air traffic control or air defence, which fulfill different roles but share many human factors problems. The nature of the human factors contribution at each stage in the evolution of a ground control system is described. Much work has dealt with displays, controls, or communications, or with man's role in complex man machine systems. Individual differences are considered in relation to selection, training, and screening procedures, and some of the differences which appear most relevant in systems are discussed. Both traditional and new methods for measuring operators are examined in terms of their merits and limitations. The factors of potential relevance to task performance are very numerous, and certain advances in other applied or academic contexts may be adapted with profit to ground control systems. Many of the proposed solutions to human factors problems have been based on limited evidence, mainly because man is treated primarily as a system component. Some probable future trends in the application of human factors to ground control systems are suggested.

Author

**N70-28501\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

**PORTABLE LIFE SUPPORT SYSTEMS Conference Papers**

Washington 1970 380 p refs Conf. held at Moffett Field, Calif., 30 Apr. - 2 May 1969

(NASA-SP-234) Avail: CFSTI CSCL 06K

Papers are presented on portable life support systems for terrestrial, underwater, and aerospace application. Protective suits, heating and cooling systems, oxygen supply, and carbon dioxide removal are stressed. For individual titles see N70-28501 through N70-28525.

**N70-28502\*#** National Aeronautics and Space Administration, Washington, D.C.

**ADVANCED PORTABLE LIFE SUPPORT SYSTEMS: THE KEY TO INDEPENDENT OPERATIONS Keynote Address**

Walton L. Jones *In its* Portable Life Support Systems 1970 p 1-3 (See N70-28501 14-05)

Avail: CFSTI CSCL 06K

Introductory remarks are given on life support systems for hostile environments. The need for space technology utilization in the nation's economy is mentioned. Reliability is identified as the basic requirement, but with two- and three-year missions, maintainability, weight, volume, and power considerations also become major constraints. It is felt that the correct balance between theory and experiment has not yet been achieved in the area of advanced portable life support, and the university can help in developing more concepts and in training more people in this field.

N.E.N.

**N70-28503\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

**PHYSIOLOGICAL SPECIFICATIONS FOR PERSONAL LIFE SUPPORT SYSTEMS**

John Billingham *In its* Portable Life Support Systems 1970 p 5-10 refs (See N70-28501 14-05)

Avail: CFSTI CSCL 06K

The problems encountered in preparing physiological and environmental design specifications are outlined. In choosing between

physiological and environmental specifications, it is recommended that preference be given to quantities that are the least complicated, least ambiguous, and easiest to measure. The specification should be supplemented by a variety of data to assist in translating requirements into hardware. The acceptability of factors for controlling parameters within allowable limits should be included. In the event that the optimum environment is not attainable, penalties must be stated for human performance reduction; mortality probability; development of chronic pathological conditions; intensity, duration, rates of change of application, and other characteristics of stresses; the mean probability that one of three failure modes will occur; and the curve describing the variability about this point. Specifications are given for inspired gas partial pressures, total pressure, metabolic rate, and thermal condition.

N.E.N.

**N70-28504\*#** Hamilton Standard, Windsor Locks, Conn.

**INTEGRATED MANEUVERING AND LIFE SUPPORT SYSTEM**

Thomas W. Herrala, Douglas C. Howard, and Philip F. Heimlich *In* NASA, Ames Res. Center Portable Life Support Systems 1970 p 11-27 (See N70-28501 14-05)

(Contract F33615-67-C-1946)

(AMRL-TR-69-41) Avail: CFSTI CSCL 06K

Descriptions are presented of the protective suit, life support system, and maneuvering unit which are combined into one system providing increased EVA capability. All the hardware is wrapped around the crewman in such a way that the center of gravity of the complete system with man is approximately the same as that of the man alone. It provides powered translational and rotational maneuvering capability in six degrees of freedom. The suit portion consists of a two-piece hard torso, soft arms and legs, and helmet. The life support system contains pressure supply and control, atmosphere revitalization, and thermal control. The maneuvering unit consists of a hand control assembly, thrust control assembly, and propellant tank module.

N.E.N.

**N70-28505\*#** Naval Ordnance Station, Indian Head, Md. Explosive Disposal Facility.

**MODULAR TOXIC ENVIRONMENT PROTECTIVE SUIT**

E. J. George and A. H. Klein *In* NASA, Ames Res. Center Portable Life Support Systems 1970 p 29-39 (See N70-28501 14-05)

Avail: CFSTI CSCL 06Q

The MODTEPS is a life support system designed to be used in highly toxic environs by technicians engaged in explosive ordnance disposal work and for special munitions handling. The suit provides complete protection to the wearer from chemical and biological agents, as well as from contamination by radioactive materials. The suit is used with one of three air supply systems: (1) cryogenic, (2) compressed air, or (3) filtered air. The cryogenic backpack provides up to four hours of life support while also providing air conditioning to the wearer. The compressed air, either from bottles or a portable compressor, provides breathing air and, using a vortex discrimination effect, also provides cooling or heating. The filter system, always present as a backup, is two M-17 gas mask filters mounted in the back of the helmet. Details of the development and system components are given.

Author

**N70-28506\*#** AiResearch Mfg. Co., Los Angeles, Calif. Space Environmental Systems.

**DEVELOPMENT OF THE PORTABLE ENVIRONMENTAL CONTROL SYSTEM**

R. Norman Prince (NASA, Manned Space Craft Center, Houston, Tex.), Thomas L. Iles, and William J. O'Reilly *In* NASA, Ames Res. Center Portable Life Support Systems 1970 p 41-58 (See N70-28501 14-05)

## N70-28507

Avail: CFSTI CSCL 06K

The system selection and prototype development of the control system for AAP earth orbital and extended lunar applications are described. Three types of prototype systems were identified: semiclosed, closed, and a chemical system which absorbs carbon dioxide and generates oxygen. Comparison data are tabulated. The components of the prequalification prototype are also described. It contains a water loop for heat rejection and an oxygen loop for respiration, suit pressurization, and carbon dioxide and humidity control. The noteworthy features are identified as (1) an integrated fan, pump, and photoelectrically commutated dc motor; (2) magnetic coupling of the pump to the fan motor; (3) redundant pump and motor; (4) ejector pump backup to fan; and (5) liquid-to-liquid heat exchanger for pre- and post-EVA operations within a pressurized cabin. N.E.N.

### N70-28507\*# Navy Experimental Diving Unit, Washington, D.C. **SEMICLOSED AND CLOSED CIRCUIT UNDERWATER BREATHING APPARATUS**

William I. Milwee, Jr. *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 59-71 refs (See N70-28501 14-05)  
Avail: CFSTI CSCL 06K

The design of Mark 9, an umbilical supplied semiclosed circuit mixed gas underwater breathing apparatus, is described. The semiclosed circuit represents a practical compromise between the need for increased depth and duration of dive, the size and complexity of the breathing apparatus, and diver safety. Its advantages are identified as the following: (1) Gas utilization is high. (2) Semiclosed systems are relatively simple and are purely mechanical. (3) There has been a wealth of experience with semiclosed systems. The system is also compact and weighs only 50 lb. The components and operation of the system are described. N.E.N.

### N70-28508\*# Army Natick Labs., Mass. **MICROCLIMATE-CONTROLLED (THERMALIBRIUM) PROTECTIVE CLOTHING SYSTEM FOR MILITARY APPLICATIONS**

Leo A. Spano *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 73-85 (See N70-28501 14-05)  
Avail: CFSTI CSCL 06Q

Microclimate-controlled clothing to protect troops against a multitude of potential hazards was developed. In thermal equilibrium clothing, heat regulation is achieved by circulation of heated, ambient, or conditioned air inside the clothing. The total system consists of three major components: a combined protective helmet; the body clothing with appropriate shoes and gloves; and a lightweight, self-powered, heat regulation device that can be integrated with the clothing or a heat regulation device that is powered remotely from a vehicle. The insulation property is such that if the heat regulation device fails in extreme cold, the individual will not become a cold weather casualty. This combined protective ensemble provides complete protection against CW and BW agents and prevents radioactive fallout from coming into direct contact with the skin or respiratory tract. It also affords protection against thermal radiation to the level required and protection against natural hazards. The individual wearing this ensemble should be able to perform duties effectively at temperatures as low as 40 F and as high as +110 F. Author

### N70-28509\*# TRW Systems, Redondo Beach, Calif. **ELECTROCHEMICAL PRODUCTS DEPT.**

**NASA AIRCREW OXYGEN SYSTEM**  
P. D. Quattrone (NASA. Ames Res. Center), A. D. Babinsky, R. J. Kiraly, F. H. Shubert, R. K. Mitchiner et al *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 87-113 refs (See N70-28501 14-05)  
(Contract NAS2-4444)  
Avail: CFSTI CSCL 06K

An advanced aircrew oxygen system is being developed to replace the currently used LOX aircrew breathing systems. This new system is designed to increase flight mission durations, to eliminate the safety hazards associated with the LOX systems, and to have minimal ground servicing requirements that decrease costs. The system is a closed-loop system and includes: a water electrolysis module for generating oxygen; a rebreather loop that includes an electrochemical carbon dioxide scrubber, a nitrogen elimination vent, humidity control, and thermal control. Results are reported on the water electrolysis module, carbon dioxide concentrator module, power conversion and conditioning, laboratory breadboard system, flight breadboard system, and aircrew oxygen system. Author

### N70-28510\*# Naval Facilities Engineering Command, Falls Church, Va.

#### **RADIOISOTOPE HEATED SWIMSUIT**

Glenn W. Zimmer *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 115-126 (See N70-28501 14-05)  
Avail: CFSTI CSCL 06K

Problems and solutions in the development of the swimsuit for Sealab 3 are briefly described. The problem areas include the location and shielding of the isotope, effects of increased oxygen pressure on radiosensitivity of body cells, and dose rates and dose limits. Monitoring and emergency systems are also outlined. N.E.N.

### N70-28511\*# Litton Systems, Inc., Beverly Hills, Calif. Space Sciences Center.

#### **LITTON PORTABLE LIFE SUPPORT SYSTEM**

Daniel L. Curtis *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 127-137 (See N70-28501 14-05)  
Avail: CFSTI CSCL 06K

A prototype portable life support system is described which represents a reduction in weight and volume. It is felt that the most important advancement is a breathing vest worn over the liquid coolant garment. A volume change in the lungs is reflected by an equal volume change in the vest, causing a corresponding volume of oxygen to be delivered to the oral/nasal region, and reducing the oxygen flow requirements. The essential features are considered to be an open loop gas flow, a gas-operated pump for circulating coolant water, a lightweight nonclogging sublimator for cooling, and a chest-mounted control unit for gas and temperature. The system does not depend on electrical power for primary life support. N.E.N.

### N70-28512\*# Naval Air Development Center, Johnsville, Pa. Life Sciences Research Group.

#### **DESCRIPTION AND EVALUATION OF A PORTABLE DRY-ICE WATER-COOLING SUIT SYSTEM FOR AIR CREWMEN**

John J. Esposito *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 139-149 refs (See N70-28501 14-05)  
Avail: CFSTI CSCL 06K

The water cooling system using dry ice as the refrigerant is described and test results are described. Subjects wearing liquid-cooled suits were exposed to ambient temperatures of 105 F and 115 F, with and without the portable cooling system in operation, and rectal and skin temperatures were monitored. It is felt that the dry-ice cooler system is effective and has the advantages of minimized weight, maintenance, and power consumption. N.E.N.

**N70-28513\*#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**EFFICACY OF VENTILATING SYSTEMS**

James H. Veghte *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 151 158 refs (See N70-28501 14-05)

(AMRL-TR-69-54) Avail: CFSTI CSCL 06Q

Several air-cooled systems and one water-cooled system worn under flight clothing were evaluated. The subjects were exposed to an environment of 43 C/45 mm Hg water vapor pressure at sea level. Sweat loss, body temperature, and heart rate measurements were taken. All systems were found to ameliorate discomfort, with the water-cooled system showing slight enhancement over air systems. Provisions for cooling the face decreased discomfort. Optimal ventilating systems are proposed for permeable and impermeable clothing. N.E.N.

**N70-28514\*#** Webb Associates, Yellow Springs, Ohio.

**AUTOMATIC COOLING: STRATEGIES, DESIGNS, AND EVALUATIONS**

Paul Webb *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 159 - 177 refs (See N70-28501 14-05)

Avail: CFSTI CSCL 06K

As a basis for evaluating the various control approaches, the physiology of a man in a water-cooled suit was defined in a study of metabolic time constants; the subject was thermally isolated and kept biothermally neutral at rest and during work. The characteristic responses studied were oxygen consumption, heart rate, skin temperature, rectal temperature, and rate of heat removal. This study resulted in a biothermal model that was useful as an analytical tool and as a means of testing control approaches during simulation runs. The biothermal model is updated and improved continually; it was found recently, for example, that muscle temperatures are lower during work with cooling than the standard values given in the literature. The metabolic time constants provided a basis for evaluating various control approaches. The first and simplest of these was an open-loop controller using oxygen consumption as an input, from which was generated an exponential change in cooling rate with the proper time constant. The second control approach employed as inputs rate of heat removal and skin temperature, the skin temperature representing a feedback that added stability and improved control behavior during long quiet periods of low activity. Author

**N70-28515\*#** Honeywell, Inc., St. Paul, Minn. Systems and Research Center.

**FLUIDIC TEMPERATURE CONTROL FOR LIQUID-COOLED SPACE SUITS**

J. B. Starr *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 179 189 refs (See N70-28501 14-05)

Avail: CFSTI CSCL 06K

An approach to coolant inlet temperature modulation with a liquid temperature controller in the spacecraft is described. With such a system, signals calling for coolant temperature modulations are transmitted by some means from the astronaut via the umbilical to the controller. The system is based on the use of the already existing supply and return conduits to transmit the control signals. Control signals are produced by varying the flow resistance across the liquid-cooled garment. These variations can be produced manually by the astronaut by turning a valve, or automatically by skin temperature sensors. Fluidic techniques are employed in the coolant temperature controller because of inherent reliability (no moving parts are required) and because of the low signal thresholds that are characteristic of fluidic devices. Author

**N70-28516\*#** TRW Systems Group, Redondo Beach, Calif. Environmental Control and Life Support. **TECHNIQUES FOR EXCESS METABOLIC HEAT REJECTION**

**FROM THE OUTSIDE SURFACES OF PROTECTIVE SUITS**

A. P. Schlosinger *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 191 209 refs (See N70-28501 14-05)

(Contract NAS2-3817)

Avail: CFSTI CSCL 06K

The variable thermal conductance space suit shell concept and component subsystems are briefly summarized. The system uses controllable heat pipes to bypass a thermal insulation layer, flexible heat pipes for transmission of heat from the skin of an astronaut to the interior surface of a hard shell space suit, and heat pipes for temperature equalization in the external surface of the space suit. Author

**N70-28517\*#** Naval Air Development Center, Johnsville, Pa. Aerospace Cren Equipment Dept.

**PHYSIOLOGICAL EFFECTS OF WATER COOLING UNDER DIFFERENT ENVIRONMENTAL CONDITIONS**

Louis J. Santa Maria *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 211 - 220 refs (See N70-28501 14-05)

Avail: CFSTI CSCL 06S

The effects of water cooling were studied in subjects at rest and performing mild work, in subjects wearing full pressure suits and performing extreme work, in subjects at rest wearing an automatically controlled system, and in sedentary subjects wearing portable water-cooled devices. To attain a level of constancy in the suit-subject relationship, the cooling suit was carefully taped close to the body in circumferential areas such as the torso, arms, and legs. While the results generally indicate the thermal advantages of the water-cooled system under the conditions described, there is a potential problem following the characteristic rise in rectal temperature and the continuous drop in overall skin temperature, observed especially during peak metabolic loads. Author

**N70-28518\*#** Martin-Marietta Corp., Denver, Colo.

**PORTABLE HEAT REJECTION SYSTEMS FOR THE EXTRAVEHICULAR ASTRONAUT**

J. Travis Brown (NASA. Manned Spacecraft Center, Houston, Tex.) and Donald A. Myers *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 221 255 refs (See N70-28501 14-05)

(Contract NAS9-8184)

Avail: CFSTI CSCL 06K

Promising heat rejection systems were identified and compared with respect to various types of EVA missions as well as on individual system merit. Nine systems consisted of a liquid-cooled garment, a heat transport loop, and one of the following sinks: wick-fed evaporator, forced-vortex boiling evaporator, porous-plate sublimator, gelled-water sublimator, heat of fusion of ice, heat of fusion of eutectic salts, recoverable water evaporant, recoverable ammonia evaporant, and space radiators. The systems not requiring a garment or loop were integral diffusion vaporization and integral heat pipes/suit radiator. It is concluded that the selection of heat rejection systems for next-generation PLSS must be tempered by considerations of safety, reliability, inflight maintainability, crew time lines for servicing, potential failure modes, spacecraft interfaces, probable impact of the system on the astronaut's center of mass, and development risk. The volume on the man and the total launch weight were overriding considerations in evaluating the parametric analyses. Author

**N70-28519\*#** McDonnell-Douglas Astronautics Co., Santa Monica, Calif. Advanced Biotechnology and Power Dept.

**EGGS LIQUID-PHASE-CHANGE GARMENT COOLING SYSTEM**

## N70-28520

J. G. Bitterly *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 257 277 refs (See N70-28501 14-05)  
(Contract NAS9-7207)  
Avail: CFSTI CSCL 06K

The evaporative cooling garment system (ECGS) which is integrated into an Apollo space suit is described. This garment provides heat exchange from the skin directly to space by means of 12 cooling segments, each utilizing the principle of liquid-phase-change of water within its structure. The cold steam generated in the segments at near-vacuum pressure is exhausted through a control directly to space. The system was demonstrated conclusively on the treadmill during 4-hr continuous simulated EVA missions. Work loads varied from resting periods up to sustained metabolic levels of 5000 Btu/hr (1260 kcal/hr). Cooling rates can be established instantly at any level with a fine control. This self-contained system has only one moving part, a valve that requires no power in manual control operation. The ECGS is a next-to-the-skin, highly flexible garment that functions as a body conductive heat sink; it provides high heat transfer with quantitative, controllable precision. Its application can greatly enhance the normal rate of heat loss at the skin surface. Any preselected cooling rates can be immediately established and maintained. The degree to which the skin capillary bed can meet this imposed cooling heat transfer is rate limited only by the efficiency of the vascular supply.

Author

## N70-28520\*# Aerojet-General Corp., Azusa, Calif. **SOLID OXYGEN FOR PORTABLE LIFE SUPPORT SYSTEMS IN SPACE**

John E. Ahern *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 279 290 refs (See N70-28501 14-05)  
(Contract F33615-67-C-1849)  
(AMRL-TR-68-105) Avail: CFSTI CSCL 06K

Oxygen storage and conversion systems are discussed. Oxygen stored in the solidified condition at the beginning of a mission will provide a longer storage life than that stored in the subcritical or supercritical liquid condition, provided that advantage is taken of the greater density, sensible heats, and heats of fusion of the solid material. Oxygen stored as a solid has advantages where continuous supply is not required; it would have advantages as a reserve or emergency supply as well as for EVA or lunar exploration where intermittent supply is required. Conversion of solid oxygen from the storage vessel into a breathable condition, as well as transport from one vessel to another, can best be done by manual transfer of solid blocks through an air lock device. Although oxygen can be converted from a solid to a breathable state by means of cryosorption pumps, certain characteristics of the test system indicated problems in widespread application of this system.

Author

## N70-28521\*# AiResearch Mfg. Co., Los Angeles, Calif. Space and Applied Systems. **RESEARCH ON SODIUM CHLORATE CANDLES FOR THE STORAGE AND SUPPLY OF OXYGEN FOR SPACE EXPLORATION**

Jack Littman and R. Norman Prince (NASA. Manned Spacecraft Center, Houston, Tex.) *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 291 330 refs (See N70-28501 14-05)  
Avail: CFSTI CSCL 06K

Chlorate candle research and development programs are reviewed. Analytic methods are described, and mechanisms are suggested for the unwanted chlorine production. Sodium chlorate decomposition reactions are given and catalysis of the reaction is discussed. Fabrication techniques, purity analyses, and candle performance are described. Igniter research and development are also included. It is felt that definite advances in oxygen candle technology have been made, and potential applications are identified as

space emergency oxygen supply, spacecraft rapid repressurization, filling of high pressure gas bottles, and supply of oxygen to portable environmental control systems. N.E.N.

## N70-28522\*# General Dynamics Corp., Groton, Conn. Electric Boat Div.

### **THE ROLE OF ACTIVE CHEMICALS FOR AIR REVITALIZATION**

A. W. Petrocelli and H. Wallman *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 331 341 refs (See N70-28501 14-05)

Avail: CFSTI CSCL 06K

The use of metal superoxides, ozonides, and peroxides for oxygen supply and carbon oxide removal is discussed. The availability and air revitalization chemistry of the chemicals are described. Methods of air revitalization which were tested are the following: forced airflow through a fixed, granular bed of active chemicals; forced airflow through freshly ground powder; and reaction of the solid chemical with water followed by carbon dioxide absorption with the resulting alkaline solution. It is concluded that the chemistry of sodium and potassium superoxides is sufficiently developed to allow their application in air revitalization systems.

N.E.N.

## N70-28523\*# Hamilton Standard, Windsor Locks, Conn. **LITHIUM PEROXIDE FOR PORTABLE LIFE SUPPORT SYSTEM ATMOSPHERIC REGENERATION**

Kenneth J. Dresser and R. Norman Prince (NASA. Manned Spacecraft Center, Houston, Tex.) *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 343 371 refs (See N70-28501 14-05)

(Contract NAS9-8159)

Avail: CFSTI CSCL 06K

A test program was conducted to evaluate the capabilities of lithium peroxide to control carbon dioxide and supply oxygen for a PLSS, with the crewman's average metabolic rate at 2000 Btu/hr for 4 hr. It is demonstrated that lithium peroxide has excellent potential for development. The present system size is smaller than the nearest contender. The low-bulk-density granules, catalyzed with 2% nickel sulfate, gave the best overall performance. Thermal decomposition of the chemical enhances the oxygen evolution yield but deters carbon dioxide removal by producing lithium oxide, which is too dense to efficiently remove carbon dioxide, and by heating the lithium hydroxide monohydrate above its temperature for stable operation. The most significant parameter for lithium peroxide operation is bed temperature.

Author

## N70-28524\*# General Electric Co., Philadelphia, Pa. Missile and Space Div.

### **A MEMBRANE SYSTEM FOR CARBON DIOXIDE CONTROL IN LIFE SUPPORT SYSTEMS**

W. J. Ward, III *In* NASA. Ames Res. Center Portable Life Support Systems 1970 p 373 378 refs (See N70-28501 14-05)

Avail: CFSTI CSCL 06K

The development of immobilized water membrane for carbon dioxide/oxygen separation is described. Porous cellulose acetate films impregnated with a saturated cesium bicarbonate solution containing 0.5M sodium arsenite were used. The effect of the sodium arsenite was to increase the carbon dioxide permeability by a factor of 3. The major disadvantage of the system is identified as the requirement that the humidity of the entering gases must be controlled. The major advantage is considered to be that it requires no replacement or regeneration of any components.

N.E.N.

**N70-28525\*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

**REGENERABLE SORBERS AND PORTABLE LIFE SUPPORT**

Rex B. Martin *In its* Portable Life Support Systems 1970 p 379 389 refs (See N70-28501 14-05)

Avail: CFSTI CSCL 06K

Carbon dioxide sorbers are discussed. Development of the molecular sieve regenerable sorber and a method for analyzing it are described. Ion exchange resins were also investigated, and weak base amine resins showed the greatest promise. N.E.N.

**N70-28536#** Miami Univ., Fla. Inst. of Marine and Atmospheric Sciences.

**STUDIES WITH TROPICAL AND SUBTROPICAL MICROALGAE Annual Progress Report**

J. S. Bunt [1969] 21 p refs

(Contract AT(40-1)-3795)

(ML-70004; TID-25325) Avail: CFSTI

Progress is reported on research in algal and protozoan nutrition, the establishment of bacteria-free algal cultures, screening of bacteria-free cultures for photoheterotrophic capacities, and the physiological and biochemical basis of photoheterotrophy. NSA

**N70-28576#** Joint Publications Research Service, Washington, D.C.

**PSYCHOPHYSIOLOGICAL AND ENGINEERING-PSYCHOLOGICAL ASPECTS OF AVIATION AND SPACE MEDICINE**

B. A. Dushkov et al 8 May 1970 13 p Transl. into ENGLISH from Vop. Psikhologii (USSR), v. 16, no. 1, 1970 p 179 -185

(JPRS-50489) Avail: CFSTI

Summaries of conference papers are presented on the effects of flight factors and methods of increasing human efficiency during flight, investigation of the work of pilots and cosmonauts to determine optimum work methods during flight assignments, improvement of methods of medical selection and crew training, and improvement of closed ecological life support systems. Author

**N70-28579#** Maryland Univ., College Park. Dept. of Botany. **IN VITRO BIOSYNTHESIS OF PLANT PROTEINS AND NUCLEIC ACID Final Report, 15 Apr. 1965 -31 Jul. 1969**

31 Jul. 1969 6 p refs

(Contract AT(30-1)-3536)

(NYO-3536-13) Avail: CFSTI

An overview of research accomplishments in a program to refine the various components of a cell-free, all-maize model system is presented. These accomplishments include: (1) the isolation and characterization of a polypeptide from the cell-free amino acid incorporating system of maize seedlings; (2) the purification and characterization of the DNA-dependent RNA polymerase from maize seedlings; and (3) the demonstration of a response of dark-grown tissues to illumination in terms of increases in the level of polysomes and polymerase activity. D.L.G.

**N70-28592#** Joint Publications Research Service, Washington, D.C.

**MAN UNDERWATER**

V. Nikol'yev 11 May 1970 14 p Transl. into ENGLISH from Nauka Zhizn (USSR), no. 3, Mar. 1970 p 13 -19

(JPRS-50493) Avail: CFSTI

Physiological diving limits are assessed in terms of the depth to which man can descend and the length of time he can remain under water without using any breathing apparatus. The problems inherent in aqualung diving are examined, and the

occurrence and prevention of depth intoxication are discussed. The experiments with underwater laboratories or Sealabs are reviewed, and the need for studies on gas exchange methods is stressed.

M.G.J.

**N70-28622#** Joint Publications Research Service, Washington, D.C.

**HYPOKINESIA IN MODERN MAN**

K. M. Smirnov 11 May 1970 9 p refs Transl. into ENGLISH from Gig. Sanit. (USSR), no. 2, 1970 p 74 -78

(JPRS-50492) Avail: CFSTI

The need for determining the effects of hypokinesia and the optimal regimen of motor activity and relaxation is discussed. Studies are reviewed on gas exchange, blood circulation, and cardiac activity in atheletes, nonatheletes, and persons subjected to a period of inactivity, both during physical exercise and rest. The relation between hypokinesia and emotional stress is considered, and it is pointed out that retarding of the muscular component of emotions is a new factor in the historical development of mankind. The possible significance of restriction of movements in the process of human intellectual development is also mentioned. N.E.N.

**N70-28644#** Joint Publications Research Service, Washington, D.C.

**DECIPHERING AUTOMATA IN THE ABSENCE OF AN UPPER BOUND OF THE STATE NUMBER**

Ya. M. Barzdin 21 Apr. 1970 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 190, no. 5, 1970 p 1048 -1051

(JPRS-50356) Avail: CFSTI

Automata are defined as finite initial Mealy automata with given numbered states. All the automata are assumed to have the same input and output alphabets. An automation with an initial state is given about the internal structure of which nothing is known, including the upper bound of the state number, and such an automation is called a black box. Although no experiment is possible by which a black box can be deciphered, a multiple experiment does exist which permits deciphering the majority of black boxes. An analogous result is derived for the case of simple experiments and the length of the corresponding simple experiments is estimated. A deciphering algorithm over the black box is derived from which a corresponding algorithm is constructed to describe the behavior of the black box. R.B.

**N70-28658\*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

**CONTROL OF CELL DIVISION BY THE ELECTRICAL VOLTAGE OF THE SURFACE MEMBRANE**

Clarence D. Cone, Jr. [1970] 12 p refs Presented at the Am. Cancer Soc. 12th Ann. Sci. Writers Seminar, San Antonio, Tex., 20 -25 Mar. 1970

(NASA-TM-X-62916) Avail: CFSTI CSCL 06C

Two basic developments are reported, in cell division theory which may provide the basis for an increased understanding of cancer and new approaches to its control: (1) A fundamental new theory, which proposes that the cellular ionic concentration pattern (caused by the electrical voltage which normally exists across the surface membrane) acts to exert precise control over division in body cells, has been developed and experimentally verified in tests with mammalian cells. (2) This theory has provided, for the first time, an explanation of the functional connection between the two major pathological features of cancer (uncontrolled proliferation and metastasis) and implies that the basic functional aberrancy producing both of these conditions lies in an alteration of the molecular structure of the cell surface. Author

## N70-28670

**N70-28670\***# National Aeronautics and Space Administration, Washington, D.C.

### **ADVANCEMENTS IN TELEOPERATOR SYSTEMS An AEC-NASA Technology Utilization Publication**

1970 242 p Presented at a colloq., Denver, 26 -27 Feb. 1969 (NASA-SP-5081) Avail: CFSTI CSCL05H

Advances in computers, television, and electronic and mechanical devices which have contributed to the widespread use of the teleoperator are discussed. Emphasis is placed on transfer and teleoperator device technology to medical, aeronautical, and industrial fields. S.S.

**N70-28680\***# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

### **FIDELITY OF SIMULATION AND TRANSFER OF TRAINING: A REVIEW OF THE PROBLEM**

Siegfried J. Gerathewohl Dec. 1969 21 p refs (FAA-AM-69-24) Avail: CFSTI

There are several kinds of flight simulators available today which are valuable tools for research, training and proficiency determination. They range from simple trainer type devices, which are useful for the learning of specific tasks, to very sophisticated ground based facilities and aircraft used for crew training under simulated environmental and operational conditions. The various perceptual phenomena and performance modes observed indicate that it is not physical similarity of the devices but psychologic, physiologic, and operational realism which determine fidelity in simulation. The amount of transfer of training appears to be closely related to the degree of fidelity which can be provided. Author

**N70-28693\***# Joint Publications Research Service, Washington, D.C.

### **HUMAN MOTOR ACTIVITY IN SEALED CHAMBERS AND DURING SPACE FLIGHT**

Boris Andreyevich Dushkov 18 May 1970 279 p refs Transl. into ENGLISH of the book "Dvigatel'naya Aktivnost Cheloveka v Usloviyakh Germokamery i Kosmicheskogo Poleta" Moscow, Meditsina, Jun. 1969 p 1-320 (JPRS-50535) Avail: CFSTI

Questions touching on changes in the coordination of movements, time intervals, and power reactions in connection with up-to-date data on the physiology of activity are considered. Quantitative characterizations of the stability of a highly-automatic motor act (walking) and specially-selected exercises in various positions during time spent in sealed chambers are discussed. A comparative physiological characterization is offered of the influence of a change in the supply of information in dependence upon the length of time spent in a small-volume chamber, as well as of the extent of the influence of unfavorable factors and individual character traits on the human organism under such circumstances. Scientifically-grounded recommendations are provided to solve a number of questions concerning the guidance of muscular activity and the regulation of movements under extreme conditions. Author

### **N70-28751\***# Lockheed Missiles and Space Co., Sunnyvale, Calif. **TECHNICAL FEASIBILITY DEMONSTRATION MODEL OF ORBITING EXPERIMENT FOR STUDY OF EXTENDED WEIGHTLESSNESS**

J. M. Smith, P. B. Maine et al 11 May 1970 174 p refs (Contract NAS1-8200) (NASA-CR-66934) Avail: CFSTI CSCL06B

The design, fabrication, and testing of a Technical Feasibility Demonstration Model (TFDM) of a one-primate configuration of the Orbiting Primate Experiment hardware is summarized. The TFDM has provisions for supporting a 6 kg rhesus monkey in an unrestrained fashion for a period of one year. Subsystems include: feeder, waterer, waste management, air circulation, temperature control, TV

and illumination, behavioral programmer and associated task equipment, biotelemetry of ECG and temperature, detection of primate activity and vocalizations, primate mass measurement, and automatic primate retrieval at experiment conclusion. Among the tests reported are feeder vibration, accelerated one-year life testing of the feeder and waterer and acceptance tests, and a 56-day primate test. Author

**N70-28766** New York Univ., N.Y.

### **EGO IDENTITY, TIME PERSPECTIVE, TIME CONCEPTUALIZATION, AND PLANNING**

Stanley Kaye (Ph.D. Thesis) 1969 159 p Avail: Univ. Microfilms: HC \$7.40/Microfilm \$3.00 Order No. 69-21191

The relation among the time variables perspective and conceptualization, the time variables and planning, and the relation of Ego Identity with these variables is discussed. Four hypotheses were formulated: (1) time conceptualization will vary positively with Ego Identity, (2) time perspective will vary positively with Ego Identity, (3) planning will vary positively with Ego Identity, and (4) a greater relationship will be noted between Ego Identity and conceptual foresight than between Ego Identity and perceptual foresight. Conceptual foresight and perceptual foresight were two factors subsumed under the general term planning. The findings did not support the hypothesized relation between time conceptualization and Ego Identity. The study showed that there is a relation between Ego Identity and both planning and time perspective. Dissert. Abstr.

**N70-28815\***# State Univ. of New York at Buffalo. **CENTER FOR THEORETICAL BIOLOGY**

1969 137 p refs (Grant NGR-33-015-106) (NASA-CR-110182) Avail: CFSTI CSCL06C

Progress is reported on research in nuclear and cytoplasmic inheritance, models of central nervous system and sensory communication, statistical mechanics in biophysical systems, symbolic relational systems, theoretical pharmacology, quantum biochemistry, membranes and surfaces, cancer chemotherapy, and behavioral studies. R.B.

**N70-28817\***# Pittsburgh Univ., Pa. Space Research Coordination Center.

### **TWO SURVEYS OF THE NEEDS OF ENGINEERING SCHOOLS IN THE FIELD OF BIOMECHANICAL AND HUMAN FACTORS ENGINEERING EDUCATION**

Erwin R. Tichauer (New York Univ.) and Alan A. Glaser 14 Apr. 1970 38 p refs (Grant NGL-39-011-002) (NASA-CR-110201; SRCC-124) Avail: CFSTI CSCL06B

Several excellent surveys about the state of the art of bioengineering, biomechanics, and biomechanical and human factors engineering at American universities and colleges already exist. This report endeavors to complement and supplement the aforementioned two strands of inquiries with the opinion of engineering educators about the needs to train, in sufficient numbers, badly needed professionals for the practice of this fast developing discipline. While the purpose of the two surveys was to obtain information on biomechanical and human factors engineering education in particular, the results are of interest and apply to most areas of biotechnology. Author

**N70-28833\***# Techtran Corp., Glen Burnie, Md. **THE PROBLEM OF THE ELECTROMYOGRAPHIC AND MECHANOGRAPHIC CHARACTERISTICS OF THE OPERATION OF THE HUMAN MOTOR APPARATUS DURING**



**EXERCISE [K VOPROSU OB ELEKTROMIOGRAFICHESKOY I MEKHANOGRAFICHESKOY KHARAKTERISTIKE RABOTY DVIGATELNOGO APPARATA CHELOVEKA V PROTESSE UPRAZHNEENIYA]**

V. S. Averyanov Washington NASA Jun. 1970 11 p refs  
Transl. into ENGLISH from Nervnaya Systema (Leningrad), No. 7, 1966 p 125 - 131

(Contract NASw-2037)

(NASA-TT-F-12998) Avail: CFSTI CSCL 06P

Experiments were performed on four test subjects, for a total of 80 experiments, involving the flexing and extension of the arm, with recording of bioelectric currents and mechanical movements. The relationships between the recordings were found to fall into three groups, with the following characteristics: There is an initial absence of a clearly expressed maximum of speed during flexing, followed by the appearance of a maximum during the beginning of the movement, and a final shift of the maximum toward the middle of the cycle. Author

**N70-28856#** Kernforschungsanlage, Juelich (West Germany). Zentralabteilung Strahlenschutz.

**EXPERIENCE IN PRACTICAL RADIATION PROTECTION WITH THERMOLUMINESCENCE DOSIMETERS FOR THE DETERMINATION OF THE DOSAGE OF PARTIAL RADIATIONS [ERFAHRUNGEN IM PRAKTISCHEN STRAHLENSCHUTZ MIT THERMOLUMINESZENZDOSIMETERN ZUR BESTIMMUNG DER DOSIS BEI TEILBESTRAHLUNGEN]**

M. Heinzelmann Feb. 1970 22 p refs In GERMAN

(JUEL-640-ST) Avail: CFSTI

The experience after one year and the results of partial particle dosage determination with thermoluminescence dosimeters are discussed. The results are compared with those from dosimeter films, worn as bracelets, and finger rings. The comparison shows that the film dosimeters are not suitable for determining the maximum values of the dosages received on hands. Author (ESRO)

**N70-28862#** Kernforschungsanlage, Juelich (West Germany). Inst. fuer Medizin.

**DNA SUBUNITS, THE LINKING PHOSPHOPEPTIDES, AND THE COMPONENTS FOR DNA REPOLYMERIZATION**

Richard S. Welsh Jul. 1969 58 p refs Sponsored partly by Am. Heart Assoc., Inc.

(Jul-612-ME) Avail: CFSTI

The aim of this study was to prepare whole, unclumped nuclei, protected against enzymatic activity, and to isolate DNA from them in a form approaching as closely as possible that found in vivo. Two basically different forms of DNA exist: (1) a reversibly polymerized, associated state which gives subunits on EDTA (ethylenediamine tetraacetate) treatment, and (2) an irreversibly polymerized, EDTA-stable state. Protected nuclei gave DNA of type 1, whereas ruptured or Mg-ATP (Mg-adenosinetriphosphate) treated nuclei gave the irreversibly polymerized type 2. It was found that the DNA subunits obtained from protected nuclei could be irreversibly polymerized to given the type 2 DNA described by addition of the chromatographically purified, cell free components: one or more phosphopeptide (PP) fractions, two protein (enzyme) fractions, Mg-ATP, Mg(2+). If any of the components, especially the PP's were omitted, no irreversible polymerization occurred. The detailed procedures for preparation of the non-degraded DAN subunit fractions, and of the phosphopeptides and components needed for repolymerization are described. Author (ESRO)

**N70-28898#** California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.

**DIFFERENTIAL EFFECT OF A CHRONIC DOSE OF GAMMA**

**IRRADIATION ON SHRUBS IN THE NORTHERN MOJAVE DESERT**

H. W. Kaaz, A. Wallace, and E. M. Romney [1969] 14 p refs

(Contract AT(04-1)-GEN-12)

(UCLA-12-761) Avail: CFSTI

A 33,600 curie Cs-137 gamma source, which was differentially shielded to increase the uniformity of the distribution of irradiation, was set up on a 15 meter tower in the center of a 9 hectare plot in the Rock Valley Area of the Northern Mojave Desert in January 1964. In the spring of 1969 the large majority of 5000 Ephedra nevadensis within the plot failed to produce flowers and very little vegetative growth occurred in contrast to a control plot and to other nonirradiated areas. The cumulative irradiation dose throughout the plot ranged from 3000 to 29,000 R. Irradiation effects on Lycium andersonii were uncertain and effects were doubtful on other species. Ephedra nevadensis and L andersonii have higher nuclear volume than do the other shrub species. Considerable resistance to gamma irradiation was observed for several of the other species present. Author (NSA)

**N70-28920#** Hamburg Univ. (West Germany). Inst. fuer Allgemeine Botanik.

**THE DISINTEGRATION OF n-DECANE AND THE ASSIMILATION OF n-ALKANES BY A MARINE BACTERIUM [DER ABBAU VON UNDECAN UND DIE ASSIMILATION VON N-ALKANEN DURCH EIN MARINES BAKTERIUM]**

Albrecht Killinger (Ph.D. Thesis) 1969 90 p refs In GERMAN

Avail: CFSTI

A marine bacterium which can oxidize n-alkanes, was isolated from North Sea water. The influence of the carbon chain length on the disintegration was investigated using n-decane as an example. By comparative analysis of the fatty acid sample after growth on several n-alkanes, the metabolic processes which can turn these substrates into useful carbon sources were investigated. ESRO

**N70-29049#** Colorado Univ., Denver. Medical Center.

**DIGITAL COMPUTER ANALYSIS AND DISPLAY OF THE RADIOISOTOPE SCAN Technical Progress Report**

1969 27 p refs

(Contract AT(11-1)-1472)

(COO-1472-27) Avail: CFSTI

A computer program for performing two dimensional fast Fourier transforms of radioisotope scans and carrying out the inversion of the transforms was developed. Methods of using these transforms to accomplish differential and band pass filtering of scans and to enhance scan resolution by deconvolution with a collimator response function are developed. Evaluation of the results of applying these procedures to scans of phantoms and patients' organs are evaluated. Methods developed for digital computer analyses and display of radioisotope scans are described. NSA

**N70-29071#** Joint Publications Research Service, Washington, D.C.

**ENVIRONMENTAL POLLUTION IN THE USSR**

30 Apr. 1970 9 p Transl. into ENGLISH from Russian Journals

(JPRS-50437) Avail: CFSTI

The planning action taken to reduce noise from automobiles and automobile garages is described. Concern is also voiced about air pollution. S.S.

**N70-29085#** Royal Aircraft Establishment, Farnborough (England) Engineering Physics Dept.

**AN ANTHROPOMETRIC SURVEY OF 200 RAF AND RN AIRCREW AND THE APPLICATION OF THE DATA TO**

**N70-29188**

**FARMENT SIZE ROLLS**

R. E. Simpson and C. B. Bolton 1970 93 p refs Supersedes  
RAE-TR-67125; ARC-30918  
(ARC-R/M-3612; RAE-TR-67125; ARC-30918) Copyright. Avail:  
CFSTI; HMSO: £ 2 8s; BIS \$8.65

An anthropometric survey of limited scope was undertaken in October and November 1966, involving 200 Royal Air Force and Royal Navy aircrew. The 44 measurements taken on each subject were mainly those used in the drafting of patterns for the RAF experimental range of aircrew functional garments. The acquired data was tabulated and presented in a form primarily suitable for functional clothing purposes. Tables and graphs are also included which give the data in a form suitable for use in aircrew work-space studies etc. Comparisons are made between specimen garment size-rolls for the 200 subjects based on the chest girth/torso hoop, chest girth/stature, and weight/stature as control parameters. Analysis of the data supports the recommendation that size-rolls for one-piece garments in which a good torso fit is essential should be based on two direct body measurements, such as chest girth and torso hoop, rather than include one or more indirect measurements like weight or stature in the control parameters. The data indicate that if one-piece garment torso fit is not important, it is better logistically to use chest girth/stature of weight/stature as controls for garment sizing. From the experience gained during this survey, suggestions are made regarding measuring techniques and procedures which should prove useful in a larger scale survey which is recommended. Author (ESRO)

**N70-29188#** Michigan State Univ., East Lansing. Dept. of Botany and Plant Pathology.

**PRIMARY PRODUCTIVITY, CHEMO-ORGANOTROPHY, AND NUTRITIONAL INTERACTIONS OF EPIPHYTIC ALGAE AND BACTERIA ON MACROPHYTES IN THE LITTORAL OF A LAKE, PART 2**

Harold LeRoy Allen (Ph.D. Thesis) 1969 201 p refs  
(Contract AT(11-1)-1599; Grants NSF BO-15665; NSF GB-6538)  
(COO-1599-25-Pt-2) Avail: CFSTI

Assessment of epiphytic algal and bacterial in situ community metabolism, and physiological-nutritional interrelationships of macrophyte-epiphyte systems, were investigated in the littoral zone of a small temperate lake from April 1968 through May 1969. Annual primary productivity, chemo-organotrophic utilization of dissolved organic compounds, and field and laboratory studies of macrophyte-epiphyte interactions were monitored by carbon-14 techniques. Qualitative and quantitative photosynthetic pigment composition, and a brief taxonomic examination of the sessile complex, accompanied measurement of field parameters. Productivity measurements of epiphytic algae on artificial substrata colonized in emergent and submergent macrophytic vegetation sites were compared over an annual period with pigment estimates of biomass. The results indicate biomass are not indicative of photosynthetic activity, except during periods of intense productivity. Author

## IAA ENTRIES

**A70-28379 #** Man-machine design for the Apollo navigation, guidance, and control system - Revisited - Apollo, a transition in the art of piloting a vehicle. J. L. Nevins. *International Federation of Automatic Control, Symposium on Automatic Control, 3rd, Toulouse, France, Mar. 2-6, 1970, Paper.* 50 p. 17 refs.

Outline of the anticipated progress of man-machine Apollo system designs toward ones requiring less human labor in piloting, supervision and control operations. It is visualized that the expected increases in component reliability and decreases in component size will result in flight system designs with a much higher flight control automation level. The subjects discussed specifically include man-machine communication and integration, the lunar landing phase, the man-machine interaction in spacecraft attitude control, and CMC and LGC programs. V.Z.

**A70-28386 #** On man-machine coupling concerning the control of a machine whose dynamics do not present damping factors. Raoult and Meziere (Compagnie des Compteurs, S.A., Montrouge, Hauts-de-Seine, France). *International Federation of Automatic Control, Symposium on Automatic Control, 3rd, Toulouse, France, Mar. 2-6, 1970, Paper.* 27 p. Research supported by the Direction des Recherches et Moyens d'Essais.

Study of the behavior of the man-machine system in a tracking task, when the machine develops a double pure integration which makes the task of the pilot difficult; it applies particularly to helicopters, certain ocean-going craft, and all those aircraft which utilize propellers directly driven by the man. The particularly interesting case was considered in which only a visual stimulus triggers the control feedback; the control system is direct. The results are plotted graphically and discussed. O.H.

**A70-28392 \* #** Simulation and error analysis of a manual rendezvous system. Alan M. Schneider and Howard Koble (California, University, La Jolla, Calif.). *International Federation of Automatic Control, Symposium on Automatic Control, 3rd, Toulouse, France, Mar. 2-6, 1970, Paper.* 30 p. 7 refs. Grant No. NGR-05-009-106.

Description of a system for navigation, guidance, and control of a spacecraft to rendezvous with an orbiting target, based entirely on observations by handheld, unpowered instruments, and with computations performed entirely by hand. The results of an interactive simulation of this system through a selected set of rendezvous missions are outlined, which demonstrate feasibility in the presence of realistic errors. The simulation is carried out by a trained operator working in conversational mode with a desk-size digital computer. It is shown that the manual rendezvous system is strongly convergent, so that the real penalty of errors is not failure to rendezvous, but using more fuel and time than would otherwise be necessary. F.R.L.

**A70-28394 #** The design of the control system spacecraft stabilisation with human operator. V. V. Solodovnikov, A. N. Dmitriev, V. V. Semenov, S. K. Arutunov, and E. S. Lobusov. *International Federation of Automatic Control, Symposium on Automatic Control, 3rd, Toulouse, France, Mar. 2-6, 1970, Paper.* 18 p. 7 refs.

Consideration of the active role of man in solving numerous space problems such as rendezvous, midcourse correction, landing, etc. All these operations include manual spacecraft stabilization.

Because of their great importance, analytical design is necessary. Attention is given to the dynamic and information research of human-operator features. The major reason for manual tracking is the necessity for constancy of information transmission rate. The correlation between random delay time and input provided an opportunity to obtain a stochastic dynamic model of the operator. F.R.L.

**A70-28526 #** Selection of astronaut cooling systems for extravehicular space missions. D. C. Howard and R. G. Syversen (United Aircraft Corp., Windsor Locks, Conn.). (*American Institute of Aeronautics and Astronautics, Thermophysics Conference, 4th, San Francisco, Calif., June 16-18, 1969, Paper 69-617.*) *Journal of Spacecraft and Rockets*, vol. 7, Apr. 1970, p. 498-501. 5 refs. (For abstract see issue 17, page 2914, Accession no. A69-33278)

**A70-28775 #** In-flight stress (Napriazhennost' v polete). V. L. Marishchuk, K. K. Platonov, and E. A. Pletnitskii. Moscow, Voenizdat, 1969. 119 p. 86 refs. In Russian.

The results of a study of the causes of in-flight stress and of methods of preventing and eliminating it are presented. The manifestations of stress under flight conditions and the physiological bases of such stress are considered. Methods of studying and predicting stress are described, as well as means of preventing and overcoming stress. Special physical training for overcoming stress is suggested, and a list of exercises for overcoming stress is presented. Methods of estimating the emotional stability of a flight crew are outlined. A.B.K.

**A70-28816** Transducers for bioimplantable telemetry systems. George D. Summers (Fairchild Hiller Corp., Germantown, Md.). *IEEE Transactions on Industrial Electronics and Control Instrumentation*, vol. IECI-17, Apr. 1970, p. 144-150.

Description of a candidate bioimplantable telemetry system and the requirements it imposes on transducer development. A related alternative system, possibly more suitable for self-use by nonhospitalized persons, is outlined. It is pointed out that there exists a hitherto largely unstated but urgent need for means of obtaining data from within the body, on a long term basis, without continuously or repeatedly penetrating the skin. With such a system, the health and lifespan of many people would be improved. The described candidate systems exist and there may be others of superior merit. M.M.

**A70-28833** Cardiac metabolic response to hyperbaric oxygen. Don H. Blount (Melpar, Inc., Falls Church, Va.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 133, Apr. 1970, p. 1129-1131. 11 refs. Research supported by the West Virginia Heart Association and Melpar, Inc.

Experimental investigation of the possibility that alterations in cardiac aerobic and anaerobic pathways may be produced when rats are subjected to hyperbaric pressures of oxygen for periods of time sufficient to produce evidence of central nervous system toxicity. Rats were exposed to 45 psig of oxygen until central nervous system toxicity was evident. Oxygen consumption, lactic acid production, and adenosine-5'-triphosphoric acid (ATP) concentration were studied in the heart tissue of these rats after their hyperbaric oxygen experience. Of these 3 parameters only the lactic acid production proved to be significantly different in the experimental animal. Heart homogenates from the exposed rats produced a greater amount of lactic acid than in control rats. M.M.

**A70-28834 \*** Hypothermia, radiation, and the immune response. Eunice Yin, J. M. McKenna, and X. J. Musacchia (Missouri, University, Columbia, Mo.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 133, Apr. 1970, p. 1207-1211. 22 refs.

## A70-28890

NSF Grant No. GB-8776; Grant No. NGR-26-004-021.

Observation of an adverse effect of hypothermia for 18 hr to the immune response in hamster sera up to 10 days after primary immunization with Influenza A virus vaccine. Hypothermia caused less inhibition to the secondary response than did radiation, while 2000 R completely destroyed the primary response of both active and hypothermic hamsters. Hypothermia under the conditions described did not afford any protection to the radiosensitivity of either the primary or the secondary immune response. The combination of hypothermia and radiation seemed to act synergistically in lowering the immune response. M.M.

**A70-28890 #** Changes in the phonocardiogram during experimental radiation disease (Izmeneniia fonokardiogrammy pri eksperimental'noi luchevoi bolezni). E. R. Sidorenko and A. A. Chevlytko (Minskii Meditsinskii Institut, Minsk, Belorussian SSR). *Akademii Nauk BSSR, Doklady*, vol. 14, Mar. 1970, p. 283-285. 7 refs. In Russian.

Study of phonocardiograms, EKGs, cardiac activity phases and Kunos-Garan mechano-electrical coefficient (1956) in 5 dogs prior to and after exposure to single X-ray doses of 600 r. Statistical data analysis indicates an increase in the strength of Q-to-I tones and in the duration of I and II tones, and a decrease in the tone amplitudes and in the mechano-electrical coefficient during the ensuing radiation disease. These changes reach a maximum on the 10th to 17th day after exposures. V.Z.

**A70-28998 \*** Some neurological species differences - A posteriori. William R. Mehler (NASA, Ames Research Center, Neurobiology Branch, Moffett Field, Calif.). *New York Academy of Sciences, Annals*, vol. 167, Oct. 24, 1969, p. 424-468. 158 refs. NASA-supported research.

Study of neurological differences in spinal projections of 4 Rhesus and 8 Cynomolgus monkeys, 4 opossums, 5 rats, one rabbit, 3 cats and 5 chimpanzees subjected to spinal cordotomies of various extents at cervical and thoracic levels. The human material used in comparison consisted of cervical, thoracic and medullary level cordotomies with postoperative survivals from 2 to 26 days. A selective silver impregnation technique developed by Nauta is used in the observations. An extensive discussion of the results is given. V.Z.

**A70-29112 #** The relationship between the predicted maximum oxygen uptake ( $V(O_2)_{max}$ ) and the age of subjects employed in various professions. S. Kozłowski, H. Kirschner, A. Kamiński, and R. Starnowski (Akademia Medyczna, Starachowice, Poland). (*Polskie Archiwum Medycyny Wewnętrznej*, vol. 42, no. 2, 1969.) *Polish Medical Journal*, vol. 8, no. 6, 1969, p. 1303-1311. 18 refs. Translation.

In 257 white-collar workers and workmen, aged 20-64, a gradual age-dependent decrease of the predicted maximum oxygen uptake was observed (determined by the indirect method of Astrand-Ryhming after previous verification of the applicability of this method in the studied population) independently of type of work performed by these subjects or light manual work or sedentary work. However, the efficiency of the oxygen transport system was statistically significantly higher in men performing physical work than in those doing light physical work or sedentary work independently of their age. The differences reached 20-30%. (Author)

**A70-29113 \*** Yields of *Hydrogenomonas eutropha* from growth on succinate and fumarate. Leonard Bongers (Martin Marietta Corp., Research Institute for Advanced Studies, Baltimore, Md.). *Journal of Bacteriology*, vol. 102, May 1970, p. 598, 599. 10 refs. Contract No. NAS 2-5651.

Molar growth yields were determined from chemostat cultures of *Hydrogenomonas eutropha* on succinate and on fumarate. The

yields from culture on succinate were about 12 g higher than on fumarate. Assuming this difference to be equivalent to 1 molecule of adenosine triphosphate, it is concluded that the oxidation by oxygen of the *Hydrogenomonas* cytochrome b yields 1 molecule of adenosine triphosphate. (Author)

**A70-29121** Accuracy of visual spatial interpolation. H. E. Guttman and B. H. Finley (Sandia Laboratories, Albuquerque, N. Mex.). *Ergonomics*, vol. 13, Mar. 1970, p. 243-246. 7 refs. AEC-supported research.

Investigation of the accuracy with which observers could estimate the location of a point within a rectangular area. The experiment is described, in which highly motivated subjects (a sample of military pilots) with normal to superior vision and with previous experience in map reading, were required to make two-dimensional interpolations to an accuracy of one-tenth of a grid dimension, which can be expressed as a scale interval of one-tenth. The results show that the subjects were able to report both coordinates to the nearest tenth of a cell dimension in approximately 88% of the cases; the number of errors exceeding one-tenth was negligible. It is concluded that with specialized training even greater accuracy might be achieved. O.H.

**A70-29241** Cardiovascular effects of paced respiration and selective attention. Hiram E. Fitzgerald and Stephen W. Porges (Michigan State University, East Lansing, Mich.). *Psychonomic Science*, vol. 19, Apr. 25, 1970, p. 65, 66. 14 refs. Research supported by the Michigan State University.

The effects of paced respiration (PR) and attentive observation (ATT) on heart rate (HR) and finger-pulse amplitude (FPA) were investigated in adult female Ss. Although HR responses to trial onset were task dependent, accelerating for Group PR and decelerating for Group ATT, temporally conditioned anticipatory HR deceleration was obtained across tasks. Across trials, HR decelerated and FPA dilated, indicating autonomic habituation to the experimental conditions. Methodological implications for paced respiration research and FPA analysis were discussed. (Author)

**A70-29242** EEG changes after 1, 4, and 7 days of sensory deprivation - A cross-sectional approach. John P. Zubek, Jean Mary Shephard, and S. L. Milstein (Manitoba, University, Winnipeg, Manitoba, Canada). *Psychonomic Science*, vol. 19, Apr. 25, 1970, p. 67, 68. 13 refs. Defence Research Board of Canada Grant No. 9425-08; National Research Council of Canada Grant No. APA-290.

Three groups of Ss, exposed to 1, 4, or 7 days of sensory deprivation (darkness and silence), all showed a significant post-isolation decrease in occipital alpha frequency. However, no indication of a progressive decrease in mean alpha frequency as a function of increasing duration of sensory deprivation was obtained, a finding contrary to that reported in several earlier studies employing a longitudinal approach. After each of the three durations, the magnitude of the post-isolation decrease was approximately 1 Hz. It was concluded that a different temporal pattern of EEG changes may occur, depending on whether a cross-sectional or longitudinal test procedure is employed, a finding of considerable importance for future research in the area of sensory and perceptual deprivation. (Author)

**A70-29296 #** Portable device for preflight medical examination of pilots (Portativnyi pribor dlia predpoletnogo meditsinskogo osmotra letchikov). A. N. Morozov and V. P. Sterlikov. *Voenna-Meditsinskii Zhurnal*, Mar. 1970, p. 69, 70. In Russian.

Description of a compact portable device for simultaneously recording systolic and diastolic arterial pressure, body temperature and pulse rates during preflight medical examination of flying personnel. The device uses a distal-perimetric oscillographic technique proposed by Kazar'ian (1965) for arterial pressure recording

from fluctuations of extremity perimeters. A transparent slide rule is used for reading the pulse rates from oscillograms. A zero-method servosystem is used at a frequency of 400 Hz for temperature measurements. V.Z.

**A70-29297 #** Some psychophysiological characteristics of pilot activity for various landing approach systems (Nekotorye psikhofiziologicheskie osobennosti deiatel'nosti letchikov pri razlichnykh sistemakh zakhoda na posadku). L. S. Isaakian. *Voenna-Meditsinskii Zhurnal*, Mar. 1970, p. 70-72. In Russian.

Preliminary results of a comparative analysis of pilot activity during various types of landing approaches with different instrumentation levels. It is pointed out that the usual SP-50 system of landing approach control is more complex in terms of the pilot's instrument reading activity than the 1M system and the still less demanding BSU-3P system. It is found that the average heart beat and respiration rates of pilots are markedly lower when the latter is used, while there is no safely recorded difference between these rates for the former two systems. Data concerning the distribution of the pilot's attention between individual instruments during landing approaches are also given. V.Z.

**A70-29298 #** A method for the objective determination of visual acuity (Metod ob'ektivnogo opredeleniia ostrot'y zreniia). M. S. Nikitin. *Voenna-Meditsinskii Zhurnal*, Mar. 1970, p. 73, 74. In Russian.

Description of a technique for determining the visual acuity with the aid of a tape rotating on a drum behind a screen with a window. Squares matching in size the characters on a Sivtsev-Golovin table are drawn on the tape in staggered rows. The readings of a nystagmograph during examinations are used for obtaining visual acuity ratings when the patient's vision follows the movements of staggered squares on the tape. V.Z.

**A70-29322 \*** Stereotaxic atlas of the infant rat hypothalamus. Thelma Valenstein, Barbara Case, and Elliot S. Valenstein (Fels Research Institute, Yellow Springs, Ohio). *Developmental Psychobiology*, vol. 2, no. 2, 1969, p. 75-80. 5 refs. NIH Grant No. M-4529; Grant No. NGL-36-005-001.

Description of an electrode placement ancillary technique for obtaining a stereotaxic atlas of the hypothalamus. The technique is applied to a group of 91 male and female albino Holzman strain rats 1, 7 and 14 days old. A stereotaxic atlas of the hypothalamus of rats is drawn on the basis of this experiment. V.Z.

**A70-29323** Investigations into the fluctuations of proprioceptive reflexes in man. I - Fluctuations of the patellar tendon reflex and their relation to the vegetative rhythms during spontaneous respiration. W. Schmidt-Vanderheyden, L. Heinich (München, Universität, Munich, West Germany), and H. P. Koepchen (Max-Planck-Institut für Psychiatrie, Munich, West Germany). *Pflügers Archiv*, vol. 317, no. 1, 1970, p. 56-71. 50 refs. Research supported by the Deutsche Forschungsgemeinschaft.

In relaxed humans in a sitting position the patellar tendon reflex was mechanically elicited repetitively with an interval of 0.6 sec. The electromyogram of the quadriceps muscle was recorded by surface electrodes. The respiratory movements of thorax and the ear plethysmogram were recorded simultaneously. The recordings were analyzed by automatic auto- and cross-correlation functions. The reflex amplitudes fluctuated either irregularly or with distinct coordinations with respiration and/or cardiovascular rhythms. In about 50% of the experiments there were coordinations between the fluctuations of reflex amplitudes and respiration. In most of these cases the fluctuations of reflex amplitudes were synchronous with respiration and/or with respiratory cardiovascular rhythms, and

showed inspiratory increase of the reflex amplitudes. Some time coordinations in integral numbers could be observed between the fluctuations of reflex amplitudes and respiration ('relative coordination'). In the case of a periodic respiration the same superimposed period could be demonstrated in the reflex fluctuations. In some rare cases a coordination between cardiovascular and reflex fluctuations without any relation to respiration was found. The central nervous mechanism of the somato-vegetative interrelations are discussed.

(Author)

**A70-29324** Investigations into the fluctuations of proprioceptive reflexes in man. II - Fluctuations of the patellar tendon reflex and their relation to vegetative rhythms during controlled respiration. W. Schmidt-Vanderheyden (München, Universität, Munich, West Germany) and H. P. Koepchen (Max-Planck-Institut für Psychiatrie, Munich, West Germany). *Pflügers Archiv*, vol. 317, no. 1, 1970, p. 72-83. 22 refs. Research supported by the Deutsche Forschungsgemeinschaft.

During controlled, defined respiratory cycles and periods of voluntary apnea in healthy young men in a sitting position the patellar tendon reflex was mechanically elicited continually. During voluntary apnea a persistence of regular reflex fluctuations was observed which had about the same frequency of the previous spontaneous respiration. An exact coordination or a correlation in integral numbers could be demonstrated between reflex-fluctuations and a controlled respiration in intervals of 2.5-12 sec. When such a coordination had occurred and an apnea was interposed, the reflex-fluctuations took a frequency of about 12/min like that of the previous spontaneous respiration independently of the frequency of the preceding controlled respiration. In the range of frequencies from the respiratory frequency to half that value a synchronization between respiration and reflex fluctuations ensued immediately. During a controlled respiration with an interval between the spontaneous respiratory interval and double that interval, it took a longer time until an exact coordination of reflex fluctuations and respiration appeared. In addition, during apnea and extremely slow respiration coordinations of the tested parameters in a 1:2 or 1:3 ratio occurred. In comparison with earlier results of animal experiments conclusions are drawn concerning the possible site of the observed somato-vegetative coordinations. (Author)

**A70-29325** Is there a nitrogen elimination by the human lung (Gibt es eine Stickstoffabgabe über die menschliche Lunge). K. Muysers (Bonn, Universität, Bonn, West Germany). *Pflügers Archiv*, vol. 317, no. 2, 1970, p. 157-172. 7 refs. In German.

Investigation of the possible respiratory elimination of nitrogen by the human lung. To examine this problem, analyses of expired air by mass spectrometry and volume displacement in closed systems were performed. The results obtained are tabulated and discussed. They suggest that nitrogen is eliminated by the human lung; the observed elimination ranges between 1.5 and 9.1 ml/min at rest, and up to 30.0 ml/min during exercise. O.H.

**A70-29326 #** Dynamics of changes in the marrow granulocyte reserve of animals exposed to chronic gamma radiation (Dinamika izmeneniia granulotsitarnogo rezerva kostnogo mozga zhivotnykh, podvergnutykh khronicheskomo gamma-oblucheniui). E. S. Zubenkova and B. A. Markelov. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 3-6. 6 refs. In Russian.

Study of variations in the marrow granulocyte reserve of 55 dogs exposed to 25 to 225 rem/year doses of gamma radiation over a period of 1.5 year, with or without intramuscular injections of a pyrogenic agent. A certain depression of leukopoiesis established between the 6 and 14th months of the experiment in dogs exposed to 225 rem/year radiation doses was followed by a gradual resoration of the marrow granulocyte reserve. As a result, the leukocyte reaction of the dogs to the pyrogenic agent was normalized by the 16-18th months of the experiment. V.Z.

**A70-29328 #** Cultivation of plants in closed biological cycles with the use of keramsit (Kul'tivirovanie rastenii v sistemakh zamknutogo krugovarota veshchestv s ispol'zovaniem keramzita). I. V. Tsvetkova, V. P. Zamota, and E. V. Maksimova. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 11-15. 11 refs. In Russian.

Description of experiments in plant growing by the hydroponic method using a porous alumoferrisilicate as the solid substrate. It is found that substantial changes occur in the chemical composition of this material after it has been used four times repeatedly in biological cycles. It is further found that it undergoes a decomposition involving the separation of elements including aluminum into the nutrient solution when it is used repeatedly for a long period of time. This reduces the yield of the plants and changes adversely the chemical composition of their green mass. V.Z.

**A70-29329 #** Activity of certain blood serum enzymes in rats during a prolonged hypokinesia (Aktivnost' nekotorykh fermentov syvorotki krovi u krysv pri dlitel'noi obezdvizhennosti). E. E. Simonov and I. V. Fedorov. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 16-18. 18 refs. In Russian.

Study of the activity of glutamate asparagin and glutamate alanine aminotransferases, ketoso-l-phosphate aldose, lactate dihydrogenase, and nonspecific choline esterase in the blood serum of a group of 39 white rats subjected for 1, 15 and 60 days of hypokinesia. The activity of all these enzymes was higher in experimental rats than in control rats during the early stage of hypokinesia and continued to increase (aminotransferases) or decreased (the rest of enzymes) during the later stage of the experiment. Theories are proposed to explain these observations. V.Z.

**A70-29330 #** Thermostability of white mice in an ambient medium with different rates of temperature variations (Termoustoichivost' belykh myshei pri razlichnykh skorostiakh izmeneniia temperatury vneshnei sredy). I. P. Shcherbachev. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 18-22. In Russian.

Study of survival rates in a group of 309 white mice exposed to upward and downward temperature variations from room temperature at rates from 0.01 to 3 deg/min at 40-70% humidity. The dependence of the rectal temperature on ambient temperature variations is also investigated in these mice. Statistical analysis of the observations indicates that the mice die in a shorter time at higher (or lower) body and ambient temperatures when the rates of the temperature increase (or decrease) are higher. V.Z.

**A70-29331 #** Theoretical and experimental problems in the study of the mechanisms of the vestibular nystagmus (O teoreticheskikh i eksperimental'nykh problemakh issledovaniia mekhanizmov vestibuliarnogo nistagma). A. N. Razumeev, V. G. Sragovich, B. G. Sushkov, and A. A. Shipov. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 22-30. 41 refs. In Russian.

Review of published studies concerning the mechanisms of the vestibular nystagmus. A mathematical model of the interaction between the vestibular and oculomotor apparatuses is proposed as the basis of a possible mechanism of the development of a vestibular nystagmus. The anatomical and physiological correlations between the components of this model during the processing of afferent information are discussed. Experiments designed to bring this model closer to the cerebral structures responsible for the nystagmus are described. V.Z.

**A70-29332 #** Problem of human tolerance under thermal stresses (K probleme perenosimosti chelovekom teplovoi nagruzki). S. M. Gorodinskii, G. V. Bavro, and E. I. Kuznets. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 30-34. 7 refs. In Russian.

Discussion of the value of various physiological indices as criteria of the thermal stress tolerance of man. Rectal temperature is found to be an insufficiently informative criterion of thermal stress tolerance. A closer relation is established between tolerance and the thermal condition of the body surface. It is also shown that the mean temperature of the body is a useful criterion and that the tolerance can be varied substantially by localized cooling of portions of the body. V.Z.

**A70-29333 #** Calculation of the minimum ventilation volume requirement for special insulating equipment (K voprosu o raschete minimal'no neobkhodimogo ob'ema ventilatsii izoliruiushchego spetssnariazheniia). V. V. Selivanov. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 34-38. In Russian.

Description of a procedure for calculating the minimum ventilation volume requirement of a space suit for various levels of individual space-suit-air pollutants and their mixtures. Formulas are derived for determining this requirement for various intensities and locations of gas discharges from the body. V.Z.

**A70-29334 #** Problem of normalizing high intensity noises (K probleme normirovaniia shumov bol'shoi intensivnosti). E. M. Iuganov, Iu. V. Krylov, and V. S. Kuznetsov. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 38-41. 19 refs. In Russian.

Study of the effects of 500 Hz 114-116 and 125-126 db noise on the auditory thresholds, blood pressure and the time of response to light stimuli in a group of 64 male subjects, covering a total of 152 tests. Unfavorable effects of 125-126 db noise on the cardiovascular system and auditory and visual analysors are established. Noise levels of 114-116 db are accepted as permissible during the active phases of space flights. V.Z.

**A70-29335 #** Some specific characteristics of human energy consumption during the simulation of modified gravitation (Nekotorye osobennosti energotrat cheloveka pri modelirovanii izmenennoi gravitatsii). A. V. Eremin, V. I. Stepantsov, V. I. Sokolov, and M. A. Tikhonov. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 41-45. 7 refs. In Russian.

Study of the energy consumption in 4 male subjects during the walking at 4-4.5 km/h and running at 9-9.5 km/h on a 'running lane' with controlled motion. The force of gravity was modified during the experiments by rubber shock absorbers attached to a girdle on the subject and pulling him down to the plane of the lane, or by changing his position with respect to the force of gravity vector on a special 'pseudogravitation' stand. It is found that walking and running require more energy in a supine position than in a vertical position even when the loads along the horizontal axis of the body are equal. V.Z.

**A70-29336 #** Possibilities of using clinical data as a basis for permissible radiation exposures under conditions of prolonged space flights (Vozmozhnosti ispol'zovaniia klinicheskikh dannnykh dlia obosnovaniia dopustimykh luchevykh nagruzok v usloviakh dlitel'nykh kosmicheskikh poletov). A. K. Gus'kova. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 46-49. 7 refs. In Russian.

Review of available clinical observations of the effects of systematic professional exposures to radiation in an attempt to estimate the permissible levels of radiation exposures during prolonged space flights. Radiation exposure levels producing clinical syndromes during various manifestations of the radiation disease are discussed. Suggestions are given for further clinical studies to collect more data on the development of chronic radiation damages as criteria for the establishment of permissible radiation exposure levels during space flights. V.Z.

**A70-29337 #** Mental working capacity of the subjects during the period of aftereffects of accelerations up to 5g. (Umstvennaia rabotosposobnost' ispytuemykh v period posledestviia uskoreniia do 5 g.). A. L. Narinskaia. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 49-52. 6 refs. In Russian.

Centrifuge simulation study of the attention shift and stability, the operational memory shifts, the development and shifts of routine mental habits, the memory productivity and the sensomotor reactions in a group of 30 fighter pilots prior to and after exposure to stepwise 30-second accelerations from 3 to 5g for a total acceleration time of up to 1 min 20 sec. Accelerations impaired performance by 50% in more than half of the subjects. The mental routine of the subjects was affected the hardest. V.Z.

**A70-29338 #** Possible specific features of the progress of the principal stomatologic diseases during the simulation of certain conditions of prolonged space flights (Vozmozhnye osobennosti techeniia osnovnykh stomatologicheskikh zabolevanii pri modelirovaniu nekotorykh uslovii dlitel'nykh kosmicheskikh poletov). T. V. Nikitina. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 53-56. 11 refs. In Russian.

Evaluation of available Soviet and American simulated medical test data concerning possible stomatologic disorders which may afflict crew members during prolonged space flights. Some specific stomatologic conditions whose development under prolonged extremal loads should be anticipated are discussed briefly. These include gingivitis, stomatitis, dental caries, parodontitis and odontogenous inflammations. V.Z.

**A70-29340 #** Study of the working capacity of an operator under conditions of a prolonged bed rest (K voprosu rabotosposobnosti operatora v usloviakh dlitel'nogo postel'nogo soderzhaniiia). E. S. Zav'ialov, S. G. Mel'nik, G. Ia. Chugunov, and A. A. Vorona. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 61-65. 9 refs. In Russian.

Investigation of the effects of hypokinesia on the working capacity of 6 subjects who performed various manual aircraft control assignments during a 100 day period of bed rest, with or without physical exercises on a special stand. The negative effects of hypokinesia on the performance of the subjects are noted. Routine control operations requiring instrument dial scanning and well-coordinated precision motions were affected the most. V.Z.

**A70-29341 #** Ultraviolet fluorescence of biological objects exposed to ionizing radiation effects (Ul'trafioletovaia fluorestsentsiia biologicheskikh ob'ektov, podvergnutykh deistviu ioniziruiushchei radiatsii). S. N. Aleksandrov, I. E. Brumberg, I. E. Vorobtsova, T. M. Kondrat'eva, V. G. Safronova, and A. S. Iagunov. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 66-72. 26 refs. In Russian.

Experimental study of the hereditary UV luminescence of cancerous cells of mice and lymphosarcomatous cells of rats transplanted to nonirradiated animals after exposure to a 500 r dose of ionizing radiation. It is found that the daughter cells produced by such transplanted cells retained the fluorescent properties of their parent cells and passed on these properties to their offspring during the multiplication in nonirradiated organisms. The hereditary transmission of radiation-induced changes in the myelocytes, metamyelocytes and segmental-nucleus neutrophils of irradiated rats is also demonstrated. The various types of radiation damage leading to the intensification of UV fluorescence in irradiated cells are discussed. V.Z.

**A70-29342 #** EEG characteristics in pilots. I (O kharaktere EEG u letchikov. I). A. N. Litsov, V. V. Nistratov, and V. G. Terent'ev. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 73, 74. In Russian.

Results of an analysis of a total of more than 1200 EEGs of pilots recorded in a quiet reclined position with closed eyes. High and medium alpha-rhythm activities are established in 77.7% of tests. The distribution of the subjects according to alpha-wave amplitude is moderately asymmetrical with a maximum amplitude between 70 and 90 microvolt. It is concluded that the alpha- and beta-rhythms prevail in most healthy pilots. V.Z.

**A70-29343 #** Effect of variations in the daily human vital activity rhythm on the dynamics of electrolyte excretion (Vliianie izmeneniia sutochnogo ritma zhiznedeiatel'nosti cheloveka na dinamiku ekskretsii elektrolitov). V. P. Krotov and L. A. Lugovoi. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 74-77. 7 refs. In Russian.

Study of the dynamics of daily electrolyte excretion during 45 day experiments on 2 subjects whose daily working time was varied and work-and-rest schedule was shifted by 12 hr during the experiments. Flame photometry was used for determining the Na, K and Ca contents in the urine of the subjects every 4 hr. The adaptation of daily urine discharges and Na, K and Ca excretion to the shifts in the daily work-and-rest routine is discussed. Disagreement between the results of this study and the results of Scharp (1960) is noted. V.Z.

**A70-29344 #** Effect of some pharmacological substances on the stability of animals under certain extremal loads (Vliianie nekotorykh farmakologicheskikh veshchestv na ustoiichivost' zhivotnykh k nekotorym ekstremal'nym nagruzkam). V. E. Belai, P. V. Vasil'ev, and G. D. Glod. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 77-79. In Russian.

Study of the effects of phenamine, sidnocarb, strychnine, securinine, araleside, trioxazine, banactisine and chlordiazepoxide injections on the resistance of 1684 white mice and 116 white rats to g-accelerations and to acute hypoxia at atmospheric pressures corresponding to altitudes of 10.5-11 km. The floating capability of experimental animals with attached weights was used as a criterion of their physical condition in some of the experiments. The diverse effects of these injections on the resistance of mice and rats to different stresses are indicated. Thus, the acceleration and hypoxia resistance of experimental animals were increased substantially but their physical condition was weakened after chlordiazepoxide injections. V.Z.

**A70-29345 #** Effect of the somatotropic hormone and esculamine on the survival of rats under acceleration (Vliianie somatotropnogo gormona i eskulamina na vyzhivaemost' krysa pri vozdeistvii uskoreniia). V. G. Ovechkin and G. V. Tumanov. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 80. In Russian.

Brief description of an experiment in which somatotropic hormone injections were given to male and female rats subjected then to accelerations of up to 20g for 1.5 to 3 hr. The survival rates increased in male rats and decreased in female rats after injections of human or porcine somatotropic hormones. These effects were less pronounced after injections of the bovine hormone. Similar observations were made after injections of esculamine. V.Z.

**A70-29346 #** Change in the total protein and protein fraction contents of the blood serum of rats under highland conditions (Izmenenie soderzhaniiia obshchego belka i belkovykh fraktsii v syvorotke krovi krysa v usloviakh vysokogor'ia). T. M. Tukhtae and S. I. Pauk. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 81, 82. In Russian.

Study of the dynamics of total protein content and protein composition in the blood serum of 80 rats kept at a natural altitude of 3600 m for 1 to 15 days before decapitation. A decrease in total

protein content, largely due to the decreases in albumin and alpha and beta globulin fractions, was observed by the 7th day of the experiment, followed by a partially recovery after the 10th day, which was still incomplete at the end of experiment. V.Z.

**A70-29347 # Electrolyte composition of the cerebrospinal fluid and cerebral blood of rabbits after exposure to accelerations (Elektrolitnyi sostav spinnomozgovoi zhidkosti i tserebral'noi krovi u krolivkov posle vozdeistviia uskorenii).** A. G. Kuzovkov and I. D. Kudrin. *Kosmicheskaiia Biologiia i Meditsina*, vol. 4, Jan.-Feb. 1970, p. 82-84. 7 refs. In Russian.

Determination of Na, K and pH in the cerebrospinal fluid and cerebral blood of 16 rabbits exposed to a single sequence of 5 30-sec 5g accelerations at intervals of 1.5 min, or to the same acceleration sequences repeated 5 times over a period of 5-7 days. Higher contents of K are established in these tissues of experimental rabbits exposed to accelerations, especially to repeated acceleration sequences. V.Z.

**A70-29351 # Functional properties of the surface membranes of excitable cells, and metabolism (Funktsional'ni vlastivosti poverkhnevikh membran zbudlivikh klitin i metabolism).** P. G. Kostyuk (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 16, Feb.-Apr. 1970, p. 155-160. 17 refs. In Ukrainian.

Consideration of the functional properties of the surface membranes of excitable animal cells in the light of published studies. Evidence is indicated for the existence of two independent mechanisms of ion transport through biological membranes - a 'passive' mechanism due to the electrochemical gradients present in the membranes and an 'active' mechanism using the energy of metabolic processes occurring in the cells. Experiments on giant mollusk neurons are quoted to demonstrate that both ion transport mechanisms participate in maintaining a constant state of membrane polarization. The possibility of chemical activation of the active ion transport mechanism by synaptic mediators is discussed. V.Z.

**A70-29352 # Neurochemical mechanisms of the functional activity of limbico-reticular formations (Pro neirokhimichni mekhanizmi funktsional'noi aktivnosti limbiko-retikuliniarnikh utvoren').** F. P. Vediaev (Kharkivs'kii Medichnii Institut, Kharkov, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 16, Feb.-Apr. 1970, p. 172-181. 23 refs. In Ukrainian.

Discussion of the role of serotonin, adrenalin and choline mediator mechanisms in the functional activity of various structures of the reticular and limbic systems of the brain. Vegetative cardiovascular reactions, motor reactions and electrophysiological reactions in response to the electrical stimulation of the limbic and reticular formations of the cerebrum are studied against a background of adrenalin and aminazine injections. The importance of neurochemical mechanisms in the functional activity of these formations is pointed out. V.Z.

**A70-29353 # Hypothalamus and the vegetative nervous system (Gipotalamus i vegetativna nervova sistema).** O. F. Makarchenko and G. D. Dinaburg (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 16, Feb.-Apr. 1970, p. 182-189. 18 refs. In Ukrainian.

Investigation of reactions of the vegetative nervous system of a group of patients with a diencephalic syndrome. It is found that the tonus of the hypothalamo-hypophysial-adrenal system and other neuroendocrine systems control the tonus of the sympathetic and parasympathetic nervous systems. Two vegetative vascular diencephalic syndromes - hypertonic and hypotonic - are identified as a result. The mechanisms of vegetative functional disorders during these syndromes are discussed. V.Z.

**A70-29354 # Participation of the hypothalamus in blood and lymph composition and circulation control (Uchast' gipotalamusa v reguliatsii skladu i tsirkulatsii krovi ta limfi).** P. D. Kharchenko, V. P. Glagolev, V. O. Tsibenko, L. M. Ponomarenko, and L. O. Smirnova (Kiivs'kii Derzhavnii Universitet, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 16, Feb.-Apr. 1970, p. 190-196. 28 refs. In Ukrainian.

Investigation of the effect of electrical stimulation of the hypothalamus on the regional blood circulation, the lymph circulation and composition, the physicochemical properties of the blood, and the blood acetylcholine content of a group of 135 dogs. It is found that complex interrelated reactions of various systems, rather than isolated responses of individual organs, are produced in these dogs by stimulation of the hypothalamus. V.Z.

**A70-29355 # Mountains and red blood (Gori i chervona krov).** M. M. Sirotnin (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). (*Gory i Sistema Krasnoi Krovi, Simpozium, Frunze, USSR, June 9, 1969.*) *Fiziologichnii Zhurnal*, vol. 16, Feb.-Apr. 1970, p. 205-210. 29 refs. In Ukrainian.

Review of the results of studies of the effect of mountain climbing and prolonged stays in the mountain on the composition of red blood. Observations of changes in the red blood of members of an expedition which made a several-phase gradual scaling of the Elbrus in 1967 are discussed. A fairly well pronounced inverse correlation between the contents of erythrocytes and autoantibodies in the red blood of expedition members during the ascent is indicated. An increase in fractions A2 and A3 and in hemoglobin F content is also noted. V.Z.

**A70-29356 # Reflex cardiogenic mechanisms of vascular tonus regulation (Pro reflektorni kardiogeni mekhanizmi reguliatsii sudinnogo tonusu).** M. M. Gorev and O. O. Moibenko (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 16, Feb.-Apr. 1970, p. 228-236. 55 refs. In Ukrainian.

Description of experiments in which separate greater circulation and coronary circulation perfusions were performed in dogs by artificial blood circulation techniques. The experiments indicated that the left ventricle zone was the principal reflexogenic zone of the heart, participating in greater-circulation vessel tonus control. The functional nonuniformity of the receptor field of the heart in terms of vascular tonus control is noted. V.Z.

**A70-29357 # Afferent intercentral connections in the cerebellum (Pro aferentni mizhtsentral'ni zv'iazki mozochka).** N. V. Bratus' and G. V. Ianchik (Vinnits'kii Medichnii Institut, Vinnitsa, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 16, Feb.-Apr. 1970, p. 257-264. 32 refs. In Ukrainian.

Analysis of the evoked cerebellar activity during the stimulation of the spinal cord, the hypothalamus posterior and red nuclei in thiopental-anesthetized cats. It is concluded that the presence of cerebellar intercentral connections has a distinct effect only on the time characteristics of evoked potentials. V.Z.

**A70-29432 Origin significance and amelioration of coriolis illusions from the semicircular canals - A non-mathematical appraisal.** G. Melvill Jones (Defence Research Board, Ottawa; McGill University, Montreal, Canada). (*International Congress of Aerospace Medicine, 18th, Amsterdam, Netherlands, Sept. 15-18, 1969.*) *Aerospace Medicine*, vol. 41, May 1970, p. 483-490. 21 refs.

The physical origin of so-called coriolis illusions deriving from semicircular canal stimulation is examined in the functional context of the aerospace environment. It is shown that in the whole-vestibulo-postural system it is not enough to calculate mechanical cross-coupling effects in the end-organ. Effects such as optokinetic



fixation, the direction of prevailing gravitational field, vestibular adaptation and habituation may substantially modify reflex and perceptual responses to the sensory message received in the brain stem. Experimental evidence indicates that reflex vestibular stabilization of the head probably acts to minimize cross-coupling effects in man's natural life, and this suggests ways of ameliorating these effects in flight. (Author)

**A70-29433 \*** **Prevention of bedrest induced orthostatism by 9-alpha-fluorohydrocortisone.** Byron J. Bohann, Kenneth H. Hyatt, Leonid G. Kamenetsky, Burton E. Calder, and William M. Smith (U.S. Public Health Service Hospital, San Francisco, Calif.). *Aerospace Medicine*, vol. 41, May 1970, p. 495-499. 31 refs. NASA Contract No. T-28565(G).

Eight healthy volunteers were evaluated during two 10-day bedrest periods and two 10-day ambulant periods. Studies were metabolically controlled. Subjects received 0.4 mgm. of 9-alpha-fluorohydrocortisone daily during one bedrest period and an identical placebo during the other. At the end of drug bedrest mean plasma volume was 348 ml. greater than at the end of placebo bedrest. This greater plasma volume resulted in heart rate responses to tilt and exercise and heart rate recoveries from exercise which were similar to pre-recumbency responses. These results suggest that there is a relationship between plasma volume decrease during bedrest and the alterations in cardiovascular response to gravitational stimuli and exercise seen following bedrest. (Author)

**A70-29434 \*** **Summary of medical experience in the Apollo 7 through 11 manned spaceflights.** Charles A. Berry (NASA, Manned Spacecraft Center, Houston, Tex.). (*International Congress of Aerospace Medicine, 18th, Amsterdam, Netherlands, Sept. 15-18, 1969, Paper.*) *Aerospace Medicine*, vol. 41, May 1970, p. 500-519. 12 refs. (For abstract see issue 02, page 239, Accession no. A70-12669)

**A70-29435 #** **Evidence for increased renal tubule sodium reabsorption in the dog during hypoxia.** George J. Kaloyanides, Joseph D. Cohn, and Philip Raskin (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Aerospace Medicine*, vol. 41, May 1970, p. 520-524. 14 refs.

The effect of systemic hypoxia on renal tubule sodium reabsorption was examined in anesthetized mongrel dogs. Ventilation was controlled with a constant volume respirator to maintain a constant blood pH and pCO<sub>2</sub>. Renal blood flow as determined by the extraction of PAH and glomerular filtration rate as determined by inulin clearance did not change during hypoxia. In the face of a constant filtered sodium load, sodium excretion was observed to decrease significantly indicating an absolute increase in the rate of sodium reabsorption. It is suggested that the increase in sodium reabsorption occurred distal to the ascending limb of Henle's loop. The increase in sodium reabsorption could not be related to changes in perfusion pressure or redistribution of renal blood flow. The possibility of a humoral mechanism being involved is discussed. (Author)

**A70-29436 \*** **Follow-up on mice exposed to 1.08 ats of oxygen in nitrogen for a substantial portion of lifespan.** Harry Sobel (Veterans Administration Hospital, Sepulveda; California, University, Los Angeles, Calif.). *Aerospace Medicine*, vol. 41, May 1970, p. 524, 525. 9 refs. NSF Grant No. GB-662; Grant No. NGR-05-007-113; Contract No. N 00014-67-A-0008.

Male mice were exposed to 24 cycles each consisting of compression at 45 lbs/sq in. in an air-oxygen mixture containing 27% oxygen for 72 hours followed by 4 days of recovery. The compression cycles were discontinued and the mice were observed for 250-390 days following the completion of the last exposure. There was no obvious adverse effect on mortality, growth, and

nitrogen content as compared with the controls. Nor were there differences in the contents of hyaluronic acid and collagen in the skin, such changes being anticipated if aging had been accelerated, nor was there any difference in the contents of hyaluronic acid and collagen in the skin, such changes being anticipated if aging had been accelerated, nor was there any difference in the fluorescence of the collagen. (Author)

**A70-29437 \*** **Effect of orbital flight on the duration of the cardiac cycle and of its phases.** Carlos Vallbona (Baylor University, Houston, Tex.), Lawrence F. Dietlein, and William V. Judy (NASA, Manned Spacecraft Center, Houston, Tex.). *Aerospace Medicine*, vol. 41, May 1970, p. 529-537. 26 refs. Contract No. NAS 9-6162.

Simultaneous electrocardiographic and phonocardiographic records were obtained from both crew members during the flights of Gemini IV and V and on the pilot of Gemini VII. Analysis of the data recorded during flight reveals: (1) wide fluctuations of the duration of the cardiac cycle within physiological limits throughout the mission; (2) fluctuations in the duration of the electromechanical systole that correlated with the changes in heart rate; (3) stable values of the electromechanical delay; (4) considerable shortening of the duration of the cardiac cycle (i.e., increase in heart rate), of the electromechanical systole and, to a lesser extent, of the electromechanical delay at lift-off, at reentry and for the few hours that preceded re-entry. It is likely that the shortening of the cardiac cycle and of its phases occurred in response to positive chronotropic and inotropic influences (adrenergic reaction) that were observed in all the astronauts who participated in this experiment. (Author)

**A70-29438** **Force input and thoraco-abdominal strain resulting from sinusoidal motion imposed on the human body.** K. O. Lange and R. G. Edwards (Kentucky, University, Lexington, Ky.). *Aerospace Medicine*, vol. 41, May 1970, p. 538-543. 16 refs. Contract No. AF 33(616)-7766.

Human subjects were exposed to sinusoidal inputs of an electrohydraulic shake-table over the range of 2 to 14 Hz, successively at 0.2, 0.3, 0.4 and 0.5 g acceleration amplitude. The subjects were in the supine attitude, first relaxed, then by contracting all voluntary muscles, tensed. The force at the interface of shaketable and subject and circumferential deformation of the torso were measured. A principal body resonance occurs between 5 and 7.5 Hz. At frequencies below about 8 Hz the transmitted force exceeds that which a pure mass would absorb; above 8 Hz it diminishes rapidly. It always increases with increasing shake-table amplitude in a fashion which might be considered linear as a first approximation. Maximum body strain occurs at, or somewhat above, the resonant frequency and it too increases systematically with increasing shaking intensity. Near the resonant frequency, the force input increases by some 50% when the muscles are tightened, but the torso deformation decreases by as much as 75%. On the other hand, at frequencies above 12 Hz the force input to the tense subject decreases as much as 35% from that which is imposed on the relaxed subject while little or no difference of strain in the thoraco-abdominal region is noted. (Author)

**A70-29439 #** **Responses of USAF undergraduate pilot trainees to indoctrination in the spatial orientation trainer.** P. J. Dowd, R. L. Cramer, J. W. Wolfe, and S. H. McKean, III (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine*, vol. 41, May 1970, p. 544-549.

Twenty-two students from the Air Force Undergraduate flying Training Program 'flew' a prototype spatial orientation trainer to the solution of different orientation problems. In subsequent interviews, all but one recommended incorporation of orientation training in their program. The lone dissenter had not yet begun instrument flight training. (Author)

## A70-29440

**A70-29440** Medical wastage of military and civil aircrew in Great Britain 1963-68. G. Bennett (Board of Trade, London, England) and P. J. O'Connor (RAF, London, England). *Aerospace Medicine*, vol. 41, May 1970, p. 550-552.

This paper compares the medical wastage of trained professional aviators in military and civil flying in Great Britain for the years 1963-68. It concerns flight deck personnel who are prevented from revalidating their flying license by reason of ill health or death. The Board of Trade which issues flying licenses to all civilian air crews gave the civil medical wastage, and the statistics branch of the Royal Air Force gave details concerning military air crew. The data show that cardiovascular disease, flying accidents and psychiatric illness are the chief causes of medical wastage of air crew. In civil aviation cardiovascular disease (90% due to coronary artery disease) is the chief cause of wastage, while in military flying, flying accidents and psychiatric wastage are expectedly higher. (Author)

**A70-29441** Physiological and psychological factors in 'The dark night takeoff accident.' L. E. Buley and J. Spelina (International Civil Aviation Organization, Montreal, Canada). (*Aerospace Medical Association, Annual Scientific Meeting, 40th, San Francisco, Calif., May 5-8, 1969.*) *Aerospace Medicine*, vol. 41, May 1970, p. 553-556. 11 refs.

Discussion of twelve accidents covering the period from 1950 to 1965, in which pilot disorientation of the dark night takeoff accident type appears to have played a primary or contributory role. Two recent accidents which present a similar pattern are also cited. The calculated flight paths and sequential accelerations for an accident in 1954 and for the two recent accidents are presented, and illusory angular displacements of the vertical are derived for climb and descent phases. Factors thought to contribute to pilots' susceptibility to illusion are considered, and the need for an integrated multi-level prevention program is stressed. M.M.

**A70-29442** Effect of gravity on positional alcohol nystagmus (PAN). W. J. Oosterveld (Amsterdam, Universiteit, Amsterdam, Netherlands). *Aerospace Medicine*, vol. 41, May 1970, p. 557-560. 29 refs.

Experiments were performed in order to evaluate the effect of gravity on positional alcohol nystagmus (PAN) in man and in rabbits. Weightlessness, evoked in a parabolic flight, abolished PAN I as well as PAN II. Higher g-values increased the speed of the slow component of PAN. In the period when PAN had disappeared higher g-values were able to provoke alcohol nystagmus up to 48 hours after the intake of alcohol. Weightlessness during a few seconds abolished this nystagmus for a period of several minutes. The threshold value to provoke PAN seems to increase in the weightless state. Increasing gravity lowers the threshold for provoking PAN. (Author)

**A70-29443** Effect of oxygen on night vision. H. A. Pretorius (Military Medical Institute, Voortekkerhogte, Republic of South Africa). *Aerospace Medicine*, vol. 41, May 1970, p. 560-562. 6 refs.

The rods of the retina are the receptors responsible for night vision. This function is highly sensitive to oxygen deficiency. A deterioration in night vision is perceptible with even a minimal decrease in the partial pressure of atmospheric oxygen. A group of 100 young men (average age 19.5 years) were tested on a Goldmann-Weekers Adaptometer. Threshold curves of dark adaptation, with and without the administration of oxygen, were obtained at a height of 5,000 feet above sea level. Following the administration of oxygen an average improvement in night vision of 25.9% was found. (Author)

**A70-29444** Study of pilots who have made multiple ejections. S. O. Smelsey (USAF, Directorate of Aerospace Safety, Norton AFB, Calif.). *Aerospace Medicine*, vol. 41, May 1970, p. 563-566.

Through 31 December 1968 there were 116 individuals who made two or more emergency noncombat ejections from USAF aircraft. The circumstances surrounding both ejections for each individual were reviewed and analyzed. The author came to the following conclusions. Overall success rates are better on the second ejection. Receipt of an injury on the first ejection lead to a higher success rate on subsequent ejections. Thirty-five individuals in this category had a success rate on the second ejection of 97.1%. Individuals who did not receive an injury (84) had a subsequent success rate of 83.3%. In the cases reported, receipt of a vertebral fracture on the first ejection did not predispose an ejectee to additive injury on a subsequent ejection. (Author)

**A70-29495 \*** Initiation of eating as a function of ingestion of hypoosmotic solutions. Jan W. Kakolewski (Fels Research Institute, Yellow Springs, Ohio) and Edward Deaux (Antioch College, Yellow Springs, Ohio). *American Journal of Physiology*, vol. 218, Feb. 1970, p. 590-595. 26 refs. NIH Grant No. M-4529; Grant No. NGL-36-005-001.

Factors involved in the initiation of food ingestion were investigated. The model used was based on an observation that, in rats kept under water deprivation conditions, ingestion of 3 ml or more of water results in initiation of food ingestion after a latency. Addition of glucose, saccharin, or NaCl to the water revealed that the latency to initiation of eating is an increasing function of the osmolality of the presented solution, and appears to be not solute specific. The rat's ability to discriminate between the solution's osmolality as measured by the initiation of food ingestion appears to be most sensitive to small differences in the low (hypoosmotic) range. Blood-composition measures revealed a significant decrease in serum osmolality at the time of initiation of eating and an increase when the animal had an opportunity to ingest food for a short period. Animals in a state of decreased serum osmolality initiate food ingestion immediately on exposure to food. The possibility of a hypoosmotic cue in the initiation of food ingestion is discussed. (Author)

**A70-29501 #** Significance of the teaching of V. N. Sukachev concerning biogeocenosis in the development of closed systems (Znachenie ucheniia V. N. Sukacheva o biogeotsenoze v razrabotke zakrytykh sistem). V. P. Dadykin (Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Akademiia Nauk SSSR, Izvestiia, Serii Biologicheskaiia*, Mar.-Apr. 1970, p. 229-237. 36 refs. In Russian.

Consideration of the applicability of the basic tenets of the theory of biogeocenosis to the development of artificial closed ecological systems. The particular systems involved consist, according to Sukachev, of plants which create organic matter and heterotrophic organisms which decompose it. The special features involved in the creation of systems of this type and the limitations resulting from the use of artificial life-support systems in spacecraft are indicated. A.B.K.

**A70-29502 #** Microcalorimetric studies of the process of blood coagulation (Mikrokalorimeticheskie issledovaniia protsessu svertvyvaniia krovi). L. A. Piruzian, M. A. Rozenfeld', and V. M. Glezer (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR). *Akademiia Nauk SSSR, Izvestiia, Serii Biologicheskaiia*, Mar.-Apr. 1970, p. 299-302. 13 refs. In Russian.

Study of the thermal effects of the process of blood coagulation, using a calorimetric method. Thermograms are obtained, and a determination is made of the total quantity of heat generated as a result of the occurrence of this process. The calorimetric data are found to correlate well with thromboelastographic indices. It is concluded that a high-sensitivity calorimetric method may be used as a new test in studying the complex process of blood coagulation. A.B.K.

**A70-29520 # Mechanisms of formation of intracranial pressure pulse waves (O mekhanizmakh formirovaniia pul'sovykh kolebaniu vnutricherepnogo davleniia).** Iu. E. Moskalenko, Iu. Ia. Kisliakov, and G. B. Vainshtein (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 56, Mar. 1970, p. 384-391. 18 refs. In Russian.

Use of the method of mathematical modeling to ascertain the processes responsible for the formation of intracranial pressure pulse waves. On the basis of the amplitude-phase characteristics obtained, an estimate is made of the role of biomechanical factors in the formation of intracranial pressure pulse waves. The correctness of the analysis performed is demonstrated by the agreement between the experimental and simulation results. A.B.K.

**A70-29521 # Human responses to gas mixtures with different oxygen contents under rarefied atmosphere conditions (Reaktsii cheloveka na gazovye smesi s razlichnym soderzhaniiem kisloroda v usloviakh razrezhnoii atmosfery).** I. S. Breslav, E. N. Salatsinskaia, and A. M. Shmeleva (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 56, Mar. 1970, p. 400-406. 16 refs. In Russian.

Study of the respiratory responses of humans and their active choice of gas mixtures with different oxygen contents at different altitudes in mountains and in decompression-chamber experiments. Starting from an altitude of 2800 to 3000 m, the subjects manifested a preference for mixtures with an enhanced percentage content of oxygen. At higher altitudes (4500 to 6700 m), they reliably distinguished from ordinary air respiratory mixtures with only a slightly augmented oxygen concentration. It is shown that, starting from an altitude of about 3000 m above sea level, it is desirable to enrich the respiratory medium with oxygen. It is concluded that gas mixtures where the oxygen partial pressure is close to the ordinary pressure are physiologically adequate for humans, regardless of the degree of rarefaction of the atmosphere. A.B.K.

**A70-29522 # Multiparameter autonomous EEG analyzer for operative testing of the functional state of a human operator (Mnogoparametricheskii avtonomnyi analizator EEG dlia operativnogo testirovaniia funktsional'nogo sostoiianiia cheloveka-operatora).** A. I. Atabekiants, V. M. Akhutin, P. V. Bundzen, G. A. Kuchuk, I. A. Neroslavskii, N. K. Syrogin, B. M. Shishkin, and A. V. Chubarov (Akademiia Meditsinskikh Nauk SSSR; Severo-Zapadnyi Zaochnyi Politekhnikeskii Institut, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 56, Mar. 1970, p. 443-446. 12 refs. In Russian.

Brief description of a portable autonomous complex EEG analyzer which makes it possible to perform continuous processing of brain biopotentials with respect to a number of amplitude, phase, and frequency parameters. The device consists of three paired frequency filters, three channels for measuring phase shifts between any two EEG leads, and a channel for analyzing the oscillation frequency of the envelope of the main rhythm. The device is distinguished by the possibility of performing continuous complex measurements of bioelectric activity without the use of expensive computer hardware and without requiring the participation of highly qualified engineering personnel in the experiments. A.B.K.

**A70-29594 The afferent discharge elicited by vibrotactile stimulation.** Ulf Lindblom (Karolinska Sjukhuset, Stockholm, Sweden). *IEEE Transactions on Man-Machine Systems*, vol. MMS-11, Mar. 1970, p. 2-5. 18 refs.

When skin is mechanically stimulated, different receptor systems will be activated depending upon the type of skin stimulated and stimulus characteristics such as rate and amplitude of displacement and repetition frequency. The general properties of the primary mechano-receptive units are (for the rapidly adapting intracutaneous receptors) low thresholds, restricted receptive field, relatively good

rate sensitivity (in terms of repetitive impulse discharge), and poor capacity of tracking on high-frequency repetitive stimulation; (for the Pacinian corpuscles) high critical slope, very low displacement threshold, diffuse receptive field, poor rate sensitivity, and good frequency-following capacity; (for the tactile spots in hairy skin) low displacement threshold, small receptive field, good rate sensitivity, and good frequency-following capacity. When tactile displays are designed, the stimulus parameters will have to be chosen according to the psychophysical functions as well as to the receptor properties, in order to obtain a device that is optimal from a discriminatory point of view. (Author)

**A70-29595 The measurement of fluctuation in perceptual and learning tasks.** E. G. Eijkman (Nijmegen, University, Nijmegen, Netherlands). *IEEE Transactions on Man-Machine Systems*, vol. MMS-11, Mar. 1970, p. 11-19. 7 refs.

In psychophysical experiments subjects always produce responses that are not nearly as constant as the stimuli presented in laboratory conditions. In this study the fluctuation of responses is described as originating in the nervous system. This description requires a definition of three quantities: a measure for the total neural activity elicited by the stimulus, the fluctuation of this activity about the mean, and the criterion value set by the subject. The method is used in the case of electrical and tactile pulses applied to the skin. This experiment is extended to the case where the test pulse is masked by another simultaneous pulse at an adjacent location. Also, in many learning experiments the response does not improve from trial to trial but it is the mean of fluctuating responses which shows a learning phenomenon. Here again a theoretical description requires the definition of three quantities: a measure for the state of the nervous system telling its aptitude to show the required response, the fluctuation of this aptitude about the mean and the criterion value set by the experimental environment. These theoretical considerations are applied to the learning of a compensatory tracking task with two different displays: a visual display and a tactile display. (Author)

**A70-29596 Temporal ordering of events in haptic space.** Carl E. Sherrick (Princeton University, Princeton, N.J.). *IEEE Transactions on Man-Machine Systems*, vol. MMS-11, Mar. 1970, p. 25-28. 6 refs. NIH Grant No. NB-04755.

The most rapid acquisition of skill in the use of complex vibrotactile displays will occur when the capabilities of the organism are most efficiently exploited by the display code. When spatio-temporal patterns are chosen as the coding scheme, the problem of perception of temporal order is of great importance. The present paper describes the effects on the limen for order of two events, of the quality of the stimuli, their spacing on the body, and their intensive relations. The results suggest the presence of limiting conditions for the spatial and, by analogy, the temporal density of vibrotactile patterns. Comparisons are made with results reported previously, and a hypothesis is developed concerning the onset and timing of stimuli in relation to the capacity of the nervous system to augment the clarity of sensory events and to transfer the argumentation to successive location on the sensory surface. (Author)

**A70-29597 Some comparisons between touch and hearing.** George A. Gescheider (Hamilton College, Clinton, N.Y.). *IEEE Transactions on Man-Machine Systems*, vol. MMS-11, Mar. 1970, p. 28-35. 18 refs. PHS Grants No. NB-04177; No. MH-11096; No. MH-11966; No. NB-07620.

The skin can be used for sound localization with accuracy nearly as good as that for hearing. However, auditory sound localization is based on the utilization of both intensive-difference and temporal-difference cues while cutaneous sound localization is based almost entirely on the utilization of only intensive-difference cues. Further-

more, the time interval necessary for resolving two temporally separated pulses was found to be 2.0 ms for binaural and monaural stimulation and, at best, 10 ms for stimulation of the skin. The superior temporal acuity of the ears over the skin was again demonstrated by the finding that pairs of auditory pulses separated by less than 30 ms were perceived as more separated in time than pairs of cutaneous stimuli separated by the same time interval. A series of experiments was conducted to measure inhibitory interaction between touch and hearing. When absolute thresholds were measured by a tracking method in which the subject was free to vary his judgment criterion, auditory stimulation by a click was found to increase tactile thresholds for mechanical pulses by as much as 5.0 dB. Intense tactile pulses slightly increased the auditory click threshold. Subsequent experiments using signal-detection methodology revealed that auditory-tactile masking is caused by a slight reduction in stimulus detectability accompanied by a corresponding increase in the subject's criterion. (Author)

**A70-29598** A survey of the mechanical characteristics of skin and tissue in response to vibratory stimulation. Thomas J. Moore (USAF, Aerospace Medical Div., Wright-Patterson AFB, Ohio). *IEEE Transactions on Man-Machine Systems*, vol. MMS-11, Mar. 1970, p. 79-84. 13 refs.

The possibility that the mechanical characteristics of skin and tissues may influence physiological and psychophysical measurements of tactile sensitivity is considered. A survey of selected literature indicating how certain mechanical characteristics of skin and tissue vary as a function of changes in variables known to influence physiological and psychophysical measurements of the tactile system is presented. Finally, certain physiological and psychophysical studies in which the physical properties of the area stimulated may have influenced the results are mentioned. (Author)

**A70-29599** A describing function analysis of tracking performance using two tactile displays. John W. Hill (Stanford Research Institute, Menlo Park, Calif.). *IEEE Transactions on Man-Machine Systems*, vol. MMS-11, Mar. 1970, p. 92-101. 18 refs. Contract No. AF 33(615)-68-C-1435.

A display consisting of two vibrators attached to the body was tested using three different error signal-to-vibration amplitude transformations. In addition, a novel ripple display consisting of seven sequentially activated air-jet stimulators was tested on a compensatory tracking task. For both displays the range of gains and body locations were determined by both describing-function and error-power analyses. The results showed that the two-vibrator display was equally effective on all five body areas tested, but that the ripple display produced best tracking performance only when widely spaced or situated on an anatomical landmark. The best ripple display, however, was better than the best vibrator display and provided tracking performance nearly equivalent to visual displays. It was found that the ripple display was not enhanced by apparent motion but produced equivalent operator time delays shorter than those measured with visual displays. (Author)

**A70-29627** Application of discriminant analysis to electroencephalographic data (Sur l'application de l'analyse discriminative aux données électroencéphalographiques). Jacqueline Cornée (Institut National de la Santé et de la Recherche Médicale, Marseille, France) and Donald O. Walter (California, University, Los Angeles, Calif.). *Académie des Sciences (Paris), Comptes Rendus, Série A - Sciences Mathématiques*, vol. 270, no. 16, Apr. 20, 1970, p. 1019-1022. In French.

Discussion of the evaluation of electroencephalographic data using a test reported by Blackman and Tukey (1958) and an approach considered by Dixon (1967). A Gaussian stationary stochastic process with the same mean and the same variance as the primary signal is discussed and an illustration of the application of

the test of Blackman and Tukey is given. It is shown that the discriminant analysis is one of the most suitable methods for the automatic classification of the EEG. G.R.

**A70-29671 #** An analysis of the human eye accommodation system. Katsuhiko Fujii, Katsuya Kondo, and Takeshi Kasai (Osaka University, Osaka, Japan). *Osaka University, Technology Reports*, vol. 20, Mar. 1970, p. 221-236. 5 refs.

Description of two experimental analyses of the image processing method incorporated in the human eye accommodation system. Methods being used for the quantitative detection of the state of blur on the retina are discussed. A special visual condition is prepared and accommodative responses of a subject under this condition are observed, using an optometer. It is concluded that the spatial gradient of the contrast of the visual pattern on the retina plays a more significant role than the amplitude of the contrast. M.M.

**A70-29687** The man-machine interface in automated testing. K. Brewster (Elliott Flight Automation, Ltd., Rochester, Kent, England). In: Institution of Electronic and Radio Engineers, Joint Conference on Automatic Test Systems, University of Birmingham, Birmingham, England, April 14-17, 1970, Proceedings. (A70-29676 13-15) Conference co-sponsored by the United Kingdom Automation Council. London, Institution of Electronic and Radio Engineers, 1970, p. 211-220.

Discussion of the design features of automatic test equipment relating to the operator's use of the equipment. Important features are highlighted by reference to recent experience. It is pointed out that, in attempting to provide an improved interface between operator and automatic testing equipment (ATE), a major difficulty lies in the justification of the extra cost of a good ergonomic design. While improved equipment layout undoubtedly reduces operator fatigue, there are little data available on which one can base a quantitative cost saving figure. Thus the ATE manufacturer who does give due attention to human factors in his design may be penalized when capital cost is so often all important. M.M.

**A70-29753 #** Problem of the mechanism of the therapeutic action of homopoietic tissue transplantations after damage by irradiation (K voprosu o mekhanizme lechebnogo deistviia peresadok krovotvornykh tkanei pri luchevykh porazheniakh). A. K. Riabukha and S. P. Aezvaia (Tsentral'nyi Nauchno-Issledovatel'skii Rentgeno-Radiologicheskii Institut, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 191, Mar. 1, 1970, p. 244-246. 24 refs. In Russian.

Experimental study of the therapeutic effects of transplanted bone marrow on irradiated rats, in the case where the transplanted tissue is prevented from resettlement in the body. The bone marrow was transplanted in diffusion chambers (0.45-micron pore diameters) after 500 and 600 r doses of irradiation. The tissue was contained in the diffusion chamber to prevent its resettlement in the body while allowing the effects of its activity to influence the irradiated animals. Survival curves for the rats subjected to 500 r doses show a strong beneficial influence of the marrow transplant; 41% of the animals with the transplant survived 21 days as compared to 10% of the animals with no marrow in the implanted diffusion chamber. Rats subjected to 600 r doses showed no effects of the transplant, and most animals died within 12 days. T.M.

**A70-29757 #** Acute hypoxia tolerance after various exposure times in medium with a high carbon dioxide content (Perenosimost' ostroi gipoksii posle razlichnykh srokov prebyvaniia v srede s povyshennym soderzhaniiem uglekisloty). N. A. Agadzhanian and R. V. Sergienko (Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 191, Mar. 11, 1970, p. 487-489. 18 refs. In Russian.

Experimental investigation of the behavior of the high-altitude tolerance of white rats as a function of the exposure time to a hypercapnic medium. The animals were kept for 7 days in a chamber containing 6 per cent carbon dioxide (normal oxygen content) at atmospheric pressure, a temperature of 25 deg C, and a relative humidity of 89 per cent. Acute hypoxia tolerance was studied in an altitude chamber (12,000 m at an ascent velocity of 25 m/sec). The results indicate that tolerance to acute hypoxia increases after exposure to a hypercapnic medium for a period of one day, but decreases appreciably after an exposure time of 7 days. V.P.

**A70-29767 # Relationship between the lability of the myocardium and its contractility and duration of the diastola of the ventricles of the heart (O vzaimootnoshenii labil'nosti miokarda s ego sokratitel'noi sposobnost'iu i dritel'nost'iu diastoly zheludochkov serdtsa).** V. A. Frolov and T. A. Kazanskaia (Moskovskii Meditsinskii Institut, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 190, Feb. 21, 1970, p. 1498-1500. 7 refs. In Russian.

Derivation of a mathematical relation between the duration of the diastola and the potential working capacity of the myocardium. A characteristic coefficient of the working capacity of the myocardium is introduced which characterizes the potential capabilities of the myocardium. This coefficient can be determined from the capability of the myocardium for increasing the intraventricular pressure during isometric contraction. V.P.

**A70-29775 # Information criterion for the quality of approximation in equipment for continuous analysis of electrocardiogram variations (Informatsionen kriterii za kachestvoto na aproksimatsiata pri ustroivstvata za neprek'snat analiz na izmeneniata v elektrokardiogramata).** G. Astardzhian, T. Ianev, Ch. Nachev, and S. Ormandzhiev. *B'lgarska Akademiia na Naukite, Institut po Tekhnicheska Kibernetika, Izvestiia*, vol. 11, 1969, p. 161-169. 6 refs. In Bulgarian.

Description of a method for informative evaluation of the quality of approximation of a curve describing a specific process when a finite number of measured points on the curve is available. The method is used to determine the minimum number of measured points required on the ST interval of an electrocardiogram in order to ensure a predetermined data-processing accuracy. T.M.

**A70-29780 Adaptive and optimizing models of the human operator in manual control systems - A review and unification.** Gary W. Irving (Librascope Corp., Ilong Beach, Calif.). *Journal of Systems Engineering*, vol. 1, Apr. 1969, p. 151-195. 22 refs.

Review of the most important contributions to the development of mathematical models of human's adaptive and optimizing characteristics. A matrix is constructed which categorizes each contribution according to which mathematical technique it applies to modeling which operator behavior phase. An attempt is made to incorporate many concepts illustrated in the contributions into one generalized model. Z.W.

**A70-29793 Motion sickness.** K. E. Money (Defence Research Establishment, Toronto, Canada). *Physiological Reviews*, vol. 50, Jan. 1970, p. 1-39. 316 refs.

Discussion of theories proposed to account for motion sickness in man and the animals. It is pointed out that none of the proposed theories has been widely accepted, not only because none is consistent with all the known observations, but also because none has met the criterion of usefulness. The overstimulation and conflict theories both appear fundamentally to be attempts to see something noxious in the stimulus. However, even if it were accepted that effective stimuli are noxious, the existence of motion sickness would not be any less puzzling from the teleological or evolutionary

viewpoints because the vomiting response apparently does not make the stimulus any less noxious. It is concluded that the essential nature of motion sickness remains a mystery. Although there is great individual variation in susceptibility, there are motions to which vomiting is the normal response in humans and in a wide variety of other species. The response to these motions is called motion sickness, but the term is inappropriate in the implication that the response is unusual or abnormal. The powerful central mechanism for this response can perhaps be considered as one would consider a prominent anatomical structure without a known function; it is apparently devoid of survival value and it is found in a large number of different species. M.M.

**A70-29794 \* Reexamination of the role of the hypothalamus in motivation.** Elliot S. Valenstein, Verne C. Cox, and Jan W. Kakolewski (Fels Research Institute, Yellow Springs, Ohio). *Psychological Review*, vol. 77, no. 1, 1970, p. 16-31. 39 refs. NIH Grant No. M-4529; Grant No. NGL-36-005-001.

The view that stimulation of discrete hypothalamic areas elicits specific drive states is challenged by recent evidence. Data are presented to support the view that there is much less anatomical specificity within the hypothalamus than is commonly assumed. Significant differences between natural states of hunger and thirst and those associated with the elicitation of eating and drinking are described. Additional information related to species differences, the role of prior experience, and an analysis of the environmental conditions essential to the elicitation of well-established response patterns suggests an alternative interpretation of hypothalamic function in the regulation of behavior. (Author)

**A70-29802 \* Reduction of serum uric acid in young men during physical training.** James S. Bosco (San Jose State College, San Jose, Calif.), J. E. Greenleaf (NASA, Ames Research Center, Moffett Field, Calif.), Ronald L. Kaye (Palo Alto Medical Clinic, Palo Alto, Calif.), and E. G. Averkin (Syntex Research, Palo Alto, Calif.). *American Journal of Cardiology*, vol. 25, Jan. 1970, p. 46-52. 40 refs. Research supported by the San Jose State College, the Palo Alto Medical Foundation, and the Palo Alto Medical Clinic.

Investigation of the effects of eight weeks of chronic physical exercise on serum sodium urate concentration in normal, healthy male college students aged 18 to 29. Preexperimental correlation coefficients between serum uric acid levels and age, height, body surface area, resting heart rate and fitness index were low and not significant statistically. It was also found that chronic physical exercise lowered serum uric acid in 80% of the subjects in the athletic and training groups. M.M.

**A70-29805 \* Serologic comparisons of the carbonic anhydrases of primate erythrocytes.** Linda Nonno, Lawrence Levine (Brandeis University, Waltham, Mass.), and Harvey Herschman (California University, Los Angeles, Calif.). *Archives of Biochemistry and Biophysics*, vol. 136, Feb. 1970, p. 361-367. 18 refs. NIH Grant No. AI-01940; Grant No. NGR-22-005-001.

Antisera have been prepared against purified carbonic anhydrase isozymes B and C, isolated from human erythrocytes. Quantitative microcomplement fixation was used to compare the carbonic anhydrase of human erythrocytes with the carbonic anhydrase in lysates of erythrocytes of other primate species. The relative degrees of serologic activity agree well with the existing primate taxa, based on morphological considerations, as well as with previous serologic evaluations of other evolving proteins. (Author)

**A70-29806 \* Influence of hunger, thirst, and previous experience in the test chamber on stimulus-bound eating and drinking.** Elliot S. Valenstein and Verne C. Cox (Fels Research Institute,

## A70-29807

Yellow Springs, Ohio). *Journal of Comparative and Physiological Psychology*, vol. 70, no. 2, 1970, p. 189-199. 10 refs. NIH Grant No. M-4529; Grant No. NGL-36-005-001.

The importance of a temporary prepotent response for the establishment and display of stimulus-bound behavior was tested with animals either deprived of food or water or permitted to eat or drink only under a distinctive set of conditions. The results of four studies rule out the relevance of deprivation state, chance contiguity of stimulation and response, and environmental stimuli associated with previous experience. Additional evidence was presented which indicates that in a given animal the behavior elicited even from widely disparate anatomical sites is likely to be the same and appears to reflect a prepotent response that is relatively independent of experience. (Author)

**A70-29807 \*** **Effects of stimulation intensity on behavior elicited by hypothalamic stimulation.** Verne C. Cox and Elliot S. Valenstein (Fels Research Institute, Yellow Springs, Ohio). *Journal of Comparative Physiological Psychology*, vol. 69, no. 4, 1969, p. 730-733. 7 refs. NIH Grant No. M-4529; Grant No. NGL-36-005-001.

Test of the hypothesis that behavior elicited by repeated invariant electrical stimulation of hypothalamic circuits changes because of a lowering of the threshold of independent neural circuits imparting to previously subthreshold current the character and effect of threshold current. A direct test of this hypothesis which employed high-intensity stimulation administered to eight mature albino rats found this explanation insufficient to account for the emergence of new behavior in the majority of cases. The emergence of new behavior did not suggest the existence of a completely independent neural substrate requiring only a sufficiently intense stimulus for its activation. M.V.E.

**A70-29809 \*** **The application of character recognition techniques to the development of reading machines for the blind.** Murray Eden (MIT, Cambridge, Mass.). In: Image processing in biological science; University of California, Conference, Berkeley, Calif., November 1966, Proceedings. Edited by D. M. Ramsey. Berkeley, Calif., University of California Press, 1969, p. 35-51; Discussion, p. 51-55. NSF Grant No. GK-835; NIH Grant No. 2 PO1 MH-04737-06; Contract No. DA-28-043-AMC-02536(E); Grant No. NGL-22-009-019.

Discussion of a conventional symbol system and the procedure to be followed in order to recognize these symbols, because the interpretation of this particular symbol system is quite well defined. The motivation is to transform the printed material into some other form which is acceptable to a blind person or to anyone else who cannot read at that particular moment. M.M.

**A70-29813 \*** **Antidiuresis associated with the ingestion of food substances.** Jan W. Kakolewski and Elliot S. Valenstein (Fels Research Institute, Yellow Springs, Ohio). In: Olfaction and taste. Edited by C. Pfaffmann. New York, Rockefeller University Press, 1969, p. 593-600. 7 refs. NIH-Grant No. M-4529; Grant No. NGL-36-005-001.

Discussion of a series of experiments describing a model for studying the development of antidiuresis in a chronic preparation. The results with this technique permit the following conclusions: (1) a short-latency antidiuresis can be triggered from oral stimulation by certain food substances. This antidiuresis does not appear to be related to salivation. The triggering of the short-latency response requires the direct stimulation of the oral cavity, as odors of effective foods do not constitute an adequate stimulus; and (2) in preliminary experiments, which bypassed the oral cavity by using gastric loads, the results suggested that stimuli originating in the stomach may not play a significant role in the triggering of either short-latency or an

overall antidiuresis. Substances that were effective in eliciting an overall antidiuresis when ingested were not effective when introduced directly into the stomach. Of the substances tested, only concentrations of salt above those the animals would ingest voluntarily were found to trigger a persistent antidiuresis when intubed directly into the stomach. M.M.

**A70-29814 \*** **The hypothalamus and motivated behavior.** Elliot S. Valenstein, Verne C. Cox, and Jan W. Kakolewski. In: Reinforcement and behavior. Edited by J. T. Tapp. New York, Academic Press, Inc., 1969, p. 242-285. 65 refs. NIH Grant No. M-4529; Grant No. NGL-36-005-001.

Experimental investigation of hypothalamic stimulation and motivated behavior, with emphasis on stimulus-bound eating, drinking, and gnawing. It was found that in every case in which hypothalamic stimulation elicited any one of these three behaviors, it was possible to change the elicited behavior to one of the other two. The second elicited behavior was exhibited with as much reliability and vigor as the first. As the stimulus parameters were not changed in any way, it was concluded that the activation of the same neural substrate could elicit a variety of behaviors, and therefore that it might be appropriate to reexamine the question of whether hypothalamic stimulation produces an excitation of specific motivational states. The methodology of the first experiment is described at length, since the same basic procedures were used in many of the subsequent experiments described in less detail. M.M.

**A70-29826** **Variations in maximal oxygen intake with physical activity in middle-aged men.** John R. McDonough, Fusako Kusumi, and Robert A. Bruce (Washington, University, Seattle, Wash.). *Circulation*, vol. 41, May 1970, p. 743-751. 33 refs.

Discussion of data on maximal exercise performance for normal middle-aged men free of cardiovascular disease. It was found that maximal oxygen intake, oxygen pulse, heart rate, and lactate levels all decrease with increasing age. Physical activity defined by habitual running of any amount had a highly significant effect on maximal oxygen consumption. The enhanced effect of physical activity was found equivalent to nearly 10 years of age effect on maximal aerobic capacity. G.R.

**A70-29942 \*** **Resting levels of fibrinolysis in blood in inactive and exercising men.** Richard T. Moxley, Pieter Brakman, and Tage Astrup (NASA, Div. of Occupational Health; James F. Mitchell Foundation, Institute for Medical Research, Washington, D.C.). *Journal of Applied Physiology*, vol. 28, May 1970, p. 549-552. 21 refs. PHS Grant No. HE-05020.

Concentrations of fibrinogen, plasminogen, and levels of euglobulin fibrinolytic activity and of inhibitors of plasmin, urokinase, and tissue plasminogen activator were determined in blood samples obtained from a resting group of heavily exercising men and collected at two sessions separated by an interval of 2 months. The results were compared with those obtained in a control group of inactive men similarly studied. The group of exercising men had trained 3 or 4 times weekly for a period of 1 year prior to the study and continued to do so. No statistically significant differences in the resting levels of the parameters studied were observed in the first sampling. In the second sampling, a slightly higher euglobulin activity was observed in the exercising group. This increase is not considered biologically significant because of the large individual variations in normal activity. Subjects practicing regular exercise showed the usual transient, individually variable increase in euglobulin fibrinolytic activity following brief exercise. (Author)

**A70-29943** **Effects of O<sub>2</sub> and CO<sub>2</sub> on airway smooth muscle following pulmonary vascular occlusion.** G. M. Tisi, W. G. Wolfe, R. J. Fallat, and J. A. Nadel (California, University; San

Francisco Medical Center, San Francisco, Calif.). *Journal of Applied Physiology*, vol. 28, May 1970, p. 570-573. 11 refs. NIH Grant No. HE-06285.

In 28 supine dogs that were anesthetized, vagotomized, and paralyzed, we ventilated each lung separately through a tracheal divider catheter. We measured the changes in dynamic pulmonary compliance (CL) and total pulmonary resistance (RL) following (1) temporary unilateral pulmonary artery occlusion with a balloon (TUPAO) and (2) selective injection of iodized oil (Ethiodol) into the pulmonary artery of one lung. Following either type of vascular occlusion, CL decreased and RL increased in both the ipsilateral and contralateral lungs. Since isoproterenol reversed all changes in CL, we postulate that these changes are due to smooth muscle contraction of the peripheral airways. We suggest that the effects of TUPAO and Ethiodol embolism are the result of ischemia, since the effects of both were reversed by inhalation of pure O<sub>2</sub>. (Author)

**A70-29944 Gravity-dependent sequential emptying of lung regions.** P. C. Robertson, W. R. D. Ross (Royal Victoria Hospital; McGill University, Montreal, Canada), and N. R. Anthonisen. *Journal of Applied Physiology*, vol. 28, May 1970, p. 589-595. 18 refs. Research supported by the Medical Research Council of Canada and the John A. Hartford Foundation.

Subjects, either standing erect or lying on their sides, inhaled boli of Xe 133 at the onset of vital capacity inspirations of pure O<sub>2</sub>, resulting in vertical, regional concentration differences of both Xe 133 and N<sub>2</sub>. Alveolar plateaus for both gases were recorded during the subsequent vital capacity expirations. When the subjects were pivoted 180 deg between inspiration and expiration the slopes of the plateaus tended to reverse. This indicated that concentration differences along the alveolar plateau were, in part, due to a gravity-dependent emptying sequence of lung regions: as lung volume decreased, superior lung regions contributed an increasing fraction of the total expirate, while the fractional contribution of dependent lung regions decreased. Turn through 180 deg did not reverse N<sub>2</sub> plateaus as much as it did Xe 133 plateaus, indicating that nonregional emptying sequences may also be important. Variation in breath hold produced minor and inconsistent changes in the alveolar plateaus. (Author)

**A70-29945 Stress distribution in lungs - A model of pulmonary elasticity.** Jere Mead, Tamotsu Takishima, and David Leith (Harvard University, Boston, Mass.). *Journal of Applied Physiology*, vol. 28, May 1970, p. 596-608. 18 refs. PHS Grant No. GM-12564.

Although lungs are exposed to transpulmonary pressure, the air spaces within are distended solely by forces applied from surrounding tissues. By relating these forces to the areas on which they operate, we derive the effective pressure distending air spaces. In uniformly expanded lungs this pressure probably approximates transpulmonary pressure. In nonuniformly expanded lungs the effective distending pressure differs from transpulmonary pressure, and in the appropriate sign to reduce the nonuniformity. This interdependence of air-space distention bears on a number of aspects of pulmonary function, including the size of air spaces which may be expanded from the gas-free state, the static and dynamic stability of air spaces, the dryness of air spaces, the forces distending airways and blood vessels within lungs, and the distribution of pulmonary edema. The principal function of the mechanical interdependence would appear to be to support uniform expansion of air spaces. The principal functional risk that it entails is increase in capillary transmural pressure in regions which become subjected to abnormally high outward-acting stress. (Author)

**A70-29946 \* Position-dependent regional differences in pericardial pressures.** Prabha Avasthey, Earl H. Wood (Minnesota University, Rochester, Minn.), and Craig M. Coulam. *Journal of*

*Applied Physiology*, vol. 28, May 1970, p. 622-629. 21 refs. Research supported by the American Heart Association; NIH Grants No. HE-3532; No. FR-00007; Grant No. NSG-327.

Variations in intrapericardial, pleural, and esophageal pressures with vertical height in the thorax were studied in six intact, anesthetized mongrel dogs in head-up and head-down positions. Pericardial pressures decreased 1 cm water/cm of vertical height in the thorax and thus behaved as a hydrostatic system. No systematic difference was demonstrated between pleural and pericardial pressures recorded at juxtaposed sites in the thorax, indicating that the pericardium acted as a passive membrane under these conditions. This hydrostatic pressure environment surrounding the heart prevented regional differences in transmural pressure over the vertical height of each cardiac chamber. Regional changes in pleural and pericardial pressures encompassing the heart, which occur when body position is altered from supine to vertical, are similar in direction and magnitude to changes recorded simultaneously in atrial pressures. Thus, large changes in effective atrial filling pressure, which otherwise would occur, are prevented, and alterations in cardiac output, which might be expected if only changes in atrial pressures with body position were considered, are minimized. (Author)

**A70-29947 Maximal oxygen consumption in a hot environment.** F. Pirnay, R. Deroanne, and J. M. Petit (Institut Ernest Malvoz, Liège, Belgium). *Journal of Applied Physiology*, vol. 28, May 1970, p. 642-645. 14 refs.

Maximal oxygen consumption was measured in a hot environment by means of two experimental procedures. A group of 18 coal miners who performed exhausting exercise were tested at the beginning of exposure to the heat. No marked difference was noticed between maximal O<sub>2</sub> consumption under these conditions and under normal conditions. A group of 8 students performed the same exhausting work after prolonged exposure to heat leading to a storage of calories. Such experimental conditions markedly reduced the work capacity, decreasing the maximal O<sub>2</sub> consumption by 25 per cent. It is presumed that after prolonged thermal exposure, hyperthermy prevents the compensating circulatory adjustments to muscular exercise. (Author)

**A70-29948 # Effects of hypoxia and hypercapnia, singly and combined, on growing rats.** William E. Pepelko (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Journal of Applied Physiology*, vol. 28, May 1970, p. 646-651. 23 refs.

Male Wistar strain rats, 51 days of age, were exposed to either room air, hypoxia (80 torr O<sub>2</sub>), hypercapnia (60 torr O<sub>2</sub>), or a combination of these levels of hypoxia and hypercapnia. Groups of 10 were examined after 1, 2, 4, 8, 16, and 32 days of exposure. In addition to body weights, the heart, lungs, liver, spleen, kidneys, adrenals, and thyroids were removed, weighed, and examined histologically. Blood samples were collected for hematocrit, eosinophil counts, reticulocyte counts, and standard bicarbonate. While hypoxia or hypercapnia caused only moderate growth inhibition, rats simultaneously exposed to both conditions grew even less. Higher adrenal/body weight ratios suggested that hypoxia and hypercapnia combined were a more potent stimulus of adrenergic activity than either variable alone. Hypoxia stimulated erythropoiesis, but in combination with hypercapnia erythropoietic activity was lower than controls. The hypercapnia-induced increase in plasma standard bicarbonate was absent in the presence of concomitant hypoxia. (Author)

**A70-29949 \* # Effect of inspired PCO<sub>2</sub> up to 30 mm Hg on response of normal man to exercise.** Stuart J. Menn, Richard D. Sinclair, and B. E. Welch (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Journal of Applied Physiology*, vol. 28, May 1970, p. 663-671. 33 refs. NASA-supported research.

Trained volunteers performed steady-state moderate exercise and heavy exercise in 0, 8, 15, 21, and 30 mm Hg inspired carbon dioxide for 30 min on a bicycle ergometer. At CO<sub>2</sub> levels of 8 and 15 mm Hg, no difficulty was encountered by the subjects. The higher levels of hypercapnia caused some respiratory symptoms of 'air hunger' (dyspnea) and intercostal muscle pain, but were of mild enough degree to permit all subjects to complete the exercise. The tolerance to maximum exercise in 21 mm Hg inspired carbon dioxide resembled that at 2/3 work load in 30 mm Hg inspired carbon dioxide. (Author)

**A70-29950 \*** An efficient, simple dialyzer suitable for small animals. David A. Miller (Emory University, Atlanta, Ga.). *Journal of Applied Physiology*, vol. 28, May 1970, p. 689-694. 21 refs. Grant No. NGR-11-001-009.

In order to make possible the dialysis of small animals, an easily assembled, efficient, countercurrent, sandwich-type dialyzer with 500 sq cm of membrane area in six blood chambers has been developed. Like the Dialung, both blood and dialysate chambers contain membrane supports. Like the Klung, the membrane support in the dialysate chamber is a pattern of cones. Unlike either the Dialung or the Klung, the membrane support in the blood chamber is a 2.1-mm-thick Silastic rubber sheet against which the cones press the membranes at multiple points. The cones produce better flow patterns than the grooves used in the Dialung, and the barrier prevents interdigitation of opposing groups of cones which tends to occlude areas of the blood chamber in the Klung. A means of comparing the efficiency of dialyzers was devised, and the barrier dialyzer was found to be one of the more efficient units. Therefore, this dialyzer would be of use for dialysis of small animals and small volumes of solutions, and the design should be applicable to the development of dialyzers and membrane oxygenators for human use. (Author)

**A70-30018** Prevention in the use of lasers (La prévention dans l'emploi des lasers). André Orlowski. *Inter-Electronique*, vol. 25, May 1970, p. 13, 14. In French.

Discussion of the hazards involved in operation of laser beams, and of ways of minimizing them. The risk is a function of the narrowness of the beam, the duration of exposure, and the energy density. The eye is by far the organ most susceptible to damage, but superficial skin burns can also result. Indirect risks are those of electrocution, cryogenic lesions, and ionizing radiation. Reflecting surfaces should be avoided, and there should be sufficient illumination to prevent maximum enlargement of the pupil. Proper training of the operator is important. F.R.L.

**A70-30019 \*** Parameters and factor structure of a three-phase code transformation task (3P-COTRAN). Earl A. Alluisi and Glynn D. Coates (Louisville, University, Louisville, Ky.). *Perceptual and Motor Skills*, vol. 29, Aug. 1969, p. 155-166. 8 refs. Grant No. NGR-18-002-008.

In an experimental test of a 3-phase code transformation task, 90 Ss performed under 1 of the 6 combinations of 2 memory-aid and 3 transformation-complexity conditions. A factor analysis of 72 measures of performance led to the identification of 5 factors. Analyses based on 9 selected measures indicated that 2 memory aids were better in the problem-solving third phase of the task. (Author)

**A70-30155 #** Possibility of the occurrence of an erythropoiesis inhibitor in the blood from the kidney vein during hyperoxia (O vozmozhnosti poavleniia ingibitora eritropoeza v krovii iz pochechnoi veny pri giperoksii). V. I. Voitkevich and A. M. Volzhskaiia (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 191, Mar. 21, 1970, p.

723-725. 13 refs. In Russian.

Investigation of the erythropoietic activity of the kidney blood of a group of 22 rabbits kept for 40 hr in a nitrogen-oxygen atmosphere containing 90% oxygen. A nearly complete arrest of erythropoietic activity was observed in the arterial blood of the rabbits immediately after exposure, while the blood plasma from the kidney showed no such effects. It is suggested that an erythropoiesis inhibitor formed in the kidney blood under hyperoxia may be responsible for the absence of erythropoiesis depression in this blood. V.Z.

**A70-30158 #** Isolation and investigation of the amino-acid composition of protein in blue-green algae *Stratonostoc Linckia* (Roth) (Vydelenie i izuchenie aminokislotnogo sostava belka sine-zelenoi vodorosli *Stratonostoc Linckia* /Roth/). Kh. Kh. Akhundov and A. P. Ibragimov (Akademiia Nauk Uzbekskoi SSR, Institut Biokhimii and Institut Botaniki, Tashkent, Uzbek SSR). *Uzbekskii Biologicheskii Zhurnal*, vol. 13, no. 6, 1969, p. 3-5. 5 refs. In Russian.

Identification of amino acids isolated by electrophoresis from the protein of algae *Stratonostoc Linckia*. The procedure used in the study is described. A total of 16 individual amino acids usually present in animals and plant protein are established in the protein. V.Z.

**A70-30159 #** Status of intraocular tension due to muscular fatigue during the overheating of the organism, and certain characteristics of mineral metabolism (Sostoianie vnutriglaznogo davleniia pod vliianiem myshechnogo utomleniia pri peregrevanii organizma i nekotorye pokazateli mineral'nogo obmena v glazu). A. Iu. Iunusov and T. G. Il'ina (Tashkentskii Meditsinskii Institut, Tashkent, Uzbek SSR). *Uzbekskii Biologicheskii Zhurnal*, vol. 13, no. 6, 1969, p. 22-25. 8 refs. In Russian.

Investigation of the ophthalmotonus and sodium and potassium contents in the tissues of the eyes of albino rats which were kept swimming in 40 C water for 1 hour each day over periods of 10, 20, and 40 days. A Maklakov tonometer and flame photometry were used in the study. Temporary fluctuations of the intraocular tension associated with variations in Na and K contents in the tissues of the eye are established in the experimental rats. V.Z.

**A70-30184 #** Development of a conditioned reaction of fear by stimulation of the hippocampus (Vyrabotka uslovnoi reaktivnoi strakha na baze razdrasheniia gippokampa). A. A. Ungiadze (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 57, Jan. 1970, p. 169-172. 8 refs. In Russian.

Discussion of experiments performed with cats with electrodes permanently implanted into the lateral hypothalamus, the ventromedial nucleus hypothalamicus, and certain other structures. The results indicate that by direct electric stimulation of the structure of the hippocampus, it is possible to develop a conditioned reflex type emotional reaction of fear. The recorded synchronized activity may be attributed to the action of a complex of reticular formations of the midbrain on the hippocampus structure. V.P.

**A70-30185 #** Results of a spectral analysis of the electroencephalogram during sleep and wakefulness (Rezultaty spektralnogo analiza elektroentsefalogrammy vo vremia sna i bodrstvovaniia). T. N. Oniani, P. P. Mol'nar, and I. K. Badridze (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 57, Jan. 1970, p. 173-176. 6 refs. In Russian.

Investigation, by spectral analysis and integration of electroencephalograms of cats with permanently implanted electrodes, obtained during various phases of the sleep-wakefulness cycle. Graphs showing the electrical activity of the auditory and visual



portions of the neocortex and the dorsal hippocampus of a sleeping cat and the changes in this activity due to electric stimulation of the reticular formation of the midbrain indicate that slow high-amplitude oscillations prevail in all these structures prior to stimulation. Delta, theta, and alpha rhythms dominate in the auditory region of the neocortex during sleep. Threshold excitation of the reticular formation leads to substantial changes in the electrical activity of the neocortex, which manifest themselves in a pronounced inhibition of the delta, theta, and alpha rhythms. These rhythms are also inhibited in the hippocampus, but to a lesser degree. V.P.

**A70-30186 #** Some data concerning the influence of X rays on the cerebral hyaluronic acid of animals (*Nekotorye dannye o deistvii Rentgenovykh luchei na gialuronovuiu kislotu golovnogo mozga zhivotnykh*). M. A. Bregadze (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 57, Jan. 1970, p. 221-224. 15 refs. In Russian.

Discussion of experiments in which mice and guinea pigs were exposed to ionizing radiation in lethal and sublethal doses. It is found that hyaluronic acid is contained primarily in the capillary walls and ventricles of the brain, as well as in the cerebellum, the cerebral cortex, and the medulla oblongata, and that both large and small radiation doses produce changes in the hyaluronic acid in all portions of the brain. These changes, however, are particularly distinct in the capillary walls and ventricles of the brain. In surviving animals, hyaluronic acid is restored first in the cortex of the cerebral hemispheres and in the medulla oblongata, and then in the ventricles of the brain and in the cerebellum. V.P.

**A70-30188 \*** Development of the chick embryo at high altitude. A. H. Smith, R. R. Burton, and E. L. Besch (California, University, Davis, Calif.). *Federation Proceedings*, vol. 28, May-June 1969, p. 1092-1098. 24 refs. PHS Grant No. HE-01920; Grant No. NGR-05-004-008.

Experimental investigation of chick embryogenesis during hypoxia. The results obtained show that the developing avian embryo, unprotected by maternal systems, is quite susceptible to hypoxia. Many of the effects of hypoxia appear to result from metabolic repression, and resemble those induced by moderate hypothermia. This similarity appears to depend on the developing embryo's poikilothermy, the effects of hypothermia and hypoxic environments having dissimilar influence on the homeothermic adult (Fregley, 1954). The most obvious manifestation of the deleterious effects of hypoxia is the marked increase in the mortality rate, which is significant at all times during incubation. Embryonic growth is slowed by hypoxia, but principally only in the early stages of incubation. The repression of embryonic growth is not uniformly shared by the organs. The most striking effect observed was upon the brain, which never completed the early developmental growth phase at 3800 m, although it did so at 3100 in elevation. M.M.

**A70-30191** Observations regarding the transportation of patients in emergencies by helicopter (*Erfahrungen im Hubschraubertransport von Notfallpatienten*). R. Ney and W. Ringler (Düsseldorf, Universität, Düsseldorf, West Germany). *Zentralblatt für Verkehrs-Medizin, Verkehrs-Psychologie, Luft- und Raumfahrt-Medizin*, vol. 16, May 1970, p. 1-10. 14 refs. In German.

Discussion of the experience gained concerning the transportation of patients in emergencies by helicopter in the case of a university clinic of Western Germany. The suitability of various types of helicopters used for the transportation of patients is examined. The salient factors of the cases in which transportation by helicopters had been found necessary are discussed taking also into consideration the necessity to have emergency treatment provided during transportation by accompanying physicians. G.R.

**A70-30247 \*** Investigation of motion requirements in compensatory control tasks. Hugh P. Bergeron (NASA, Langley Research Center, Hampton, Va.). (*Annual NASA-University Conference on Manual Control, 5th, Massachusetts Institute of Technology, Cambridge, Mass., Mar. 27-29, 1969.*) *IEEE Transactions on Man-Machine Systems*, vol. MMS-11, June 1970, p. 123-125. 5 refs.

Tests consisting of one- and two-axis closed-loop tracking tasks, with and without motion, have been made to define some areas where motion cues are beneficial. Tests were made with reduced scaling on the motion input to investigate the minimum requirements of motion cues in those tests where motion was found to be of assistance. For the set of conditions tested, little or no difference in the measurement criteria was observed in the single-axis motion/no motion runs. Similar results were obtained when comparing two single-axis tests with different pitch orientation. The two-axis tests, which consisted of pitch and yaw and pitch and roll, did, however, produce a difference in the error measurements in the motion/no motion comparison. A decrease in normalized tracking error and an increase in closed-loop system frequency were observed when motion was added. Tests were also run, in pitch and yaw only, in which the scale of the motion input was reduced. These tests were performed by the subject in sequence starting with no motion all the way to full motion and back down to no motion. Each motion scale condition (none, 1/16, 1/8, 1/4, 1/2, and full) constituted a test. The normalized tracking error remained constant for full, 1/2, and 1/4 motion scaling, but increased with a further reduction in motion scaling. (Author)

**A70-30248** Models of temporal motor responses - Stimulus, movement, and manipulation information. Appu Kuttan (Puerto Rico, University, Mayaguez, P.R.) and Gordon H. Robinson (Wisconsin, University, Madison, Wis.). *IEEE Transactions on Man-Machine Systems*, vol. MMS-11, June 1970, p. 126-128. 11 refs. Research supported by the Wisconsin Alumni Research Foundation.

Development of quantitative models of human motion relating reaction time, movement time, and manipulation time to stimulus, movement, and manipulation information. Response surface methodology (a statistical design and modeling technique) was used. Linear models relating time to information seem appropriate, and no significant interactions were uncovered. F.R.L.

**A70-30249** Rotation of visual reference systems and its influence on control quality. Rainer K. Bernotat (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). *IEEE Transactions on Man-Machine Systems*, vol. MMS-11, June 1970, p. 129-131. 6 refs.

Consideration of the large human engineering possibilities, as well as new problems, posed by electronic displays. One special aspect is the rotation of the display reference system, since the human operator is unable to compensate for rotation. This causes tracking errors to increase considerably at rotation angles of 90 and 270 deg. Related experiments are described in detail. A new 'action display' indicating the stick signal to the control system compensates completely for the rotation effect. F.R.L.

**A70-30343 \*** Inhibition of uptake and metabolism of amino acids in stationary bacterial cells by pure oxygen. Ho Lee Young (NASA, Ames Research Center, Moffett Field, Calif.). *Microbios*, vol. 5, 1970, p. 59-66. 8 refs.

The effect of one atmosphere of oxygen on uptake and metabolism of stationary cells of *Pseudomonas saccharophila* was studied. The stationary stage of the cells was achieved by incubating the cells either in a medium free of ammonium salt, or in a medium containing chloramphenicol. The uptake of leucine, valine, and phenylalanine was invariably inhibited when the stationary culture was exposed to pure oxygen for one hr or longer. After 3 hr of

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exposure to oxygen, the uptake of any one of these amino acids was 40 to 50% of that in the cells exposed to air. Although net protein synthesis was not detected in the stationary cultures, the incorporation of C14 leucine into TCA insoluble material was considerably higher in the cells exposed to air than in the cells exposed to 100% O<sub>2</sub>; conversely, the amount of C14 leucine incorporated into TCA soluble material was not statistically different in the cells exposed either to air or to 100% O<sub>2</sub>. (Author)

### A70-30344 \* A cryobiologist's conjecture of planetary life.

Joseph F. Saunders (NASA, Office of Space Science and Applications, Washington, D.C.). (*Society for Cryobiology, Annual Meeting, 6th, Symposium on Relationship to Extraterrestrial Life of Biochemical Events at Low Temperatures, Buffalo, N.Y., Aug. 5, 1969.*) *Cryobiology*, vol. 6, no. 3, 1969, p. 151-159. 24 refs.

Survey of available knowledge of cryobiological phenomena on earth from the viewpoint of using these data to explain possible life mechanisms on other planets in the solar system. Emphasis is placed on Mars, and the environmental features of this planet are outlined. Conditions conducive to Martian cryobiology are analyzed in terms of the presence of water and the maintenance of a narrow range of habitable temperatures. The different types of cryobiont flora on earth are described, and the survival of insects at low temperatures is considered. Possible exotic biochemistries which could accompany life processes under different environmental conditions are discussed, and the role of the cryobiologist in future planetary exploration is examined. T.M.

### A70-30347 \* Instrumentation for study of neuroregulatory agents and behavior.

Jack Barchas, Roland Ciaranello, and Seymour Levine (Stanford University, Stanford, Calif.). (*American Psychologist*, vol. 24, Mar. 1969, p. 271-275. 15 refs. Navy-supported research; NIH Grant No. HD-02881; Grant No. NGR-05-020-168.

Brief description of the theory and use of instruments applicable to the study of neuroregulatory agents. One strategy of investigation is to measure the level of the compounds in the brain, or in areas of the brain. A second strategy involves the use of radio-labeled compounds, while a third strategy is concerned with the enzymatic formation of particular compounds. M.M.

### A70-30348 \* Epinephrine formation and metabolism in mammalian brain.

Jack D. Barchas, Roland D. Ciaranello, and Alan M. Steinman (Stanford University, Palo Alto, Calif.). (*Society of Biological Psychiatry, Annual Meeting, Washington, D.C., June 14-16, 1968.*) *Biological Psychiatry*, vol. 1, 1969, p. 31-48. 25 refs. Navy-supported research; NIH Grant No. HD-02881; NSF Grant No. B 6-2028E; Grant No. NGR-05-020-168.

Study of the uptake and metabolic disposition of intravenously and intraventricularly administered epinephrine and the enzymatic formation of epinephrine in rat brain. The amount of epinephrine which could be taken up by the brain following peripheral administration was determined. Studies of uptake and metabolism of epinephrine were performed to elucidate the pathways and turnover of the endogenous brain hormone. Finally, examinations seeking to demonstrate the enzymatic synthesis of epinephrine in brain were carried out. The results are discussed and summarized. O.H.

### A70-30349 \* Evolutionary pattern of specificity regions in light chains of immunoglobulins.

Thomas H. Jukes (California, University, Berkeley, Calif.). (*Biochemical Genetics*, vol. 3, 1969, p. 109-117. 33 refs. Grant No. NGR-05-003-020.

Examination of the distribution of changes of single amino acids in the specificity (S) regions of light polypeptide chains of immunoglobulins G (IgG), by using criteria that correspond to a

conventional model for evolution of proteins. The examination shows that the changes, in terms of minimum base changes at each site, correspond quite well with the Poisson distribution. The findings are concordant with other evidence that the S regions are evolving in a manner similar to that in other series of homologous proteins. It is suggested that mutations in S regions are predominantly adaptive and that those in carboxyl-terminal common (C) regions are usually deleterious, thus accounting for the variability of S and the constancy of C sequences. O.H.

### A70-30364 \* Chemical evolution and the origin of life.

Cyril Ponnampuram (NASA, Ames Research Center, Exobiology Div., Moffett Field; Stanford University, Stanford, Calif.). (*Medical Society of the State of New York, Annual Meeting, 163rd, New York, N.Y., Feb. 9, 1969.*) *New York State Journal of Medicine*, vol. 70, May 15, 1970, p. 1169-1175. 21 refs.

Outline of experimental simulation studies demonstrating the possibility of developments leading to replicating molecules on the primordial earth before life appearance. These studies have shown that alpha-aminonitriles, which are precursors of amino acids, can be synthesized. Some form of chemical evolution may be taking place on Jupiter. The obtained results suggest that the red colors of the planet may be due to a ruby-red organic polymer formed when a mixture of methane and ammonia is exposed to electric discharges. These experimental studies lend support to the hypotheses of chemical evolution and of the existence of extraterrestrial life. M.V.E.

### A70-30366 Infectious disease hazards in space flight.

Paul W. Musgrave (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). (*Medical Society of the State of New York, Annual Meeting, 163rd, New York, N.Y., Feb. 9, 1969.*) *New York State Journal of Medicine*, vol. 70, May 15, 1970, p. 1179-1182.

Review of the conditions encountered in space flight that give rise to infectious disease hazards. The environmental conditions within space vehicles include factors which may affect man's resistance to infection as well as the transmission of etiologic agents. It is clear from the limited studies accomplished thus far that adverse effects do occur, but the mechanisms involved have not been identified. Resistance to specific diseases is not affected in a uniform manner, that is, certain conditions may affect resistance to one agent but not to another. Bacterial and viral diseases are both affected. Observations from actual flights are sketchy but indicate that problems may be expected, and it should be emphasized that infectious episodes assume much more importance when they involve astronauts. M.V.E.

### A70-30376 Institut de Génie Biologique et Médical,

Congress of Medical Electronics and Bioengineering, 2nd, Nancy, France, June 30-July 5, 1969, Reports (Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969, Communications). *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970. 426 p. In French.

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Equipment and method for the easy, accurate and reproducible implementation of provocative tests by inhalation in functional respiratory exploration (Appareillage et méthode pour la réalisation aisée, précise et reproductible des tests de provocation par inhalation en exploration fonctionnelle respiratoire). A. Balmes, J. Dauverchain, and J. Piglowski (Montpellier, Université, Montpellier, France), p. 53-55. (See A70-30377 14-05)

Spirometry on separated lungs using the method of measurement of impedance changes (Spirométrie sur poumons séparés par la méthode de mesure des variations d'impédance). L. Gougerot and P. Monzein, p. 56-61. (See A70-30378 14-05)

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Diaphragm function from the cinedensigraphic standpoint (La fonction du diaphragme du point de vue cinédensigraphique). B. Koci (Institut de Physiologie Clinique, Prague, Czechoslovakia) and K. Skarvan, p. 134-141. 11 refs. (See A70-30383 14-04)

Study of the influence of intentional scolioses on intra-pulmonary blood circulation in the healthy subject (Etude de l'influence des scolioses intentionnelles sur la circulation sanguine intra-pulmonaire chez le sujet sain). P. Egg, p. 147-151. (See A70-30384 14-04)

Circulatory phenomenon and deep thoracic impedance changes (Le phénomène circulatoire et les variations d'impédance thoracique profonde). L. Gougerot and P. Monzein, p. 152-157. (See A70-30385 14-04)

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Simulation of the neuron membrane - Generation and propagation of nervous impulses (Simulation de la membrane neuronique - Génération et propagation d'influx nerveux). J. Hérault and M. Buyle-Bodin (Ecole Nationale Supérieure d'Electronique et de Radioélectricité, Grenoble, France), p. 279-285. 6 refs. (See A70-30387 14-05)

New methods of investigation in the measurement and exploitation of delay times and of ocular tracking (Nouvelles méthodes d'investigation dans la mesure et l'exploitation des temps de latence et du tracking oculaire). C. Doche (SERCEL, Carquefou, Loire-Atlantique, France), J. Max, S. Garrel, and Y. Meyrieux (CEDEX, Grenoble, France), p. 307-316. (See A70-30388 14-04)

Development of a permittivity variations detector - Application to the study of blood circulation by telemetry (Réalisation d'un détecteur de variations de permittivité - Application à l'étude de la circulation sanguine en télémétrie). L. Pourcelot, Th. Planiol, R. Floyrac, and J.-M. Pottier (Orléans-Tours, Université, Tours, Indre-et-Loire, France), p. 379-383. (See A70-30389 14-05)

**A70-30377**      **Equipment and method for the easy, accurate and reproducible implementation of provocative tests by inhalation in functional respiratory exploration (Appareillage et méthode pour la réalisation aisée, précise et reproductible des tests de provocation par inhalation en exploration fonctionnelle respiratoire).** A. Balmes, J. Dauverchain, and J. Piglowski (Montpellier, Université, Montpellier, France). (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 53-55. In French.

Description of an equipment and method which make it possible to measure the volume of aerosol placed in contact with bronchopul-

monary effectors in the determination not of the inhaled volume but of the volume of air exhaled following inhalation. This equipment uses normal respiratory cycles and allows a regular progression of inhaled aerosol doses both from the standpoint of their volume and concentration. M.M.

**A70-30378**      **Spirometry on separated lungs using the method of measurement of impedance changes (Spirométrie sur poumons séparés par la méthode de mesure des variations d'impédance).** L. Gougerot and P. Monzein. (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 56-61. In French.

Description of measurements of model impedance changes induced by local conductivity variations. These measurements make it possible to determine that when Barnett's electrodes are placed in an appropriate position on each side of the chest during breathing, deep thoracic impedance variations, thus recorded, are in contact with variations in pulmonary parenchymal resistivity during the respiratory cycle. This is a method for measuring the separate ventilation of each lung. M.M.

**A70-30379**      **Cycloergometer with a powder-type electromagnetic brake for respiratory and circulatory measurements and functional rehabilitation (Cyclo-ergomètre à frein électromagnétique à poudre pour mesures respiratoires, circulatoires, et rééducation fonctionnelle).** J. Lacoste, M. Henry, and C. Kleinmann (Institut de Génie Biologique et Médical, Nancy, France). (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 69-71. In French. Research supported by the Conseil Général de la Meurthe-et-Moselle.

Description of a new type of cycloergometer which combines features of simplicity, convenience, precision and fidelity. The cycloergometer is very little noisy and very sturdy, its maintenance and wear and tear are minimal. Its arrangement facilitates medical maneuvers on the subject. M.M.

**A70-30380**      **Ventilating flowmeter tests with jet deflection (Essais de débitmètre ventilatoire à déviation de jet).** B. Lepley and J. Lacoste (Institut de Génie Biologique et Médical, Nancy, France). (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 72-82. 7 refs. In French. Délégation Générale à la Recherche Scientifique et Technique Contract No. 69 01 705.

Investigation of problems posed by the measurement of respiration in a patient. Measurements made by means of a unit which can be compared to a fluid amplifier and in which the air jet involved in respiration constitutes the vital control device acting on an auxiliary jet whose function is that of following changes in the respiratory flow, are described. M.M.

**A70-30381**      **Device for detecting coincidences among the different phases of cardiac and respiratory cycles (Dispositif pour la détection des coincidences entre les différentes phases des cycles cardiaque et respiratoire).** R.-J. Plaszczynski (Thomson Médical, Saint-Cloud, Hauts-de-Seine, France). (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 94-101. 16 refs. In French.

Description of a simple self-contained device which allows the release of cardiopulmonary X-rays in well defined phases. The validity of the information on which the device is based is discussed.

The device makes it possible to make photographic plates under entirely physiological conditions and does not cause any inconvenience to the subject. M.M.

**A70-30382** Measurement of thoracic impedance changes in the study and monitoring of respiration in premature infants (La mesure des variations d'impédance thoracique dans l'étude et la surveillance de la respiration chez le prématuré). O. Dubois (Centre Hospitalier, Arras, Pas-de-Calais, France) and J. Rousseau (Beckman Instruments France, Paris, France). (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 117-123, 27 refs. In French.

Discussion of the measurement of thoracic impedance changes in the monitoring of respiration in prematures. This method is very simple for the pediatrician, least uncomfortable for the patient and most reliable for long-term monitoring. It is pointed out that the experience so far garnered in the study of the physiology of respiration and of the physiopathology of Rds (Respiratory distress syndrome) is not ample enough but that it seems promising and needs additional research. M.M.

**A70-30383** Diaphragm function from the cinedensigraphic standpoint (La fonction du diaphragme du point de vue cinédensigraphique). B. Koci (Institut de Physiologie Clinique, Prague, Czechoslovakia) and K. Skarvan. (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 134-141, 11 refs. In French.

Cinedensigraphic analysis of diaphragmatic ventilatory movements. A very good correlation has been found in normal subjects between lung volume, diaphragm movement and vertical movement of the rib cage. The importance of correcting the measured apparent diaphragmatic excursion by simultaneously measuring the vertical movements of the rib cage in order to obtain the real diaphragm excursion is discussed. M.M.

**A70-30384** Study of the influence of intentional scolioses on intrapulmonary blood circulation in the healthy subject (Etude de l'influence des scolioses intentionnelles sur la circulation sanguine intra-pulmonaire chez le sujet sain). P. Egg. (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 147-151. In French.

Description of the modality of investigation, determination of the results, and conclusions drawn in the use of a photoelectrical pulmonary cinedensigraphic technique for studying the influence of unintentional scolioses. The experimental data obtained are shown in a summary table. M.M.

**A70-30385** Circulatory phenomenon and deep thoracic impedance changes (Le phénomène circulatoire et les variations d'impédance thoracique profonde). L. Gougerot and P. Monzein. (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 152-157. In French.

Measurements made on a model of impedance changes induced by local conductivity changes. These measurements make it possible to determine that small synchronous pulse changes, which overlap deep thoracic impedance changes of ventilatory origin, can be considered as a very faithful mirror of circulation in the pulmonary parenchyma, if suitable electrode position is used. M.M.

**A70-30386** Bundle of capillaries of silicone elastomers placed in a variable pressure chamber - Experimental setup and results (Faisceau de capillaires en élastomère de silicone placé dans une chambre à pression variable - Montage expérimental, résultats). J.-P. Gille and M. Courteaux (Institut National de la Santé et de la Recherche Médicale, Nancy, France). (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 222-226, 8 refs. In French. Délégation Générale à la Recherche Scientifique et Technique Contract No. 66 00 442.

Investigation of gas transfer through the wall of silicone capillaries, which is limited by the observed laminar flow. The setup and characteristics of a variable pressure enclosure containing these capillaries to experimentally alter the geometry of the exchanger are described. M.M.

**A70-30387** Simulation of the neuron membrane - Generation and propagation of nervous impulses (Simulation de la membrane neuronique - Génération et propagation d'influx nerveux). Jeanny Héroult and Maurice Buyle-Bodin (Ecole Nationale Supérieure d'Electronique et de Radioélectricité, Grenoble, France). (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 279-285, 6 refs. In French.

Consideration of the electronic simulation of the neuron, which is based on the reconstitution of the consequences of three main operations according to the conditions imposed by the equations of Hodgkin and Huxley (1952). A group of electronic circuits represents the permeability functions to the Na and K ions of the neuron membrane, as well as the diffusion time constants of these ions. The simulation of an elementary slice of axon demonstrates the process of generation of action potentials and confirms certain particularities of the response of the membrane to a physical excitation. The assembling of such slices one after the other restores the properties of propagation on the axon; this system makes it possible to predict a dispersion of the propagation velocity of the nervous impulses according to their frequency, and leads to the study of the mode of transmission to the synapse. F.R.L.

**A70-30388** New methods of investigation in the measurement and exploitation of delay times and of ocular tracking (Nouvelles méthodes d'investigation dans la mesure et l'exploitation des temps de latence et du tracking oculaire). C. Doche (SERCEL, Carquefou, Loire-Atlantique, France), J. Max, S. Garrel, and Y. Meyrieux (CEDEX, Grenoble, France). (*Institut de Génie Biologique et Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.*) *Génie Biologique et Médical*, vol. 1, Jan.-Mar. 1970, p. 307-316. In French.

Study of new methods of investigation and exploitation of ocular tracking and measurement of reaction times at various excitations. The methods are based simultaneously on information theory, on statistical data treatment, and on study of point processes and random phenomena. As far as tracking or ocular pursuit are concerned, attention is given to the index response, the impulse response, and the complex gain of the human operator by two methods: averaging of the response to a level, and analysis by Fourier transform of the stimulation-response. For measurement of the reaction time or the delay time, the parameters related to the first- and second-order statistics are successively studied. F.R.L.

**A70-30389** Development of a permittivity variations detector - Application to the study of blood circulation by telemetry (Réalisation d'un détecteur de variations de permittivité - Application à l'étude de la circulation sanguine en télémétrie). L. Pourcelot, Th. Planiol, R. Floyrac, and J.-M. Pottier (Orléans-Tours, Université, Tours, Indre-et-Loire, France). (*Institut de Génie Biologique et*

*Médical, Congrès d'Electronique Médicale et de Génie Biologique, 2nd, Nancy, France, June 30-July 5, 1969.) Génie Biologique et Médical, vol. 1, Jan.-Mar. 1970, p. 379-383. In French.*

Study of the mean permittivity modifications in a determined volume for various blood flows in order to avoid problems which arise when electrodes are placed on the skin to study blood circulation. The permittivities of blood and tissue are different, i.e., upon each increase or reduction of blood volume, a variation of the average permittivity of the medium can be detected. The apparatus consists basically of a high frequency oscillator tuned to a frequency of about 100 MHz. A condenser formed by two external plates serves as a tuner. These plates are covered with an insulating material so that there will be no electrical contact between them and the skin.

F.R.L.

**A70-30417 DC-9 pilot training.** M. Reist (Swissair AG, Kloten, Switzerland). *Shell Aviation News*, no. 382, 1970, p. 14-19.

Description of the Swissair DC-9 First Officer qualifying course, which takes between nine and twelve months, and is divided into three phases: jet introduction, DC-9 conversion, and route training. Concepts dealt with in the jet introduction course include centrifugal and axial compressors, turbofan engines, and the relationships of the various temperatures and pressures generated. Students are also acquainted with radio procedures, and fly as observers on the airline's network. The DC-9 conversion consists of theory, type simulator exercises, and flight training. Route training sees the practical application of techniques learned during the first two phases, upon conclusion of which the student is ready to take the right-hand seat unsupervised.

F.R.L.

**A70-30630 # Studies in the theory of automation and simulated biological systems (Issledovaniia po teorii avtomatov i modelirovaniu biologicheskikh sistem).** M. L. Tsetlin. Moscow, Izdatel'stvo Nauka, 1969. 316 p. 253 refs. In Russian.

This book contains a posthumous collection of theoretical studies and lectures of a noted Soviet specialist in cybernetics. The three sections of the book deal with his studies in the mathematical simulation of simple forms of rational behavior, with the game theory of automatic systems, with the development of automatic system designs, and with the mathematical simulation of biological systems. The mathematical basis developed by the late author for automatic system designs which win in a wide class of game theory problems is set forth in detail.

V.Z.

**A70-30692 Experimental biology of extreme environments and its significance for space bioscience.** II. S. M. Siegel (Hawaii, University, Honolulu, Hawaii). *Spaceflight*, vol. 12, June 1970, p. 256-259. 8 refs.

Examination of biological responses to various extreme space atmospheres. Several molecular types with molecular weights 2-108, including monoatomic elements, simple diatomics, and polyatomics, are reviewed as good candidates for planetary atmospheres. A qualitative analysis is made of the constituents of Earth's atmosphere and is compared to that of Mars. The difficult problem of atmosphere simulation is considered. Several data concerning seed germination in various experimental gases and oxidized and reduced N-atmospheres, general responses of various insects to reduced air pressure, and biological responses of various organisms to 100 per cent oxygen at 1.0 atmospheres, are tabulated.

O.H.

**A70-30725 \* Circannual rhythm in level and timing of serum corticosterone in standardized inbred mature C-mice.** E. Haus (Minnesota, University, Minneapolis, Minn.) and F. Halberg (St. Paul Ramsey Hospital, Minneapolis, Minn.). *Environmental Research*, vol. 3, Mar. 1970, p. 81-106. 95 refs. Research supported by the St. Paul

Ramsey Education and Research Foundation; PHS Grant No. 5-K-6-GM-13, 981; Grant No. NGR-24-005-006; Contracts No. NAS 2-2738; No. AF 29(600)-69-C-0011.

Demonstration of circannual variations in serum corticosterone levels in Balb/c mice. High values are found during the winter months and low values in late spring and summer. Cosinor analysis of the circadian rhythm of serum corticosterone during different times of the year shows a change in the circadian acrophase (crest) from about 43 deg in February to 95 deg in May. This change is evident after a seven-day standardization span at relatively constant temperatures. This circannual variation in circadian acrophase is compared with the time required for a phase shift after an abrupt change in lighting regimen: after a 180 deg shift of the lighting regimen, the change in the serum corticosterone acrophase reaches 45 deg in less than three days, over 100 deg in 4 days, and almost a full 180 deg in 7 days. Therefore, the circannual variation in the circadian system phase of the adrenal cycle shown in this study cannot be regarded as an incomplete phase shift such as occurs shortly after an abrupt shift of the lighting regimen. The underlying mechanisms of this presumably partly intrinsic circannual biorhythm await further study.

M.V.E.

**A70-30794 A free space-time traversal data-logging system for two human subjects.** M. J. Macculloch, C. J. Birtles, and Sarah Bond (Birmingham, University, Birmingham, England). *Medical and Biological Engineering*, vol. 7, Nov. 1969, p. 593-599. 23 refs.

Various techniques for measuring and recording human behavior are critically reviewed. These include direct visual observation, free space traversal, accelerometry and telemetry. A new free space traversal technique is described which introduces the possibility of more detailed analysis in terms of variation of spatial position over time, and also allows the simultaneous recording of two subjects. The system fulfils three requirements - high reliability, ease of data acquisition and handling, and minimal interference with the subject. The major components of the system are described in detail. (Author)

**A70-30795 \* A mass measuring device for use with biological specimens in zero-gravity environment.** M. S. Gardner, J. Dimeff, and E. Ogden (NASA, Ames Research Center, Moffett Field, Calif.). *Medical and Biological Engineering*, vol. 7, Nov. 1969, p. 601-606.

The mass and change of mass of biological specimens resulting from variations in environment and nourishment have long been used not only as indications of the physiological well-being of the specimen, but also as a necessary measurement in experiments designed to explain normal and disturbed physiological mechanisms. If the research is to be conducted under zero gravity, a standard weighing operation is not possible. A mass measurement instrument based on an oscillating spring-mass system has been developed for 'weighing' small biological specimens such as mice and their excised organs under weightless conditions. This instrument would be suitable for use in such space applications as the Manned Orbiting Research Laboratory. It has an accuracy of a few milligrams and a range of 50 g. It can readily be calibrated in its environment by the use of a few test masses.

(Author)

**A70-30796 A digital filter for biological data.** A. H. Wilcock and R. L. G. Kirsner (Melbourne, University, Melbourne, Australia). *Medical and Biological Engineering*, vol. 7, Nov. 1969, p. 653-660. 5 refs.

Discussion of a simple digital filter which provides a close approximation to an ideal zero phase filter for signals stored in a digital computer taking into consideration the use of such a filter with biological data. The operation of the filter is examined and the general filter function is discussed. It is found that zero or linear phase shift filtering can facilitate data analysis without distorting the time-relationship occurring in the data.

G.R.

**A70-30797** The effects upon electromagnetic flowmeter sensitivity of non-uniform fields and velocity profiles. Hiroshi Kanai (Sophia University, Tokyo, Japan). *Medical and Biological Engineering*, vol. 7, Nov. 1969, p. 661-676. 7 refs.

The magnetic flux density of implantable electromagnetic blood flowmeter cannot be made uniform, since the size of flowmeter probe must be very small for physiological reasons. The velocity distribution of blood flow is axially nonsymmetrical everywhere in arteries. Mainly for the above reasons the blood flow can not be measured accurately by implantable electromagnetic flowmeter. In this paper the relation between induced electromotive force and flow rate for implantable electromagnetic flowmeters is presented, and the errors introduced by the factors mentioned above are discussed. In order to measure pulsatile or axially nonsymmetrical flow accurately, appropriate flowmeter probes must be used. Some of these flowmeter probes are shown. (Author)

**A70-30798** An improved bipolar wire electrode for electromyography. R. N. Scott and G. B. Thompson (New Brunswick University, Fredericton, Canada). *Medical and Biological Engineering*, vol. 7, Nov. 1969, p. 677, 678. 7 refs. Research supported by the Department of National Health and Welfare, the Medical Research Council, the National Research Council, Canadian Rehabilitation Council for the Disabled.

Description of a bipolar wire electrode for electromyography in which the relative positions of the two uninsulated portions are securely fixed. A sketch of the twisted bipolar electrode in the needle showing controlled separation between bare areas is presented. The use of chemical insulation removers is discussed. It is pointed out that karma alloy wire of 0.002 in. diam, insulated with polyurethane enamel, was used for the electrodes. G.R.

**A70-30799** Simultaneous estimation of scaled interval histograms of different orders by a modified physiological analyzer. J. Škvařil and I. Krekule (Czechoslovak Academy of Sciences, Institute of Physiology, Prague, Czechoslovakia). *Medical and Biological Engineering*, vol. 7, Nov. 1969, p. 681, 682.

Description of a simple modification of an experimental data analyzer for estimating the scaled interval histograms (SIHs) of different orders simultaneously in such a way that each of the SIHs is written in one memory subgroup. The program performed by the modified analyzer is discussed. It is pointed out that the modification was proved on the KFKI NK 103 pulse height analyzer adapted for physiological purposes. G.R.

**A70-30897 \*** Magnitude estimates of the oculogyral illusion during and following angular acceleration. Richard D. Parsons (Litton Scientific Support Laboratory, Fort Ord, Calif.). *Journal of Experimental Psychology*, vol. 84, May 1970, p. 230-238. 22 refs. Grant No. NGR-05-046-002.

The present experiment was designed to examine the effects of brief, suprathreshold angular acceleration on the first effect and aftereffect of the oculogyral illusion. Ten objects scaled the oculogyral illusion according to a repeated-measurements, 4 by 4 factorial design, with four levels of acceleration (2, 3, 6, and 9 deg/sec/sec) and four durations (1, 3, 6, and 9 sec). The objects also reported magnitude estimates during control trials of constant velocity (zero acceleration). Systematic changes in magnitude estimates were obtained during and following accelerations, whereas control trials produced relatively low levels of visual autokinesis. It was shown that brief vestibular stimulations produce effects unexpected on the basis of current torsion-pendulum theory and that equal products of acceleration and time tend to produce similar behavioral effects. (Author)

**A70-30898 \*** Nonstationary processes and conservative inference. James O. Chinnis, Jr. and Cameron R. Peterson (Michigan University, Ann Arbor, Mich.). *Journal of Experimental Psychology*, vol. 84, May 1970, p. 248-251. Grant No. NGR-23-005-171.

The present experiment tested the hypothesis that people are conservative processors of fallible information because they treat stationary data-generating processes as if they were nonstationary, i.e., subject to change from time to time. The Ss made inferences from fallible data when the population from which the data were sampled could change during the sampling process. Performance on this task was compared with performance on a similar, but stationary, task. The Ss behaved differently in the two situations, appropriately assuming zero probability of change only in the stationary task. In addition, the pattern of conservatism in the two tasks requires rejection of the hypothesis that conservatism is due to inappropriate assumptions of nonstationarity. (Author)

**A70-30899** Perceptual displacement of a test mark toward the larger of two visual objects. Coleman T. Merryman (Texas University, Austin, Tex.) and Frank Restle (Indiana University, Bloomington, Ind.). *Journal of Experimental Psychology*, vol. 84, May 1970, p. 311-318. 10 refs. PHS Grant No. MH-12541; NSF Grant No. GB-5714.

Contour-repulsion concepts of satiation, fatigue, or inhibition explain some illusions, but not the fact that a hashmark between two squares of unequal size is perceived closer to the larger square. The aforementioned illusion could be explained as a result of distance perspective, for the larger square might be perceived as closer. This perspective theory cannot explain the fact that a vertical hashmark, placed between two vertical lines of unequal length, appears closer to the long line. Both results agree in quantitative detail with an adaptation-level model saying that the length of a test extent is judged relative to other nearby extents. (Author)

**A70-30900** Keeping track of sequential events - Multiple tallies and information rate. Robert Karsh (U.S. Army, Behavioral Research Laboratory, Aberdeen Proving Ground, Md.). *Journal of Experimental Psychology*, vol. 84, May 1970, p. 339-342. 7 refs.

The ability to keep track of sequential events was examined as a function of the rate of stimulus presentation and the number of categories of information displayed simultaneously. It was found that performance was a function of the 'information rate' defined as the first aforementioned variable divided by the second variable. Implications for a theory of keeping-track performance are discussed. (Author)

**A70-30908** International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings. Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz. Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970. 247 p. In English and French.

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The correlation between specific and nonspecific vestibular responses.

Evocation of vestibular nystagmus with the technique of conditioned reflexes - Interferences between specific and nonspecific vestibular stimulations. M. Arslan, D. Megighian, and C. Marchiori (Padova, Università, Padua, Italy), p. 63-66. 8 refs. (See

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The effects of arousal upon vestibular nystagmus. N. Torok (Illinois, University, Chicago, Ill.), p. 76-89. 18 refs. (See A70-30911 14-04)

Automatic fixation mechanisms and vestibular stimulation - Their study in central pathology with ocular fixation index during caloric tests. J.-P. Demanez and A. Ledoux (Liège, Université, Liège, Belgium), p. 90-98. 30 refs. (See A70-30912 14-04)

Vestibular habituation under normal and pathological conditions.

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Study on vestibular habituation among pilots and flying staff in terms of their training and seniority. P. Pialoux, J. Gibert, P. Blanc, Ch. Chouard, and P. Fontelle (Hôpital Lariboisière, Paris, France), p. 167, 168. (See A70-30914 14-04)

Studies on habituation of the human vestibular system. C. R. Pfaltz and P. Piffko (Basel, Universität, Basel, Switzerland), p. 169-179. 11 refs. (See A70-30915 14-04)

On the vestibular threshold. W. J. Oosterveld, J. B. Janeke, and L. B. W. Jongkees (Amsterdam, Universiteit, Amsterdam, Netherlands), p. 180-190. 29 refs. (See A70-30916 14-04)

Influence of cortical and subcortical factors on vestibular response (*Influence des facteurs corticaux et sous-corticaux sur la réponse vestibulaire*). G. F. Greiner, F. Rohmer, M. Collard, and C. Conraux (Strasbourg, Université, Strasbourg, France), p. 191-195. (See A70-30917 14-04)

## A70-30909

**Facilitation, inhibition and habituation of the vestibular responses.** M. Monnier, I. Belin, and P. Polc (Basel, Universität, Basel, Switzerland). In: International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings. (A70-30908 14-04) Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz, Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970, p. 28-52; Discussion, p. 53-55. 63 refs. Discussion in French and English.

Discussion of the definition, genesis, and characteristics of facilitation, inhibition and habituation of the vestibular responses. It is pointed out that the vestibular nystagmic and electrical responses are modulated by numerous subcortical and cortical systems. Facilitation results from an increase of the subliminal postsynaptic potentials, whereas inhibition is obtained by a decrease of the same postsynaptic potentials. The process of inhibition is of basic importance for habituation. The chief properties of habituation are summarized. It is concluded that habituation is perhaps also a fundamental property of the neurone, related to plasticity. M.M.

## A70-30910

**Evocation of vestibular nystagmus with the technique of conditioned reflexes - Interferences between specific and nonspecific vestibular stimulations.** M. Arslan, D. Megighian, and C. Marchiori (Padova, Università, Padua, Italy). In: International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings. (A70-30908 14-04) Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz, Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970, p. 63-66. 8 refs.

Application of the technique of conditioned reflexes to evoking vestibular nystagmus. Applying this technique, a typical vestibular nystagmus can be obtained after pure tone stimulation, without any stimulation of vestibular receptors. The pathway through which this phenomenon can be obtained is very probably the reticular formation in which integration processes take place between vestibular and acoustic afferences. M.M.

## A70-30911

**The effects of arousal upon vestibular nystagmus.** N. Torok (Illinois, University, Chicago, Ill.). In: International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings.

(A70-30908 14-04) Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz, Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970, p. 76-89. 18 refs.

Study of the effects of arousal on vestibular nystagmus in man. Mental alertness has been found to be a mandatory condition during vestibular testing. The clinician has observed from the earliest time that variations in nystagmic responses to vestibular stimulations occur not only between individuals but also in the same person at different occasions. It was found that forced mental alertness in the form of mental arithmetics at times enhanced, at times depressed, but often had no additional effect at all on the evoked vestibular nystagmus. M.M.

## A70-30912

**Automatic fixation mechanisms and vestibular stimulation - Their study in central pathology with ocular fixation index during caloric tests.** J.-P. Demanez and A. Ledoux (Liège, Université, Liège, Belgium). In: International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings. (A70-30908 14-04) Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz, Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970, p. 90-98. 30 refs.

Determination of the ocular fixation index and vestibular stimulation using the caloric tests of Fitzgerald and Hallpike. The central processes which regulate the nystagmic rhythm are beginning to be perceived; they appear to vary in nature according to whether ocular fixation is permitted or not, since an isolated functional involvement of each process may be demonstrated. M.M.

## A70-30913

**Pattern centre.** H. Festen and A. Clemens (Laboratory for Labyrinthology, Utrecht, Netherlands). In: International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings. (A70-30908 14-04) Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz, Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970, p. 100-106. 5 refs.

Experimental investigation of the pattern center hypothesis in man's habituation to a series of movements of a repetitive character. Experiments on human test subjects submitted to periodic movements of long duration, and studying the subsequent aftereffects by nystagmography, gave additional proof that centrifugal and other linear accelerations had been effective apart from the rotation. M.M.

## A70-30914

**Study on vestibular habituation among pilots and flying staff in terms of their training and seniority.** P. Pialoux, J. Gibert, P. Blanc, Ch. Chouard, and P. Fontelle (Hôpital Lariboisière, Paris, France). In: International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings. (A70-30908 14-04) Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz, Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970, p. 167, 168.

Description of a study of vestibular habituation on four groups of flying personnel from the standpoint of their training and seniority. The results obtained are detailed for each of the four groups studied. M.M.

## A70-30915

**Studies on habituation of the human vestibular system.** C. R. Pfaltz and P. Piffko (Basel, Universität, Basel, Switzerland). In: International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings. (A70-30908 14-04) Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz, Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970, p. 169-179. 11 refs.

Study of the correlation between acquisition, retention and transfer of vestibular habituation on the one side, and the method of stimulation on the other side. It is pointed out that habituation of

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the vestibular system may be achieved by repetitive physiological and nonphysiological stimulation of the end-organ, but only if both visual fixation and binaural application of the stimulus are granted. Alertness and arousal are probably some of the most important factors involved in the occurrence of habituation. Unidirectional habituation does not occur under physiological conditions. M.M.

**A70-30916**      **On the vestibular threshold.** W. J. Oosterveld, J. B. Janeke, and L. B. W. Jongkess (Amsterdam, Universiteit, Amsterdam, Netherlands). In: International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings. (A70-30908 14-04) Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz. Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970, p. 180-190. 29 refs.

Investigation of the possibility that vestibular threshold values might be the same if they were measured under higher or lower gravity conditions than 1 g. It was found that threshold values of the vestibular system for angular accelerations are dependent on gravity. Especially the sensitivity of the canals seems to be influenced by linear accelerations acting on the otoliths. Therefore, one of the many factors that define the value of the vestibular threshold is the size of gravity. This means a peripheral vestibular effect. Also some drugs, including alcohol, do influence the vestibular threshold. In this case both the peripheral vestibular organ and the central nuclei and pathways are the affected areas. M.M.

**A70-30917**      **Influence of cortical and subcortical factors on vestibular response (Influence des facteurs corticaux et sous-corticaux sur la réponse vestibulaire).** G. F. Greiner, F. Rohmer, M. Collard, and C. Conraux (Strasbourg, Université, Strasbourg, France). In: International Otoneurological Symposium, Basel, Switzerland, 1969, Proceedings. (A70-30908 14-04) Symposium sponsored by the Universität Basel. Edited by C. R. Pfaltz. Basel, S. Karger AG (Advances in Oto-Rhino-Laryngology. Volume 17), 1970, p. 191-195. In French.

Comparative study of the electronystagmographical responses and of the electroencephalographic record during prolonged sustained torsion swing tests, under the influence of various central factors. It was found that, with the normal subject, the electronystagmogram remains absolutely steady and unchanged, whatever the duration of the test and the psychological conditions of the subject. Only two factors modify its course: the degree of consciousness and the opening-closing of the eyes. The reproducibility of the response is remarkable during such test in contrast with the variability of the response during caloric stimulations, particularly under the influence of psychological and vasomotor factors. M.M.

**A70-30956 \***      **Effect of chronic exposure to hypoxia on development and maintenance of renal hypertension in rats.** Melvin J. Fregly (Florida, University, Gainesville, Fla.). *Society for Experimental Biology and Medicine, Proceedings*, vol. 134, May 1970, p. 78-82. 18 refs. Grant No. NSG-542.

Experimental investigation in which the exposure of rats to an atmosphere containing 13% oxygen immediately after encapsulation of their kidneys with latex envelopes prevented the elevation of systolic blood pressure to the level of encapsulated controls maintained in an atmosphere containing 21% oxygen. The protection afforded remained only as long as the rats were exposed to hypoxia. The mechanism responsible for the protection observed is unknown but may be associated with one or a number of the physiological and biochemical changes induced by hypoxia. M.M.

**A70-30986**      **Circadian rhythm of brain self-stimulation behavior.** Michael Terman and Juan S. Terman (Northeastern University, Boston, Mass.). *Science*, vol. 168, June 5, 1970, p.

1242-1244. 21 refs. PHS Grants No. MH-16218-01; No. FR-07085-03.

Under constant conditions of light, sound, temperature, and humidity, rats exhibited circadian rhythmicity in rate of bar-pressing with hypothalamic and septal reinforcing brain stimulation. Variations in reinforcer magnitude affected absolute levels of operant response emission but not the frequency of the circadian rhythm. In long sessions, the time of peak responding deviated systematically from a strict 24-hour period. Such data show marked similarity to free-running rhythms of motor activity. (Author)

**A70-31115 #**      **The nature of human error.** Lynn V. Rigby (Sandia Laboratories, Albuquerque, N. Mex.). In: American Society for Quality Control, Annual Technical Conference, 24th, Pittsburgh, Pa., May 11-13, 1970, Transactions. (A70-31101 14-15) Milwaukee, Wis., American Society for Quality Control, Inc., 1970, p. 457-466. 7 refs. AEC-supported research.

Discussion of the nature, frequency, effects, and controllability of human error. A brief review of human variability is followed by definitions of such human error varieties as random, systematic, and sporadic errors. The variability of tasks and the causes of human error are examined along with the frequency and importance of human error. The aspect of chance vs error proneness and the means of analysis and reduction of human error are discussed. M.V.E.

**A70-31164**      **An automatic recording respirometer.** A. I. Mytelka (Interstate Sanitation Commission, New York, N.Y.) and W. E. Brenner (AeroChem Research Laboratories, Inc., Princeton, N.J.). (*Instrument Society of America, National Symposium, 15th, New Orleans, La., May 5-7, 1969.*) *ISA Transactions*, vol. 9, no. 1, 1970, p. 17-21. 7 refs.

Discussion of a respirometer designed for determining a large number of long-term respirometry curves for industrial wastes. Oxygen produced by electrolysis is maintained at constant pressure in each respirometer cell by regulating the time during which oxygen is produced. Six reaction vessels are simultaneously controlled by individual cell modules. The amount of oxygen consumed in each reaction vessel is totaled separately, and is printed out on command from a logic unit at predetermined time intervals. The logic unit can accommodate up to 99 individual cell control modules with printout in any desired sequence. The predetermined time intervals can be varied from 20 min to 10 hr. Typical results obtained and the advantages of the instrument, such as extensive reduction in labor time to set up and carry out the test and to reduce the data, are examined. V.P.

**A70-31167 #**      **Sensory function in multimodal signal detection.** Sanford Fidell (Michigan, University, Ann Arbor, Mich.). *Acoustical Society of America, Journal*, vol. 47, Apr. 1970, pt. 2, p. 1009-1015. 14 refs. ARPA-supported research.

Five observers detected a sinusoid in noise in a two-interval forced-choice experiment. The signal could occur on an earphone, on an oscilloscope, or on both devices simultaneously. Detection performance was studied as related to (1) mode of occurrence of the signal(s); (2) the external noise correlation in the auditory and visual channels; and (3) the observers' a priori knowledge of the mode of occurrence of the signal. The observed improvement in sensitivity (measured in d' units) as a function of bimodal signal presentation closely followed the predictions of a statistical summation model and was much lower than predicted by linear and probabilistic addition models. Under conditions of independence of noise in the auditory and visual channels, some improvements in sensitivity were of almost 3 dB. The improvement in sensitivity afforded by a priori knowledge of the mode of occurrence of the signal was less for bimodal signals than for unimodal signals. (Author)



**A70-31173**      **2000 metre race as endurance test (2000-m-Lauf als Ausdauerstest).** D. Clasing (Münster, Universität, Münster, West Germany). *Wehrmedizinische Monatsschrift*, vol. 14, May 1970, p. 101-103. 7 refs. In German.

Fifty-one students were subjected to a radiological heart volume estimation, to a bicycle ergometer test with increasing load every six minutes, and to a standardized 2000 meter race. Before, during, and after the race, the heart rate was observed radiotelemetrically. By comparison of the individual results, it is evident that the standardized 2000 meter race may be used as an endurance test. (Author)

**A70-31321 \***      **A small animal acto-ballistocardiograph - Description and illustrations of its use.** John W. Tremor and Vernon L. Rogallo (NASA, Ames Research Center, Moffett Field, Calif.). *Physiology and Behavior*, vol. 5, 1970, p. 247-251. 16 refs.

A device has been developed to measure the activity, respiratory movements and heart rate of small animals without imposing the interfering effects of implantation, restraint, probes, tip cages, running wheels, etc. The piezoelectric principle of measuring change in force by change in voltage output as induced by crystal distortion is utilized. Environmental noise is minimized by an inherent rejection feature. Biorhythms of activity have been monitored in *Sceloporus occidentalis*, *Perognathus longimembris* and the chicken embryo. Heart rate and respiration movements have also been monitored in the latter two organisms. (Author)

**A70-31346**      **A molecular respiratory reflex and a fluorescent signal of severe hypoxia.** B. Rybak, B. Chance, B. Paddle, and A. Kaplan (Pennsylvania, University, Philadelphia, Pa.). *Life Sciences, Part 1 - Physiology and Pharmacology*, vol. 9, May 15, 1970, p. 557-568. 12 refs. Research supported by the Délégation Générale à la Recherche Scientifique et Technique and the Eldridge Reeves Johnson Foundation for Medical Physics.

Description of experiments in which changes in the reflectance and fluorometric behavior of cardiac tissues vs intracellular redox kinetics were measured in rabbits during hypoxia by applying techniques described by Chance et al. (1962, 1963). The redox state of intracellular pyridine nucleotides is determined in experimental rabbits by using pO<sub>2</sub> probes. V.Z.

**A70-31348**      **Binocular single vision and depth discrimination - Receptive field disparities for central and peripheral vision and binocular interaction on peripheral single units in cat striate cortex.** D. E. Joshua (Sydney, University, Sydney, Australia) and P. O. Bishop (Australian National University, Canberra, Australia). *Experimental Brain Research*, vol. 10, May 26, 1970, p. 389-416. 25 refs.

Description of a neurophysiological theory for binocular single vision and depth discrimination, intended as a theoretical framework for the construction of the horopter for the cat as well as a region analogous to Panum's fusional area in man. The properties of receptive fields far away from the center of gaze are described on the basis of an analysis of receptive field disparities for peripheral vision. Observations have been made on the responses, particularly to moving slit stimuli, of units with peripherally located receptive fields. For several binocular units, it was possible to study the full range of the binocular interaction when the two receptive fields were moved from exact correspondence to positions of increasing nonalignment. T.M.

**A70-31349**      **The visual perception of space (Die visuelle Raumwahrnehmung).** Norbert Günther (Carl Zeiss, Aalen, West Germany). Stuttgart, Wissenschaftliche Verlagsgesellschaft mbH (Optik und Feinmechanik in Einzeldarstellungen. Volume 7), 1969. 98 p. 36 refs. \$5.30. In German.

This book discusses the theory of monocular vision and binocular space perception taking into consideration fundamental concepts of 'biological optics'. Basic definitions of 'biological optics' which comprises physical, physiological and psychic processes are discussed. A model representing the eye for the study of the processes of vision is considered. The apparent magnitude of celestial bodies as seen by the human eye is investigated. The visual information equations are presented and the stereoscopic observation of aerial photos is discussed. G.R.

**A70-31408 \***      **An optimal control model of human response. I - Theory and validation.** D. L. Kleinman, S. Baron, and W. H. Levison (Bolt Beranek and Newman, Inc., Cambridge, Mass.). *Automatica*, vol. 6, May 1970, p. 357-369. 21 refs. Contract No. NAS 12-104.

Application of optimal control and estimation theory is made to a wide class of problems in manual control. The situation considered is that for which the dynamical system being tracked is linear and is perturbed by an external white noise input. By assuming that the human behaves 'optimally' in some sense, subject to his inherent psychophysical limitations, a quantitative model is developed for the response characteristics of the human operator. The resultant suboptimal model can be used to predict task performance, measured human controller describing functions, remnant and power spectra. The model is described in detail and is used to predict experimentally measured quantities for three simple, but basic, compensatory tracking tasks. In a companion paper the model is applied to study a complex VTOL hovering task. (Author)

**A70-31409**      **An optimal control model of human response. II - Prediction of human performance in a complex task.** S. Baron, D. L. Kleinman, and W. H. Levison (Bolt Beranek and Newman, Inc., Cambridge, Mass.). *Automatica*, vol. 6, May 1970, p. 371-383. 6 refs. Contract No. AF 33(615)-68-C-1192.

An optimal-control model of the human operator is used to analyze a manual control task involving the control of longitudinal position of a hovering VTOL aircraft. Using parameters that are obtained largely from analysis of simple experiments, it is shown that the model can reproduce the essential characteristics of pilots performing the VTOL task as well as system performance scores. In addition, the same optimization framework is used to predict visual scanning behavior. (Author)

**A70-31413**      **Control of a robot in a partially unknown environment.** W. G. Keckler (Washington University, St. Louis, Mo.) and R. E. Larson (Systems Control, Inc., Palo Alto, Calif.). (International Federation of Automatic Control, Congress, 4th, Warsaw, Poland, June 1969.) *Automatica*, vol. 6, May 1970, p. 469-476. 15 refs. Contract No. AF 30(602)-4147.

This paper discusses the problem of controlling the motion of a robot in a partially unknown environment. The problem can be formulated as a stochastic control problem with some state variables related to the physical dynamics of the robot and others related to the information the robot has obtained about the environment. First, a dynamic programming procedure that calculates the optimum policy for the robot is described. Next, a heuristic method that is capable of solving much larger problems is presented. The performance of the heuristic is shown to compare favorably with that of humans in complex examples. (Author)

**A70-31430**      **Factors influencing the circadian periodicity of adrenal steroid levels.** Dorothy T. Krieger (Mount Sinai School of Medicine, New York, N.Y.). *New York Academy of Sciences, Transactions, Series 2*, vol. 32, Mar. 1970, p. 316-329. 42 refs.

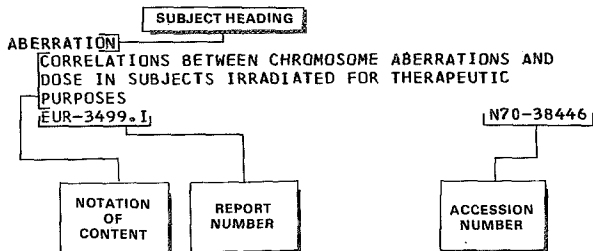
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Study of the circadian variation of pituitary-adrenal function and possible mechanisms underlying this periodicity. Experiments are made to ascertain what factors are responsible for the circadian activation of the central nervous system with regard to this periodicity of pituitary-adrenal function. It is shown that circadian periodicity in many variables is a function of age, and that light is the most common and important synchronizing agent for circadian rhythms. The role of light in initiating the level of central nervous system organization required for circadian periodicity is examined in detail. In addition, a more detailed definition is presented of some characteristics of the 'normal' circadian pattern of adrenal steroid levels, especially with regard to the conditions under which it is determined, its reproducibility, and its characteristics obtained by means of greater sampling frequency. O.H.

# Subject Index

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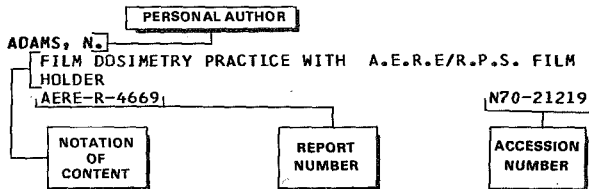
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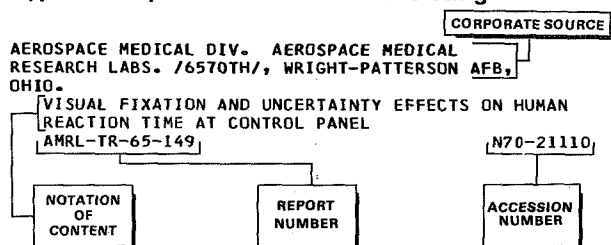


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