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# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY

### WITH INDEXES

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NASA SP-7011(51)

# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during May 1968.

*Scientific and Technical Information Division*
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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 Aerospace Medicine and Biology Bibliography Project of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics (AIAA), and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

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

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

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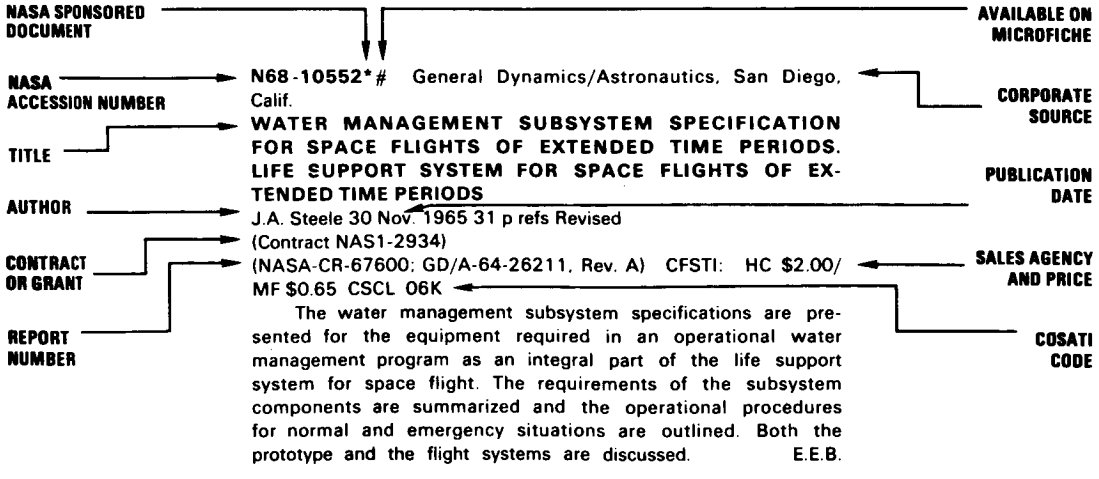

NASA

# AEROSPACE MEDICINE AND BIOLOGY

*a continuing bibliography* JUNE 1968

## STAR ENTRIES

**N68-18266#** Army Medical Research Lab., Fort Knox, Ky. Experimental Psychology Div.

**EFFECTS OF ATTENDING TO AUDITORY SIGNALS ON THE MAGNITUDE OF THE ACOUSTIC REFLEX Progress Report**

Walter J. Gunn 25 Sep. 1967 33 p refs

(Rept.-751; AD-664133)

In order to test the hypothesis that the acoustic reflex (AR) is inhibited while subjects listen for faint signals or while they track their threshold for a 250 Hz tone, two experiments were conducted in which the main objective was to measure the effects of attention demanding conditions on the magnitude of the AR. In the first of these, subjects were required to detect faint signals (threshold level clicks) in either phone ear or probe ear while the AR was elicited by a one second, 1500 Hz tone. The control condition consisted of merely remaining alert but not listening for a signal during the reflex elicitation. The results of this experiment did not demonstrate any significant effect of listening for faint clicks in either contralateral or homolateral ear on the magnitude of the AR. In the second experiment, subjects tracked a 250 Hz threshold level tone before and during eliciting tones of 15 seconds duration in the same ear. In the control condition, they merely remained alert during the elicitation. Results of this experiment showed the magnitude of the AR to be significantly ($p < .05$) larger when the subjects tracked the 250 Hz tone than when not tracking. These results do not support the notion of inhibition of the AR by subjects listening for faint sounds (Smith and Loeb, 1967). Author (TAB)

**N68-18294#** Boeing Co., Wichita, Kans.

**SUBJECTIVE REACTION TO DUAL FREQUENCY VIBRATION**

Stanley H. Brumaghim Dec. 1967 54 p refs

(Contract Nonr-2994(00))

(D3-7562; AD-664510) CFSTI: HC $3.00/MF $0.65

The purpose of the study was to provide information regarding subjective reaction to dual frequency vibration. Eight male volunteers rated Perceptible, Mildly Annoying, and Extremely Annoying levels of body resonant vibration (4, 5, 6, 8 and 10 cycles per second) under three conditions of background vibration. The background conditions were: (a) no background vibration, (b) 17 cycles per second (cps) vibration at 0.38 g, zero-to-peak, and (c) 17 cps vibration at 0.68 g, zero-to-peak. Under conditions of dual frequency vibration, subjects rated the effects of only the variable vibration frequencies and ignored the presence of the background vibration as much as possible. Vibration at each frequency was sinusoidal and in the vertical axis; subjects were seated. In general, subjective reaction curves obtained under no background vibration conditions were similar to those reported previously. Subjective thresholds to the variable frequencies at the Mildly Annoying and Extremely Annoying levels, were lowered as the severity of the background vibration was increased. The profiles of the subjective reaction curves were unchanged, in general, when ratings were made in the presence of the 0.38 g, 17 cps vibration. However, in the presence of the 0.68 g 17 cps background, Mildly Annoying subjective thresholds to vibration at the body resonant frequencies were inversely related to the difference between the primary and background frequencies. The Extremely Annoying subjective reaction curve again assumed the characteristic curvilinear profile. Subjects were highly consistent in making their ratings. Author (TAB)

**N68-18298#** Barry Wright Corp., Watertown, Mass. Controls Div.

**RESEARCH ON ACTIVE VIBRATION ISOLATION TECHNIQUES FOR AIRCRAFT PILOT PROTECTION Final Report, Jun. 1965–Dec. 1966**

Peter C. Calcaterra and Dale W. Schubert Wright-Patterson AFB, Ohio AMRL Oct. 1967 51 p refs

**(Contract AF 33(615)-2955)**

**(AMRL-TR-67-138; AD-664090)**

An investigation was conducted to evaluate the feasibility of protecting pilots from the vertical dynamic excitations experienced during low-altitude, high-speed (LAHS) flight by means of active isolation techniques. Performance specifications for candidate isolation systems were evolved based on definition of the expected dynamic environment, human tolerance levels, and cockpit clearance. Required vibration isolation and maximum relative displacement values were postulated. Analyses of existing isolation techniques indicated that, for the selected dynamic environment typically experienced during LAHS flights in the vertical direction (i.e., combined vibration and sustained acceleration excitations), passive systems cannot provide the required degree of vibration isolation while simultaneously limiting the maximum relative displacement to the desired values. Various active isolation techniques were evaluated. An active hydraulic system was selected, employing acceleration and displacement feedback mechanisms. Analyses were conducted to define the type of compensation and loop gains required to provide the desired isolation, limit the dynamic deflection, and maintain system stability. A laboratory model for experimental research was designed and tested. Test results show that the developed active hydraulic isolation technique provides the vertical isolation and displacement control postulated to be required for pilot protection during LAHS flight. In addition, the system exhibits zero static deflection, and is essentially insensitive to forces applied at the isolated payload, and to human-body resonance coupling effects. Author (TAB)

**N68-18304#** Weizmann Inst. of Science, Rehovoth (Israel).
**INFLUENCE OF OXYGEN TOXICITY ON THE RATE OF RED CELL AGING Final Report**
Dave Danon Wright-Patterson AFB, Ohio AMRL Sep. 1967 20 p refs
(Contract AF 61(052)-879)
(AMRL-TR-66-168; AD-664339)

The effect of oxygen toxicity on red cell aging was experimentally studied. The alterations in age distribution of red cells of rabbits submitted to a high oxygen concentration was determined by density distribution, osmotic fragility, acid fragility, and electron microscopy. Increased osmotic fragility and density of the red blood cells as well as an increased resistance to acid fragility is indicative of an increased population of structurally old cells. Red cell membranes as seen in the electron microscope present morphological features in agreement with this interpretation. Author (TAB)

**N68-18329#** Bolt, Beranek, and Newman, Inc., Van Nuys, Calif.
**THE EFFECTS OF BACKGROUND NOISE UPON PERCEIVED NOISINESS**
David C. Nagel, John E. Parnell, and Hugh J. Parry Dec. 1967 61 p refs
(Contract FA-65-WA-1180)
(FAA-DS-67-22; AD-663902)

Cross modality tests, in which subjects matched the apparent intensity of a 100 Hz vibration applied to the fingertip to the noisiness of one-third octave bands of noise with center frequencies of 125 Hz, 1000 Hz and 4000 Hz, have been conducted to measure the effects of background noise upon the judged noisiness of the bands of noise. The tests have indicated that the growth function for noisiness behaves somewhat like a modified power function of the form psi = k (I to the n power - (I sub o) to the n power) where psi is noisiness, I is the intensity of the stimulus, Io is the threshold intensity for the stimulus in a given background noise and k and n are constants which depend upon the frequency of the stimulus noise band. On the basis of the results of the cross modality tests, a calculation scheme has been developed to account for the effects of background noise in the perceived noise level calculation. The calculation procedure reduces, differentially, the sound pressure level of each third octave band of the judged noise by an amount dependent upon the signal-noise-to-background-noise ratio in that frequency band. For signal-noise-to-background-noise ratios of greater than 65 dB, the band correction is equal to zero. However, preliminary calculations have shown that for realistic background spectra and signal-noise-to-background-noise ratios of 40 dB, the effect upon the perceived noise level of a judged noise, as predicted by the calculation scheme, is approximately 3 PNdB. Author (TAB)

**N68-18340#** RAND Corp., Santa Monica, Calif.
**ACID-BASE METABOLISM AND THE PROTON CONDITION**
C. D. Russell Dec 1967 49 p refs
(Contract F44620-67-C-0045; Proj. RAND)
(RM-5451-PR; AD-664038)

Application is made of the proton condition of inorganic chemistry to the problem of describing the net acid content in a biological system. A proton content is defined that expresses the net acid content in terms of the detailed chemical composition of the system. This approach is compared with previous approaches to the quantitative description of acid-base metabolism and is then applied to the interpretation of experimental metabolic balances. The principal advantage of the mathematical formalism described in this study is that its use pinpoints the assumptions and makes it possible to handle unusual cases simply by including terms that are normally neglected. Author (TAB)

**N68-19369#** Oak Ridge National Lab., Tenn.
**RADIATION EFFECTS IN MAMMALIAN TISSUES**
Arthur C. Upton *In its* Radiation Biol. 5 Aug. 1965 p 25-35 (See N68-19365 09-04)

Case histories, chosen mainly from early workers in the field of radiation, are presented to illustrate the effects of radiation on the skin and other organs. The radiosensitivity of cells is examined, and the biological effects of various radiation levels are described for human and animal subjects. It is shown that irradiation interferes with the ability of cells to divide, but not necessarily to metabolize. Indications of cells repairing radiation damage are reported. E.J.S.

**N68-18375#** Agricultural Research Service, Ithaca, N. Y. Soil and Water Conservation Research Div.
**THE ENERGY BUDGET AT THE EARTH'S SURFACE: ASSESSING SOURCES AND SINKS OF CARBON DIOXIDE IN A CORN CROP USING A MOMENTUM BALANCE APPROACH Interim Report**
E. R. Lemon and J. L. Wright Jul. 1967 26 p Prepared in cooperation with Cornell Univ.
(Cross Service Order 2-68)
(RR-398; ECOM 2-68I-1; AD-664227) CFSTI: HC $3.00/MF $0.65

A momentum balance was used to estimate the vertical diffusivity of bulk air in a corn canopy. Simultaneous measurements of mean CO2 profiles enabled an evaluation of the source and sink (respiration and photosynthesis) distribution in the corn canopy. From the later data and light distribution data photoefficiency and light response were evaluated. Author (TAB)

**N68-18376#** Agricultural Research Service, Ithaca, N. Y. Soil and Water Conservation Research Div.
**THE ENERGY BUDGET AT THE EARTH'S SURFACE: ESTIMATES OF THE DIFFUSION RESISTANCE OF SOME LARGE SUNFLOWER LEAVES IN THE FIELD Interim Report**
L. A. Hunt, Ivan I. Impens, and E. R. Lemon Aug. 1967 14 p refs Prepared in cooperation with Cornell Univ.
(Cross Service Order 2-67)
(RR-396; ECOM 2-67I-3; AD-664215) CFSTI: HC $3.00/MF $0.65

Studies of resistance to gaseous exchange between large sunflower leaves and the bulk air in a crop canopy were made. Two components of the diffusive pathway for mass and sensible heat were evaluated; (a) the resistance from the interior of the leaf to the leaf surface, and (b) the resistance from the surface of the leaf through the leaf boundary air layer to the bulk air. It was found that: (a) leaf resistance not only displays diurnal trends but shorter fluctuations, and (b) boundary air layer resistance was significantly smaller than predicted from classical boundary layer formulae. Author (TAB)

**N68-18405#** Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
**MICROBIOLOGICAL CRITERIA FOR AEROSPACE POTABLE WATER SYSTEMS Final Report, Feb. 1964-Mar. 1965**
Sheldon A. London and Arselus West Sep. 1967 18 p refs
(AMRL-TR-67-37; AD-664070)

Extended space missions will necessitate that life support subsystems operate on a closed ecological or bioregenerating principle. This entails a continual recycling or regeneration of materials to sustain space crews. Potable water may be made available by a variety of techniques from various sources, such as urine and atmospheric condensate. Microbiological potability standards that can realistically be applied to space water supplies are dictated by the inherent technological problems and logistic limitations. With these in mind, a standard of sterility is proposed and the reasons for this stringent requirement are indicated. For ground based studies, a less stringent standard is also compatible with equipment capabilities and experimental requirements. Author (TAB)

**N68-18406#** Duke Univ., Durham, N. C.
**BASES AND CONSEQUENCES OF SYSTEMS OF COMMUNICATION Final Report, 1 Mar. 1960–30 Nov. 1967**
Kurt W. Back 30 Nov. 1967 21 p
(Contract Nonr-1181(11))
(AD-664256)

A series of studies has been undertaken since 1960 specifically dealing with the bases and consequences of systems of communication. This final report summarizes those studies completed under the following three categories: (A) the study of personal relations and communication processes within a group structure (Communication and Group Interaction Studies), (B) physiological and psychological conditions of conformity (Socio-biology Studies), and (C) methods of social research (Methodology Studies). Author (TAB)

**N68-18428#** Battelle Memorial Inst., Columbus, Ohio.
**WATER-ELECTROLYSIS CELLS USING HYDROGEN-DIFFUSION CATHODES Final Report, 1 Jun. 1965–20 Jan. 1967**
Edwin S. Kolic and John E. Clifford Wright-Patterson AFB, Ohio AMRL Nov. 1967 43 p refs
(Contract AF 33(615)-2954)
(AMRL-TR-67-65; AD-664361)

The feasibility of extended operation of palladium-silver alloy hydrogen-diffusion cathodes was demonstrated by essentially 100 percent hydrogen transmission for 486 days of operation at the following experimental conditions: 6.35-mm-OD x 0.013-mm-wall Pd-25Ag cathode tube at 37 ma/sq cm; free electrolyte cell with 22 ml of 60 percent NaOH at 145C; cell voltage of 1.74 +0.03 or -0.03 volts with solid cylindrical platinum anode. The determination of the maximum efficient current density (MECD) as a function of temperature indicated that satisfactory operation in the above run could have been obtained at temperatures as low as 112C; 53C with new cathode-activation treatments; or 30C with rhodium treatment of the cathode. In addition to platinum, platinum-10 rhodium alloy was shown to be a satisfactory anode material, but not gold. The feasibility of producing hydrogen gas at a pressure 15 psi higher than oxygen with only a slight decrease in MECD was demonstrated. New electrolyte preelectrolysis procedures were developed to counteract apparent purity variations in reagent-grade NaOH pellets. Of a number of possible matrix materials investigated, **the longest satisfactory operation was obtained with fuel-cell asbestos: 280 hours at 70C and 37 ma/sq cm, but only 15 hours at 135C. The feasibility of using a free electrolyte of phosphoric acid was demonstrated in a 4-hour run at 37 ma/sq cm and 60C.** Author (TAB)

**N68-18433#** Army Dept., Washington, D. C.
**THE POSSIBLE PARTICIPATION OF GROWTH STIMULANTS AND NUCLEIC ACIDS IN THE MECHANISM OF THE ACTION OF PHYTOCHROME [O BOZMOZHNOM UCHASTII ROSTOVYKH VESHCHESTV I NUKLEINOVYKH KISLOT V MEKHANIZME DEYSTVIYA FITOKHROMA]**
M. B. Shternberg 22 Nov. 1967 48 p refs Transl. into ENGLISH from the book "Regulyatory Rosta Rasteniy i Nukleinovyy Obmen" Moscow, Nauka Publishing House, 1965 p 65–102
(NIC-TRANS-2317; AD-664021)

Of the three hypotheses on the mechanism of the action of phytochrome (by means of growth stimulants, by means of a common link in the metabolism, and by a system of regulation) the one which is apparently closest to the truth is the third one which speaks of the action of light which has been absorbed by phytochrome through a system of regulation which includes active, specific DNA and RNA. **In support of this concept it is now possible to cite not only information on the diversity, specificity, and** genotypic dependence of the reactions of the plants and their individual organs on light and information concerning change of sensitivity to the action of light during the course of ontogenesis, but also the first data on the de novo synthesis of proteins and enzymes under the action of red light. In studying the possibilities for the transmission of external influences on some elements of the system of regulation and in seeking out these sensitive elements the use of phytochrome as the acceptor of light stimulation should play a significant role. Author (TAB)

**N68-18468#** Operations Research Inc., Silver Spring, Md.
**HUMAN RELIABILITY RESEARCH Final Report, May 1966–Aug. 1967**
Charles Beek, Kenneth Haynam, and Gabriel Markisohn Sep. 1967 40 p refs
(Contract Nonr-4451(00))
(PRR-67-2; TR-430; AD-664495)

The research effort focused on two major areas, a survey and analysis of existing failure reporting systems, and the investigation of alternative indirect approaches to determining human performance and quantifying the human reliability contribution to weapon system effectiveness. It was found that existing failure reporting systems do not yield meaningful data on human-initiated malfunctions. In most cases, a strong reluctance to report all failures was noted, particularly human errors. In attempting to develop an indirect approach to human reliability analysis, two techniques were investigated, both of which rely on equipment failure reporting rather than human error reporting. One technique is ERUPT. This approach, by grouping the components of a weapon system into elementary reliability units, provides a means of inferring two human performance parameters from available equipment reliability and maintenance data. The second approach relates certain personnel characteristics of individuals operating and maintaining the equipment to number of failures and equipment repair times by the application of multivariate correlation analysis techniques. Author (TAB)

**N68-18477#** Thiokol Chemical Corp., Marshall, Tex.
**TESTING "NOMEX" MATERIAL AS HEAT RESISTANT CLOTHING FOR INDUSTRIAL APPLICATION**
Jul. 1967 44 p refs
(Contract DA-11-173-AMC-200(A))
(LD-17-67; AD-664122)

The objective of this series of tests was to determine the best combination of protective clothing (utilizing Nomex material) **that would afford the line worker optimum protection against incident conditions. The data was recorded and developed for a period of time up to fourteen seconds. The first three to five seconds, however, are the most critical.** Author (TAB)

**N68-18497*#** Naval School of Aviation Medicine, Pensacola, Fla.
**INSTRUMENTATION FOR THE CORIOLIS ACCELERATION PLATFORM**
W. Carroll Hixson 6 Nov. 1967 25 p refs Prepared jointly with NASA
(NASA Order R-93)
(NASA-CR-93432; NAMI-1022) CFSTI: HC $3.00/MF $0.65 CSCL 06B

The report describes a general-purpose instrumentation system developed for use in conjunction with the Coriolis Acceleration Platform, a combined linear and angular motion device recently installed at the vestibular research facilities of this activity. The system, based on the use of standard commercially available equipment, provides the basic transducers, signal-conditioning circuitry, and recording instruments required for the acquisition, display, and storage of a wide variety of commonly collected biological and bioenvironmental measurement data. Author

**N68-18512** Texas Univ., Austin.
**A MATHEMATICAL MODEL FOR THE BIOLOGICAL CLOCK OF PASSER DOMESTICUS**

Charles Glenn Richie (Ph.D. Thesis) 1967 142 p
Available from Univ. Microfilms: HC $6.80/MF $3.00 Order No. 67-8152

The work presented in this thesis is a novel application of modeling and nonlinear differential equation theory to the life sciences. The field of circadian rhythms is briefly discussed along with the use and need for a mathematical model of biological clocks. The general properties of oscillators are discussed, and the qualitative agreement between nonlinear oscillators and circadian rhythm data is demonstrated. The case of two coupled weakly nonlinear oscillators is treated in detail with particular emphasis on coupled Rayleigh oscillators. A method for obtaining approximations for the multifrequency solutions of two unforced weakly coupled weakly nonlinear oscillators is presented. An illustrative example of coupled Rayleigh oscillators is included. Author

**N68-18513** Stanford Univ., Calif.
**AN ELECTROKINEMATIC THEORY OF MUSCLE CONTRACTION**
Neil Barton Ingels, Jr. (Ph.D. Thesis) 1967 109 p
Available from Univ. Microfilms: HC $5.40/MF $3.00 Order No. 67-7926

This theory proposes a mechanism by which the force of muscular contraction could be developed in striated muscles. The mechanism does not depend on a mechanochemical interaction of the actin and myosin filaments, but rather assumes that the F-actin filaments, neutrally charged at rest, assume a positive line charge during stimulation, and thus attract the negatively charged L-myosin filaments in the manner of an electrostatic solenoid. Calcium ions, released and later re-accumulated by the elements of the sarcoplasmic reticulum in response to muscle stimuli, are assumed to be responsible for these alterations in charge density on the actin filaments and thus regulate the magnitude and form of the forces developed in the sarcomere. By means of a mathematical model, the proposed contractile scheme is shown to agree with contemporary experimental evidence concerning isometric force development in striated muscles. Dissert. Abstr.

**N68-18514** Texas Univ., Austin.
**ENHANCEMENT OF PHOTOSYNTHESIS IN CHLORELLA AND A KINETIC MODEL FOR PHOTOSYNTHESIS**
James Henry Eley, Jr. (Ph.D. Thesis) 1967 91 p
Available from Univ. Microfilms: HC $4.80/MF $3.00 Order No. 67-8100

We have examined photosynthesis rates in Chlorella on an oxygen electrode. Visible light of desired wavelength was obtained with two grating monochromators focused on the electrode and controlled as to on–off regime by electronic shutters. We have confirmed and extended experimental observations of superimposed enhancement, alternated enhancement and chromatic transients as to wavelength dependency. Short period ($\leq$1.2 sec) alternation of a light 1 and a light 2 balanced in intensity to give equal steady state rates of photosynthesis, show enhancement values approaching that for superimposed beams. At longer periods of alternation enhancement decays as an inverse function of the balanced rate and approaches 1.0 at alternation periods of 20 seconds or longer. Dissert. Abstr.

**N68-18607#** Johns Hopkins Univ., Baltimore, Md.
**STUDIES ON BIOLUMINESCENCE AND ENERGY TRANSFER MECHANISMS**
W. D. McElroy 15 Nov. 1967 13 p refs
(Contract AT(30-1)-2514)
(NYO-2514-9) CFSTI: HC $3.00/MF $0.65

Progress is reported on studies on identification of intermediates and products of the light reaction in firefly luminescence. Experiments were conducted to determine the fate of the substrate $LH_2$, the nature of the emitting species, and the function of the enzyme luciferase. Dehydroluciferin was synthesized, and peptides containing this substance were isolated and purified. NSA

**N68-18619#** Army Aeromedical Research Unit, Fort Rucker, Ala.
**ANALOG NYSTAGMUS ANALYZER**
George W. Beeler, Jr. Dec. 1967 18 p
(USAARU-68-4; AD-664129) CFSTI: HC $3.00/MF $0.65

Rapid to-and-fro movements of the eye are classified as nystagmus. This movement is usually the consequence of reflex excitation of the extra ocular muscles associated with stimulation of the semicircular canals. An analog nystagmus analyzer is described that can produce continuous information concerning the duration, amplitude and slow-phase velocity of each nystagmic beat during experiments involving the vestibular apparatus. Author (TAB)

**N68-18695#** Illinois Univ., Urbana. Dept. of Physics.
**MOESSBAUER STUDIES OF THE IRON ATOM IN CYTOCHROME C**
R. Cooke and P. Debrunner [1967] 24 p refs
(Contract N00014-67-A-0305-0005; Grant NIH GM-720)
(AD-664519)

Mossbauer spectra of the iron atom in horse heart cytochrome c were observed in frozen solution and freeze dried samples for both the oxidized and reduced states. At temperatures above 77K, the spectrum of the oxidized enzyme consisted of a quadrupole split doublet, broadened by a temperature dependent magnetic hyperfine interaction. The spectrum of the reduced enzyme consisted, at all temperatures observed, of two peaks with a quadrupole splitting of 0.12 cm/sec. Upon freeze drying the quadrupole splitting of the oxidized enzyme decreased, whereas the spectrum of the reduced enzyme changed very little. Author (TAB)

**N68-18706*#** Douglas Aircraft Co., Inc., Huntington Beach, Calif. Missile and Space Systems Div.
**STUDY OF AN ANIMAL RESEARCH FACILITY (USING S-4B) FOR A MANNED ORBITAL BIOTECHNOLOGY LABORATORY Final Report**
L. T. Kail Sep. 1967 189 p refs
(Contract NAS7-518)
(NASA-CR-93485; DAC-58039) CFSTI: HC $3.00/MF $0.65 CSCL 06S

The feasibility of using an orbiting Saturn S-4B workshop for a manned animal research laboratory was studied. The number and type of animals involved, the biological experiments to be carried out, and the crew tasks are outlined for alternate mission profiles. Based on these factors, alternate configurations, involving both multiple and single modular concepts, are presented. The supporting research and technology requirements are discussed, and specific design criteria and recommendations are presented for laboratory and supporting equipment. The life support system for both animals and human crew is considered in detail. E.J.S.

**N68-18729#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md. Space Life Sciences.
**ENVIRONMENTAL AND MOBILITY CONSTRAINTS ON THE CONFIGURATION OF A NONANTHROPOMORPHIC SPACE SUIT**
J. A. Lieske and P. Iribe [1966] 9 p Presented at the Natl. Conf. on Space Maintenance and Extravehicular Activities, Orlando, Fla., 1–3 Mar. 1966

The orbital missions contemplated for the 1968–1980 period indicate that an extravehicular astronaut will require all the mobility

and dexterity that the best soft suit can provide. In addition, he requires more life support, power, and other working aids than such a suit can carry. Design concepts are presented in the form of a large work pack or platform which meet these requirements. The astronaut can work from within or at a distance on an umbilical. Author

**N68-18734#** Nuclear Energy Information Center, Warsaw (Poland). Dept. of Radiobiology and Health Protection.
**STABLE AND RADIOACTIVE LEAD IN ENVIRONMENT AND HUMAN BODY**
Z. Jaworowski 1967 189 p refs
(NEIC-RR-29)

Studies were undertaken to determine the level of stable and radioactive lead in typical components of the biosphere and in the organism, as well as to examine their sources and temporal and geographical distribution. The abundance and isotopic composition of lead are discussed, and it is shown how the isotopic composition of stable lead may vary depending on its origin. Various methods of determining stable lead are reviewed, with details given on a wet ashing method. Several approaches used in determining radioactive lead are assessed, and the separation of bismuth-210 by cup ferron extraction and by internal electrolysis is described. The origins and levels of stable and radioactive lead in the environment are examined, and the difficulties involved in determining the existing and natural levels of lead in the body are discussed. Data are tabulated to show the temporal and geographical distribution of the leads in the environment. A reference bibliography is included. M.G.J.

**N68-18737#** Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
**THE HUMAN SPINAL COLUMN AND UPWARD EJECTION ACCELERATION: AN APPRAISAL OF BIODYNAMIC IMPLICATIONS Final Report, Jul. 1965–Jun. 1966**
John H. Henzel Sep. 1967 57 p refs
(AMRL-TR-66-233; AD-664553)

Vertebral compression represents a significant percentage of the morbidity associated with upward ejection. Vertebral and intervertebral structure reacts to and is sometimes irreversibly altered by ejection acceleration. Design and material properties of the normal vertebral column are sufficiently constant that when structural characteristics are defined and acceleration profiles known, prediction of failure may be made. Compressive load analyses of vertebra-disc complexes demonstrated that the vertebral end-plates are the initially failing structures of the spinal column. From experimental data on vertebral breaking-loads, acceptably accurate probability-of-injury curves for static loading were generated. These data together with data describing the dynamic response characteristics of the human body permit calculation of the probability-of-injury for dynamic loading produced by exposure to impact accelerations. As an aid to the designer of ejection systems, application of these concepts should refine the estimate of safe acceleration profiles and minimize the risk of irreversible vertebral deformation. Author (TAB)

**N68-18744#** Air Force Systems Command, Brooks AFB, Tex. Aerospace Medical Div.
**PROCEEDINGS OF FIRE HAZARDS AND EXTINGUISHMENT CONFERENCE**
23 May 1967 209 p refs Conf. held at Brooks AFB, Tex., 23 May 1967
**(AMD-TR-67-2; AD-664584) CFSTI: HC$3.00/MF$0.65**

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6. HAZARDS ASSESSMENT AND PROTECTIVE CLOTHING REQUIREMENTS T. E. Goonan (Veterans Admin.) p 148–154 (See N68-18750 09-05)

7. FURTHER STUDIES ON THE PROBLEMS OF FIRE IN ARTIFICIAL GAS ENVIRONMENTS D. M. Denison (Roy. Air Force) p 155–167 refs (See N68-18751 09-05)

8. FLAMMABILITY TEST METHODS AND PROTECTIVE CLOTHING DEVELOPMENT R. S. Johnston (NASA. Manned Spacecraft Center) p 168–189 (See N68-18752 09-05)

**N68-18745#** Air Force Systems Command, Brooks AFB, Tex. Aerospace Medical Div.
**TWO MAN SPACE ENVIRONMENT SIMULATOR ACCIDENT**
A. G. Swan *In its* Proc. of Fire Hazards and Extinguishment Conf. 23 May 1967 p 4–38 (See N68-18744 09-05)

Described are the results of an investigation into a two man space environment simulator accident where the oxygen atmosphere ignited during a high altitude simulation study. Analyses of the residue and material inside the burned chamber established electrical arcing from a Teflon insulated electrical wire as the cause of the fire. It was assumed that one of the animal attendants accidently stepped on a lamp cord, fractured the insulation, and shorted it to the aluminum floor plate. G.G.

**N68-18746#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Fuels, Lubrication and Hazards Branch.
**FIRE PROTECTION FOR OXYGEN ENRICHED ATMOSPHERE APPLICATIONS**
**B. P. Botteri *In* AFSC, Brooks AFB, Tex. Proc. of Fire Hazards and Extinguishment Conf. 23 May 1967 p 39–69 refs (See N68-18744 09-05)**

**Materials, methods, and techniques to minimize the likelihood** of fire initiation and enhance the probability for personnel survival in the event of fire in oxygen enriched atmospheres are evaluated. Effective fire protection requires: (1) elimination of all ignition sources; (2) minimization of combustibles with exclusion of flammable liquids and gases; (3) control of type, quantity, and arrangement of necessary combustible materials in the chamber; (4) fire walls and other containment techniques to isolate potential high risk fire zones; and (5) a fixed fire extinguishing system that incorporates automatic initiation by flame and smoke detectors as well as manual initiation. G.G.

**N68-18747#** Air Force Systems Command, Brooks AFB, Tex. Aerospace Medical Div.
**FIRE EXTINGUISHMENT AND PROTECTIVE CLOTHING EVALUATIONS**
Donald I. Carter *In its* Proc. of Fire Hazards and Extinguishment Conf. 23 May 1967 p 70–105 refs (See N68-18744 09-05)

**Evaluated were fire extinguishing systems for a hypobaric and a hyperbaric environment as well as protective clothing to** determine the qualitative degree of fire protection provided by various fiberglass cloth formulations. Data from actual test chamber evaluations established a freon fire extinguishing system triggered

by ultraviolet detectors as most promising. Uniform tests with knitted tight fitting fiberglass materials in greater than 98% oxygen at 380 Hg showed good protection from flash fires. G.G.

**N68-18748*#** Aerojet-General Corp., Dayton, Ohio. Toxic Hazards Research Unit.
**INHALATION TOXICITY AND CHEMISTRY OF PYROLYSIS PRODUCTS OF BROMOTRIFLUOROMETHANE**
E. H. Vernot *In* AFSC, Brooks AFB, Tex. Proc. of Fire Hazards and Extinguishment Conf. 23 May 1967 p 107–117 refs (See N68-18744 09-05)

Groups of rats were exposed in inhalation chambers to pyrolysis products of 1700 to 4500 ppm monobromotrifluoromethane in order to determine the formation of toxic materials during $CBrF_3$ decomposition at 800°C. Test data evaluation established a 2300 ppm $CBrF_3$ concentration equivalent to 50% mortality; animals surviving exposure suffered weight loss but recovered after about 14 days. Analyses of $CBrF_3$ pyrolysis products showed the presence of high HF concentrations. At the $LC_{50}$ value of pyrolized $CBrF_3$ (2300 ppm), 2480 ppm HF was formed; thus, the toxicity of $CBrF_3$ pyrolysis was attributed to HF formation. G.G.

**N68-18749#** Naval Experimental Diving Unit, Washington, D. C.
**A REVIEW OF THE NAVY CHAMBER FIRE SAFETY PROGRAM**
John V. Harter *In* AFSC, Brooks AFB, Tex. Proc. of Fire Hazards and Extinguishment Conf. 23 May 1967 p 128–138 (See N68-18744 09-05)

In order to prevent the occurence of flash fires in hyperbaric diving units, a program was started to remove all sources of ignition and all flammable materials. A fiberglass mattress was installed in the chamber, the electrical system was updated, and fiberglass clothing was used for the divers in the chamber. The chamber operated in the lower partial pressures of oxygen and the diver is not transferred into an air background from water depths beyond 200 feet. G.G.

**N68-18750#** Veterans Administration, Washington, D. C.
**HAZARDS ASSESSMENT AND PROTECTIVE CLOTHING REQUIREMENTS**
Thomas E. Goonan *In* AFSC, Brooks AFB, Tex. Proc. of Fire Hazards and Extinguishment Conf. 23 May 1967 p 148–154 (See N68-18744 09-05)

The following measures are advocated to prevent fires: (1) utilization of a hyperbaric chamber with an outer lock and sprinkler protection inside and with one sprinkler line positioned on top of the chamber and one on each side at floor level to project upwards; (2) maintenance of a constant pressure differential between the pressure head and the chamber; (3) protective clothing consisting of not more than one tightly fitting layer; and (4) removal of all electrical equipment to outside the chamber whenever possible. Emphasis is placed on the maintenance of not more than 3 lbs partial oxygen pressure in the chamber atmosphere since the fire hazard increases proportionally if this limit is exceeded. G.G.

**N68-18751#** Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
**FURTHER STUDIES ON THE PROBLEMS OF FIRE IN ARTIFICIAL GAS ENVIRONMENTS**
D. M. Denison *In* AFSC, Brooks AFB, Tex. Proc. of Fire Hazards and Extinguishment Conf. 23 May 1967 p 155–167 refs (See N68-18744 09-05)

Experiments with clothing fires on a human scale showed that: (1) flash fires pass over the surface of clothing, propagate in the nap, and ignite the material at many points almost simultaneously; (2) some flame proofing treatments are able to prevent this nap propagation; (3) flash fires cannot pass underneath tight clothing; (4) ordinary water sprays cannot control such fires; and (5) water sprinkler systems work only when they obtain an evenly dense spray in all spatial dimensions and are automatically triggered. Since helium was more effective in suppressing nap fires it is advocated as the diluent additive for an oxygen atmosphere. G.G.

**N68-18752*#** National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
**FLAMMABILITY TEST METHODS AND PROTECTIVE CLOTHING DEVELOPMENT**
Richard S. Johnston *In* AFSC, Brooks AFB, Tex. Proc. of Fire Hazards and Extinguishment Conf. 23 May 1967 p 168–189 (See N68-18744 09-05) CSCL 11E

The thermal barrier capability of protective garments is evaluated by a flame impingement tester and temperature versus time curves on candidate space suit materials are discussed. Materials evaluated were beta fiber cloth, armalon, asbestos, kapton, metallic fabrics, and melds of asbestos, beta, and metallic fibers. A beta filament glass fabric is considered for outer layers of all protective garments; beta underwear shows no adverse dermatological effects and had good vapor transmission properties. Tests with a beta material garment established its nonflammability but it was found that it did not provide a sufficient thermal heat barrier for the skin. G.G.

**N68-18863*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
**WATER RECLAMATION AND CONSERVATION IN A CLOSED ECOLOGICAL SYSTEM**
V. G. Collins and D. C. Popma [1966] 19 p Presented at the Ecol. Technol. Symp., Washington, D. C., 14–15 Feb. 1966
(NASA-TM-X-57247) CFSTI: HC $3.00/MF $0.65 CSCL 06K

Introductory data are presented on life support requirements for manned space missions. The necessity for water reclamation and conservation on missions of medium or long duration is discussed, and multifiltration, distillation, reverse osmosis, and electrodialysis techniques are briefly reviewed. The efficiency required for use in closed ecological systems is outlined in terms of launch weight water requirements per man. Design criteria, reflecting high reliability, low weight and power, elimination of expendables, and water recovery approaching 100% are recommended. E.J.S.

**N68-18870*#** National Aeronautics and Space Administration, Washington, D. C.
**TELEOPERATORS AND HUMAN AUGMENTATION. AN AEC–NASA TECHNOLOGY SURVEY**
Edwin G. Johnson and William R. Corliss Dec. 1967 273 p
(NASA-SP-5047) GPO: HC $1.00; CFSTI: MF $0.65 CSCL 05H

This book surveys general purpose, dexterous, cybernetic machines developed in the last 25 years, emphasizing the principal subsystems of contemporary designs of such teleoperators. The purpose of the work is to present the concepts and techniques of teleoperators now used in nuclear and aerospace work for possible adaptation in exploring the seas, increasing industrial productivity, and aiding physically handicapped persons. Covered are: (1) present and potential teleoperator applications; (2) subsystems and man–machine integration; (3) design principles of structure, control, actuator, and sensor subsystems; and (4) teleoperator terminal devices. A glossary and an extensive bibliography are included. K.W.

**N68-18895#** Atomic Energy of Canada, Ltd., Chalk River (Ontario). Div. of Biology and Health Physics.

**AN INCREASED YIELD OF GAMMA INDUCED EYE COLOUR MUTATIONS FROM CHRONIC VERSUS ACUTE EXPOSURES IN *DAHLBOMINUS***

**W. F. Baldwin Nov. 1967 17 p refs Presented at IAEA Symp. on use of Isotopes Radiation in Entomology, Vienna, 4–8 Dec. 1967**

(AECL-2791) Available from Atomic Energy of Canada, Ltd., Chalk River: $0.50

The mutagenic effects of chronic and acute irradiations on the fecundity of *Dahlbomin* females were studied. Studies of the effects of 500 rads of gamma radiation delivered chronically over the period of comparable sensitivity, i.e. over 100 hours from 9 days to 13 days after the pupal stage, and of the same dose as acute exposures at different times in this period were completed, and complemented by similar studies using 250 rads. Results with 500 rads indicated an approximately 20% greater mutagenic effect of the chronic as compared with the acute exposures. Results at 250 rads showed that the difference in mutation frequency with acute as compared with chronic doses was less at this lower exposure, implying that the difference in effect was probably the result of a disproportionately greater killing by the acute irradiation of cells which would have produced mutations. Records of parasitization and the number of progeny per female following acute and chronic exposures at 500 and 250 rads gave conflicting result-, indicating that differential killing may not be a factor in determining mutagenesis. Results are based on 923 eye colour mutations in a total of 346,171 flies scored. Author

**N68-18903*#** Kollsman Instrument Corp., Syosset, N. Y. Electro-Optics Div.

**STEREO TV ENHANCEMENT STUDY Final Technical Report**

E. Hudson and G. Cupit Feb. 1968 10 p

(Contract NAS8-21201)

(NASA-CR-61594) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Summary data are presented on the test apparatus and procedures used to determine the effectiveness of TV stereo versus nonstereo presentations with respect to the operation of a remotely controlled extraterrestrial vehicle. Particular attention is paid to the problem of operating in an environment with a poor signal to noise ratio between noise and picture. **The results show: (1) No significant difference was noted between stereo and nonstereo presentations for good subjects when it comes to judging either size or distance of targets in pictorial representations. (2) Reasonable results can be attained by good subjects after training. Typical values might be on the order of 3 or 4 inches of error for targets** in the size range of 4 to 40 inches, 15 feet in judging distance over ranges up to 200 feet, and errors of approximately 3 feet in judging distance between targets over ranges of from 2 to 20 feet. It is concluded that stereo is not worth the additional cost and weight penalties, except solely as a redundant or back-up system. M.G.J.

**N68-18906#** Joint Publications Research Service, Washington, D. C.

**SPACE BIOLOGY AND MEDICINE, VOLUME 1, NUMBER 6**

14 Mar. 1968 141 p refs Transl. into ENGLISH of Kosmich. Biol. i Med. (Moscow), v. 1, no. 6, 1967 p 1–96

(JPRS-44732) CFSTI: HC $3.00/MF $0.65

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**N68-18907#** Joint Publications Research Service, Washington, D. C.

**COOPERATION OF BIOLOGY, MEDICINE AND ENGINEERING IN SUPPORT OF MANNED SPACE FLIGHTS**

B. A. Adamovich *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 1–6 (See N68-18906 09-04)

This paper is a discussion of bioengineering problems of manned space flights, emphasizing the fact that they can be

accomplished only on the basis of close cooperation among specialists in various fields of knowledge. Many biomedical problems associated with manned space flights necessitate joint efforts by experts in medicine, biology, chemistry and engineering. Author

**N68-18908#** Joint Publications Research Service, Washington, D. C.

**CELL AND TISSUE CULTURES AS RESEARCH OBJECTS IN SPACE BIOLOGY AND MEDICINE**

V. V. Portugalov, F. V. Sushkov, and V. B. Starikova *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 7–23 refs (See N68-18906 09-04)

In order to evaluate the possibility of using cell cultures for biomass production in a closed ecological system, methods for cultivating mammalian cells in deep cultures are advocated. Surplus products of a closed ecological system such as vegetable proteins obtained from Chlorella or other unicellular algae, from cultures of microorganisms or from other sources are possible culture medium components as indicated by the results of using protein hydrolysate of leguminous plant seeds to maintain monolayer cell cultures in a state suitable for virological purposes. G.G.

**N68-18909#** Joint Publications Research Service, Washington, D. C.

**SOME EFFECTS DEVELOPING DURING HYPOKINESIA (EXPERIMENTS ON MICE)**

V. V. Portugalov, O. G. Gazenko, Ye. I. Il'ina-Kakuyeva, V. B. Malkin, T. V. Artyukhina et al *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 24–34 refs (See N68-18906 09-04)

The effect of reduced motor activity (hypokinesia) on mice was studied during 30-day experiments by physiological, cytochemical, electron microscope and histological techniques. It was found that during the first days of hypokinesia most test animals exhibited stress reactions. In the course of further confinement this type of response became less marked. By the 15th day changes caused by hypokinesia itself (atrophy of skeletal muscles, etc.) were manifested. By the 30th day the changes were less distinct than during earlier stages in the experiment. Author

**N68-18910#** Joint Publications Research Service, Washington, D. C.

**REGULATORY MECHANISMS OF ACCELERATION-INDUCED HYDRODYNAMIC SHIFTS (AN EXPERIMENTAL STUDY BASED ON A PHYSIOLOGICAL MODEL)**

Ye. B. Shul'zhenko and T. V. Sebekina *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 35–40 refs (See N68-18906 09-04)

This paper gives results of a comparative study of the effect of animal exposure to transverse accelerations, accompanied by functional occlusion of pulmonary tissue, using basic hemodynamic indices. The similarity in changes in the cardiovascular system in animals with intact and with denervated sinocarotidal zones in both cases helped in establishing the role of vascular reflexogenic zones in the mechanism of circulatory regulation. The pathogenetic similarity gives support to the idea that cardiovascular changes occurring during exposure to acceleration are the result of neuro-reflex effects from pulmonary artery receptors. Author

**N68-18911#** Joint Publications Research Service, Washington, D. C.

**SOME DATA ON THE MECHANISM OF THE DISTURBED PERCEPTIVE FUNCTION OF THE CEREBELLUM DURING ACCELERATIONS**

L. D. Klimovskaya and N. P. Smirnova *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 41–48 refs (See N68-18906 09-04)

Inhibition of induced activity of the cerebellar cortex in white rats exposed for 4 minutes to transverse accelerations of 10 g is described. A similar effect can be brought about by a high-frequency stimulation of the brain stem reticular formation. In this case it can be significantly alleviated by aminazin, whereas in case of accelerations the treatment produces no effect. This indicates a rather complicated genesis of the inhibition of cerebellar activity induced during accelerations. In addition to the influence of the reticular formation, it may involve a direct access of excess afferent signals to the cerebellar cortex, hemodynamic changes and a physical effect of accelerations on nerve cells. Author

**N68-18912#** Joint Publications Research Service, Washington, D. C.

**SOME ASPECTS OF ACETYLCHOLINE METABOLISM IN THE BRAIN AND HEART OF GUINEA PIGS EXPOSED TO ANGULAR ACCELERATIONS**

N. V. Korneyeva and A. S. Ushakov *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 49–54 ref (See N68-18906 09-04)

The acetylcholine content and cholinesterase activity in the brain and heart of guinea pigs exposed to angular acceleration of 1.5 g for 6 hours were investigated. The greatest changes were exhibited by bound acetylcholine. In both organs its content increased sharply in 10 minutes, decreased in 24 hours and reached normalcy 120 hours after exposure. Tests made at different times revealed a slight decrease of free acetylcholine in both organs with a return to normalcy 120 hours after exposure. The patterns of change of the general, acetylcholinesterase and pseudocholinesterase activities in the brain and heart tissues were different. The activity of these enzymes increased slightly in the brain tissues and decreased slightly in the heart tissues and returned to normalcy 120 hours after exposure. Author

**N68-18913#** Joint Publications Research Service, Washington, D. C.

**EFFECT OF HYPOXIA ON FUNCTIONING OF THE VESTIBULAR ANALYZER IN RATS**

I. I. Voinova *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 55–60 refs (See N68-18906 09-04)

Data are presented on the dynamics of vestibular fluctuations in white rats in a low-pressure atmosphere (at altitudes of 11,000 and 12,000 m) occurring at a decompression rate of 2 and 25 m/sec. During the first hours of exposure the test animals exhibited an increase in the vestibulo-respiratory reflex and postrotary nystagmus. Vestibular fluctuations were more pronounced in animals exposed to altitude increase at the rate of 25 m/sec. Author

**N68-18914#** Joint Publications Research Service, Washington, D. C.

**$P^{32}$ INCORPORATION INTO BLOOD SERUM, LIVER AND BRAIN PROTEINS OF RATS IRRADIATED BY HIGH ENERGY PROTONS**

R. D. Govorun and R. L. Orlyanskaya *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 61–66 refs (See N68-18906 09-04)

Metabolic processes in rats were studied after their irradiation by 660-MeV protons. The exposure affected $P^{32}$ incorporation into tissue proteins. It increased in the liver and brain and decreased in the blood serum. The most distinct changes were noted on the 6th and 20th days of the experiment. The incorporation returned to normal levels by the 30th day only in animals irradiated with a 300-rad dose. Author

**N68-18915#** Joint Publications Research Service, Washington, D. C.

**A MATHEMATICAL MODEL OF CHLORELLA CULTIVATION PARAMETERS DURING EXPOSURE TO IONIZING RADIATION**

I. S. Sakovich, I. V. Smirnov, V. A. Sakovich, and L. K. Vekshina *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 67–72 refs (See N68-18906 09-04)

This paper describes a model which simulates the relationship between the division and growth rate of individual Chlorella cells and the growth rate of a batch-cultured biomass. The model allows one to apply the results of study of single radiation effects on cell division for an evaluation of chronic radiation effects on continuous Chlorella cultivation. Author

**N68-18916#** Joint Publications Research Service, Washington, D. C.

**SOME DATA ON VOLATILE (OXYGEN CONTAINING) COMPOUNDS RELEASED BY VEGETABLES**

V. P. Dadykin, L. N. Stepanov, and V. Ye. Ryzhkova *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 73–79 refs (See N68-18906 09-04)

Development of closed bioengineering systems requires a proper knowledge of the quantity and composition of compounds released by plants. The gas chromatography method is used in determining the quantity of volatile oxygen-containing organic substances released by leaves of vegetables (radishes, beets, tomatoes, batatas, potatoes, carrots) and their roots (carrots, potatoes) when grown in a closed environment. Each species released volatile compounds of a specific composition. Tomatoes exhibited the maximal (14) number of peaks whereas potatoes and batatas had the minimum number (7), nine of which were identified. Some gases (acetaldehyde, acetone, propionic aldehyde, methanol, ethanol) were released by many plant species. Chromatograms of gaseous compounds released by leaves contained twice as many peaks as chromatograms for roots. Author

**N68-18917#** Joint Publications Research Service, Washington, D. C.

**THE BIOLOGICAL VALUE OF UNICELLULAR ALGAE PROTEINS**

N. S. Klyuskina and V. I. Fofanov *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 80–85 refs (See N68-18906 09-04)

A study was made of the biological value of plant proteins (unicellular algae, soya). Weaned rats served as test animals. The biological value of algal proteins was found to be higher than that of soya proteins. Vitamin $B_{12}$ given to animals on a soya diet did not improve theiry protein metabolism. Author

**N68-18918#** Joint Publications Research Service, Washington, D. C.

**STUDY OF CHLORELLA CULTIVATION ON SOLUTIONS WITH MINERALIZED HUMAN WASTES**

A. L. Agre, I. V. Aleksandrova, G. V. Ilgach, V. V. Krasnoshchekov, I. Ye. Ivanova et al *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 86–90 refs (See N68-18906 09-04)

It has been shown that solutions obtained after mineralization of solid human wastes by the "wet" burning method can be used for intensive Chlorella cultivation. The solutions should have the toxic substances removed and be corrected in relation to proper mineral composition. Author

**N68-18919#** Joint Publications Research Service, Washington, D. C.

**COMPUTING CONCENTRATIONS OF VARIOUS GASEOUS CONTAMINANTS IN SPACESHIP CABIN ATMOSPHERES**

L. T. Bykov *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 91–100 (See N68-18906 09-04)

This paper gives formulas, tables and diagrams for computing the required ventilation of spaceship cabins in accordance with the admissible concentrations of gaseous contaminants. The character of the equations makes it possible to compare ventilation systems operating at different performance levels. A differential equation can be used as the process equation when establishing automatic checking of various gaseous contaminants on spaceship cabins. Author

**N68-18920#** Joint Publications Research Service, Washington, D. C.

**VARIATION IN OVERALL BODY TOLERANCE DURING A 62-DAY EXPOSURE TO HYPOKINESIA AND ACCELERATION**

G. P. Mikhaylovskiy, N. N. Dobronravova, M. I. Kozar', M. M. Korotayev, N. I. Tsiganova et al *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 101–108 refs (See N68-18906 09-04)

The overall tolerance of the human body was studied on six healthy male subjects during a 62-day period of hypokinesia. Beginning with the third week of the experiment the protective properties of the body deteriorated considerably (quantity of blood properdin, phagocytic activity of neutrophils, lysozymic activity of the saliva and bactericidal function of the skin). In addition to inhibition of natural immunity there was development of inflammatroy diseases, mostly affecting the mucous membranes and the vascular system. The results obtained should be taken into account in developing preventive measures for use during prolonged space missions. Author

**N68-18921#** Joint Publications Research Service, Washington, D. C.

**EFFECT OF TRANSVERSE ACCELERATION ON SOME KIDNEY FUNCTIONS**

M. M. Korotayev and A. I. Grigor'yev *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 109–116 refs (See N68-18906 09-04)

The functional state of kidneys was determined for 40 test subjects after triple exposure to acceleration in the back-to-chest direction with a gradient increase of 0.2 g/sec up to 10 g for 20 seconds. Results of an urine sediment study revealed a statistically reliable ($P<0.001$) increase in erythrocyte numbers. Erythrocyte numbers and leukocyte numbers increased in urine samples both 4 hrs and 24 hrs after each exposure. It was concluded that hematuria following acceleration is associated with impaired renal blood circulation, increased permeability of vascular glomerule capillary walls, main membrane and inner lining of the capsule, and possibly with more severe capillary impairments G.G.

**N68-18922#** Joint Publications Research Service, Washington, D. C.

**EFFECT OF FROLONGED BEDREST ON THE DYNAMICS OF CARDIAC CONTRACTIONS IN MAN**

N. Ye. Panferova, V. A. Tishler, and T. G. Popova *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 117–123 refs (See N68-18906 09-04)

Experiments with 5- to 20-day hypodynamia were conducted on 15 test subjects for studying their chronocardiometric dynamics with aid of polycardiographic techniques. The results obtained before and after the experiments were analyzed by variational statistics methods and compared. The hypodynamic effect was manifested in the myocardial hypodynamia syndrome, which included an increased tension period (at the expense of the asynchronous and isometric contractions phases), a decreased expulsion period, a reduced intrasystolic index, a decreased rate at which the intraventricular pressure increased and an increased index of myocardial tension. These changes were accompanied by increased pulse rate, a decrease of systolic pressure, minute and stroke blood volumes, and increased diastolic pressure. Duration of general and mechanical systoles remained within normal limits. Possible mechanisms of the described processes are discussed. Author

**N68-18923#** Joint Publications Research Service, Washington, D. C.
**THE EXPERIMENTER'S OBSERVATIONS AS A FACTOR IN SURDOCHAMBER TESTS**
O. N. Kuznetsov *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 124–130 refs (See N68-18906 09-04)

This paper describes psychophysiological peculiarities of disturbance-free solitude with outside observation as a factor in long term surdochamber tests and some occupational situations. A study was made of a test subject who while being alone is aware that he is under continuous observation. The effect of outside observation is illustrated on the basis of behavioral reactions and reports of test subjects. The pattern and degree of their response to this observation reflects the psychological peculiarities of the individual. Immunity to outside observation is regarded as a special case of immunity to disturbances in general. The physiological effect of solitude with outside observation is considered in relation to dominant theory. Such solitude during surdochamber tests is regarded as a means for excluding the effect of the experimenter on a test subject. This method is more advantageous than other techniques for experimental investigation of the personality. Author

**N68-18924#** Joint Publications Research Service, Washington, D. C.
**UNIVERSAL VESTIBULOMETRIC SEAT (UVS)**
S. S. Markaryan, A. A. Matveyev, and I. V. Pavlov *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 131–135 refs (See N68-18906 09-04)

Described is a vestibulometric seat for calibrated irritation studies on the human vestibular analyzer by angular and Coriolis accelerations. The seat has three independent electrical drives which provide rotation abut the vertical axis and tilting of the seat and head with the subject in a sitting or prone position. The positions of the seat back, foot rest, head rest, and elbow rests can be regulated in height and slope; slip rings with reliable wire shielding insure the simultaneous registration of 15 physiological parameters during seat rotation. G.G.

**N68-18925#** Joint Publications Research Service, Washington, D. C.
**REVIEW OF PAPERS IN AEROSPACE MEDICINE FIELD**
G. K. Mikushkin *In its* Space Biol. and Med., Vol. 1, No. 6 14 Mar. 1968 p 136–143 (See N68-18906 09-04)

Briefly reviewed are medical and biological support studies of aerospace interest. The effects of acceleration, vibration, noise, and modified environmental conditions on the human body, as well as psychophysiology and flight hygiene problems are discussed. G.G.

**N68-18927*#** National Aeronautics and Space Administration, Washington, D. C.
**OXYGEN CONSUMPTION AND RESPIRATORY FUNCTIONS AT HIGH ALTITUDES [SAUERSTOFFAUFNAHME UND RESPIRATORISCHE FUNKTIONEN IN GROSSEN HOEHEN]**
E. H. Christensen Dec. 1967 15 p Transl. into ENGLISH from Skand. Arch. Fuer Physiol. (Berlin), v. 76, 1937 p 88–100
(NASA-TT-F-11284) CFSTI: HC $3.00/MF $0.65 CSCL 06P

A study was made of the effect of high altitudes on oxygen intake during muscular activity and on respiration during rest and work. The results indicated that during work all subjects showed the same relationship between work intensity and $O_2$-intake at different altitudes. The degree of efficiency was not affected by the altitude. Lung ventilation was not reduced and increased strongly with increasing altitude, reaching a value of more than 120 liters/minute during work. Reduced lung ventilation was constant at identical $O_2$-intake at all altitudes investigated. At high heights, the alveolar $O_2$-tension was higher at work than at rest. At high altitudes, the maximum oxygen intake was limited by the ventilation of the lungs. Author

**N68-18951*#** Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Control Lab.
**BIOPHYSICAL EVALUATION OF THE HUMAN VESTIBULAR SYSTEM Semiannual Status Report**
J. L. Meiry and L. R. Young Jun. 1967 22 p
(Grant NGR-22-009-156)
(NASA-CR-93544; MV-67-3; SASR-3) CFSTI: HC $3.00/MF $0.65 CSCL 06P

The physical properties of the vestibular system are examined to determine an analytical model of the canalicular response to rotation in a linear acceleration field. The distension of the membranous canal duct is shown to produce a "roller pump" action of the endolymph when the canal is rotated about an axis orthogonal to the linear acceleration vector. Experiments to evaluate further the apparently nonlinear low frequency response of the semicircular canals are presented and discussed. Author

**N68-18954*#** Northrop Space Labs., Hawthorne, Calif.
**RELATIONSHIPS BETWEEN CELL POPULATION KINETICS AND RADIATION RESISTANCE IN POCKET MICE (HETEROMYIDAE: PEROGNATHUS)**
J. J. Gambino and J. W. Towner 1966 10 p refs Presented at the 3d Intern. Congr. on Radiation Res., Cortina, Italy, 26 Jun.–2 Jul. 1966
(Contract NASw-812)
(NASA-CR-69454) CFSTI: HC $3.00/MF $0.65 CSCL 06R

Pocket mice (*Perognathus longimembris*), subjected to 1000 and 1500 rad whole body $Co^{60}$ irradiation, were sacrificed in groups of 5 on days 1, 2, 5, 6, 7 post-irradiation. Degenerative changes were noted in the intestinal mucosa within hours after irradiation, but visible damage was confined mainly to intestinal crypts. Villi remained inteact throughout the observation period, but showed some reduction in size. Regeneration of mucosal epithelium was prompt, restoring villi to normal by the 7th day even after 1500 rad. Tritiated thmidine studies indicate that intestinal epithelium cells of pocket mice have a villus transit time of 5.7 days. This slow rate of villus attrition probably enhances post-irradiation survival, accounting, in part, for the high $LD_{50/30}$ (1500 r) reported for this species. Author

**N68-18994*#** Stanford Univ., Calif.
**A FLUORESCENT PROBE AT THE ACTIVE SITE OF $\alpha$ CHYMOTRYPSIN**
Richard P. Haugland and Lubert Stryer 21 Jan. 1967 40 p refs Presented at the Intern. Symp. on Conformation of Biopolymers, Madras Univ., 18–21 Jan. 1967
(Grant NGR-05-020-137)
(NASA-CR-78109) CFSTI: HC $3.00/MF $0.65 CSCL 06A

A highly fluorescent anthraniloyl group has been inserted at the active site of $\alpha$-chymotrypsin. The anthraniloyl acyl enzyme is indefinitely stable at neutral pH, allowing a detailed spectrofluorimetric study of the mobility and polarity of the active site. The acylating reagent, p-nitrophenyl anthranilate, is very selective in its reactivity. Only one anthraniloyl chromophore is introduced into chymotrypsin, rendering the enzyme inactive. Chymotrypsinogen, diisopropylphosphoryl chymotrypsin, trypsinogen, lysozyme, and serum albumin do not react at all, while trypsin reacts slowly. Author

**N68-19011*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
**THE PROBLEMS OF MAN'S ADAPTATION TO THE LUNAR ENVIRONMENT**
William Letko, Amos A. Spady, Jr., and Donald E. Hewes [1966] 29 p refs Presented at the Workshop on Hearing, Bioacoustics, and Biomech., Moffett Field, Calif., 25–27 Jan. 1966 Sponsored by NAS-NRC
(NASA-TM-X-57241) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Effects of the reduced gravity of the lunar environment on man's general senses of equilibrium are considered along with his ability to orient himself and move about on the lunar surface. It appears that the otolith and proprioceptive sensors will be directly affected by gravity reduction, while vision and the semicircular canals will be relatively unaffected. Complete loss of two of the general sensors, especially if vision is involved, will not permit man to maintain his equilibrium; but it is felt that the reduced stimulation in a lunar environment will be manageable by men who are properly trained. Data obtained in a reduced-gravity simulator are presented. M.W.R.

**N68-19088#** Kernforschungsanlage, Juelich (West Germany).
**ANNUAL REPORT, 1966 [JAHRESBERICHT, 1966]**
1966 212 p refs In GERMAN
(NP-17070)

The general development and organization of the Julich Nuclear Research Installation and the work of the Installation for the THTR Association are outlined. Data are presented from the Scientific Institutes of the Installation on the analysis of genetic, physiological, and biochemical bases of radioresistance, direct radiation effects on cells, organs, and complete organisms, prevention or inhibition of radiation injuries by treatment of plants and animals after irradiation, reversible damage in irradiated tissue cultures, analysis of radiation effects in irradiated chicken embryos, cytological basis research with respect to delayed radiation damage, agricultural chemistry, soil science, anatomy and physiology of house animals, development of an activation analytical method for the determination of resorbed elements with enriched stable isotopes, and investigation of element concentration in carcinomas, measurement of the trace element concentration in the blood and other samples as a function of the state of health. NSA

**N68-19137*#** Naval Submarine Medical Center, Groton, Conn. Physiological Sciences Div.
**STUDIES OF CIRCADIAN CYCLES IN HUMAN SUBJECTS DURING PROLONGED ISOLATION IN A CONSTANT ENVIRONMENT USING EIGHT-CHANNEL TELEMETRY SYSTEMS**
Bruce R. Clagg and Karl E. Schaefer [1966] 15 p refs
**Presented at Natl. Telemetry Conf., Boston, 10–12 May 1966**
**(NASA Order R-24)**
**(NASA-CR-74032) CFSTI: HC$3.00/MF$0.65 CSCL 06P**

This report presents experiences obtained with the use of 8-channel telemetry systems in continuous simultaneous monitoring of six physiological functions (EEG, EKD, respiratory rate, body temperature, skin temperature, BSR) in one or two subjects during isolation experiments of two to three weeks duration. The studies were performed to determine the extent of internal desynchronization in free running circadian cycles of physiological functions, under conditions of confinement in a constant environment such as those encountered in spaceflights and underwater exploration. The enormous amount of one minute data obtained in these experiments required the development of special computer programs for the correction of artifacts in telemetered data and for the analysis of data to determine periodicities and phase shifts of circadian cycles. Author

**N68-19145*#** Kollsman Instrument Corp., Syosset, N. Y. Electro-Optics Div.
**STEREO TV ENHANCEMENT STUDY Final Technical Report**
**E. Hudson and G. Cupit Feb. 1968 108 p refs**
**(Contract NAS8-21201)**
(NASA-CR-61630) CFSTI: HC$3.00/MF$0.65 CSCL 05H

A program was conducted to evaluate the ability of individuals to judge size and distance of targets on a TV-type display with both stereo and non-stereo presentations at different S/N ratios. Its purpose was to determine the effectiveness of stereo TV presentations in allowing an operator to remotely control an extra-terrestrial vehicle. Sixty subjects, both male and female, were shown 72 photographs of a lunar-type terrain on a dual TV-type projection system. Twenty-four of these pictures were monocular presentations, 24 were stereo taken with a 4-inch inter-camera distance, and 24 were stereo taken with a 12-inch inter-camera distance. The camera-to-target distances ranged from 20 to 200 feet, and the target sizes ranged from 4 to 40 inches. The subtended visual angles of the targets covered a range from 5 to 550 minutes of arc. The results were that for trained subjects there was no significant difference between either of the stereo presentations and the non-stereo presentation at any noise level. Accuracy in judging size and distance of targets was equally good with all noise conditions, but there was a diminution in the number of targets seen at higher noise levels. Author

**N68-19165*#** Serendipity Associates, Chatsworth, Calif.
**A DESCRIPTIVE MODEL FOR DETERMINING OPTIMAL HUMAN PERFORMANCE IN SYSTEMS. VOLUME 3: AN APPROACH FOR DETERMINING THE OPTIMAL ROLE OF MAN AND ALLOCATION OF FUNCTIONS IN AN AEROSPACE SYSTEM**
Harold E. Price and Barbara J. Tabachnick Washington NASA Mar. 1968 1204 p refs
(Contract NAS2-2955)
(NASA-CR-878) CFSTI: HC$3.00/MF$0.65 CSCL 05H

Conventions, sequence of activities, and research needs are considered in an effort to determine the role of man in space and the allocation of functions to men and machines in aerospace systems. The 11 conventions discussed include the local and remote segment, optimal manned design, man-rated performance, core performance, and roles of men in systems. Types and components of human performance, personnel support systems, man–machine comparisons, personnel products package, and automation are the other conventions implicit in a descriptive model for determining optimal human performance in aerospace systems. Activities are considered in terms of determining both the optimal role of man and the optimal allocation of function; and detailed data are appended on man–machine performance and crew support requirements. M.W.R.

**N68-19176#** Institute of Aviation Medicine, Toronto (Ontario).
**AEROMEDICAL INCIDENTS AMONGST CANADIAN FORCES PILOTS: A SURVEY**
J. R. Smiley Feb. 1967 24 p refs
(Rept.-67-RD-1)

A probability sample of 300 Canadian Forces pilots was used in a questionnaire survey regarding their experience with aeromedical incidents. Peripheral information was sought about drug usage, flying with hangovers, hemorrhoids, and the role of flight surgeons as seen by the pilots. From 224 returns (a 75% response) it was found that 97% of pilots had had at least some aeromedical incidents in flight. The predominant cause was vertigo and/or disorientation. This cause factor also predominated when related to incidents threatening the safety of the aircraft. Findings related to drug usage and hemorrhoids were negative. However, 60% of the pilots had flown at least a few times with hangovers. Flying with hangovers was found to be significantly associated with higher incidence of all types of aeromedical incident. About 40% of pilots failed to report any of their aeromedical experiences to the flight surgeon. More significantly, 70% of those having experienced hazardous incidents failed to report these specific incidents. Author

**N68-19214*#** Kansas Univ., Lawrence. Engineering Science Div.
**VEGETATION ANALYSIS WITH RADAR IMAGERY**

S. A. Morain and D. S. Simonett 1966 21 p refs Presented at the 4th Symp. on Remote Sensing of the Environ., Ann Arbor, Mich., 11–14 Apr. 1966
(Contract NSR-17-004-003)
(NASA-CR-75170; CRES-61-9) CFSTI: HC $3.00/MF $0.65 CSCL 02F

This paper presents vegetation maps prepared from radar imagery obtained over several climatic environments. The maps and imagery have been compared with each other to determine the types of information extractable. Conventional vegetation maps were employed to aid in the comparison. Emphasis was on the K-band and AN/APQ-56 radar systems. Results indicate that it is normally possible, by means of tonal and textural comparisons combined with basic geographic knowledge of the study area, to: (1) prepare regional or reconnaissance vegetation maps either on the basis of physiognomy or vegetation "type"; (2) delimit vegetation zones as they vary with elevation; (3) trace burn patterns of previous forest fires; (4) delimit altitudinal timber line; and (5) identify species from inference in areas characterized by near monospecific stands. Author

**N68-19222*#** Chicago Univ., Ill. Dept. of Biophysics.
**HIGH RESOLUTION ELECTRON MICROSCOPY OF BIOLOGICAL SPECIMENS**
H. Fernandez-Moran [1966] 8 p refs Presented at 6th Intern. Cong for Electron Microscopy, Kyoto, 27 Aug.–4 Sep. 1966
(Grant NsG-441)
(NASA-CR-76632) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Improved instrumentation and specimen preparation techniques are briefly described for ultrastructural studies of biological systems with high resolution electron microscopy. Summary data are presented on improved point cathode sources with single crystal filaments and new types of molybdenum gun design; on short focal length objective lenses of improved stability; and on the precise alignment of multi-hole or annular condenser apertures and objective phase plates of composite ultrathin single crystal films with adjustable electric fields, or ferromagnetic thin film apertures permitting phase shift control. Improved specimen preparation techniques discussed include: systematic use of ultrathin carbon films prepared by evaporation in ultrahigh vacuum ($10^{-8}$ torr) on special supports; asbestos filaments or related substrates for mounting specimens without background support; examination of wet or hydrated biological specimens in special vacuum tight microchambers, using low intensity microbeam illumination and cryogenic devices to minimize desiccation and radiation damage; and the examination of thin, frozen sections of native, unfixed tissue directly after ultrathin sectioning with a diamond knife, in microtomes operating in liquid nitrogen or helium cryostats, and transferred without thawing to the low temperature electron microscopy stage. E.J.S.

**N68-19235*** Massachusetts Inst. of Tech., Cambridge. Research Labs. of Electronics.
**READING MACHINE STUDIES FOR SENSORY AIDS**
Samuel J. Mason 29 Jul. 1966 7 p Presented at NEREM-66, Boston, 2–4 Nov. 1966
(Grant NsG-496; Contract DA-36-039-AMC-03200(E); Grants NSF GK-835; NIH G-MH-04737-06)
(NASA-CR-77888) CSCL 05H

An experimental integrated real-time reading machine system is discussed which has been developed for research on character recognition, special-purpose picture processing, tactile pattern perception, and auditory displays, including artificial speech. The system consists of an electronic print scanner, local special-purpose logic circuitry for scan control, a data link to the PDP-1 and TX-0 digital computers in an adjacent building, a typewriter and console for system control, and earphone and loudspeaker outputs. In its present form the system recognizes actual Roman bookprint at an error rate of less than one-half percent; it also produces an auditory "spelled-speech" output, thus constituting a possible progenitor of practical reading aids for the blind. K.W.

**N68-19288** Royal Aircraft Establishment, Farnborough (England).
**PERFORMANCE MEASUREMENT IN UNUSUAL ENVIRONMENTS**
L. G. Innes and M. F. Allnutt Apr. 1967 19 p refs
(T-298)

This paper discusses the relevant factors in assessments of operator performance in unusual environments. A discussion is presented of the aspects of human behaviour which have been shown to change under specific environmental stress conditions, and at what degree of severity, suddenness and duration of the stress they have been shown to change significantly. The man himself influences the result of any investigation of this kind, to the extent that individual differences often overshadow all other effects. The influence of personality factors, motivation, emotional state, and training are discussed, with reference to the relevant theoretical systems. The task done by the operator is an important variable in the situation, since sensory, psychomotor, and mental functions are differentially effected by different environmental deviations. The methodological problems of adjustment of task difficulty to ensure maximum sensitivity are explored. The influences of various psychological stresses resulting from the physical situation of the experiment, and of the degree and complexity of the fidelity of environmental simulation used, are considered in relation to the generality of experimental findings. Author

**N68-19295*#** Naval School of Aviation Medicine, Pensacola, Fla.
**VISUAL HORIZONTAL PERCEPTION IN RELATION TO OTOLITH FUNCTION**
Earl F. Miller, Alfred R. Fregly, and Ashton Graybiel Dec. 1966 14 p refs
(NASA Order R-93)
(NASA-CR-93657; NAMI-989) CFSTI: HC $3.00/MF $0.65 CSCL 06S

To determine the influence of the otolith organs on visually perceived direction of space the constant and variable errors of normal persons and deaf persons with bilateral labyrinthine defects during nineteen positions of body tilt within ±90° of gravitational vertical were compared. The general perceptual pattern was similar for the two groups, although that of the labyrinthine-defective group was found to be more variable, and greater E- and A-effects were manifested during several of the tilt positions. A significantly larger E-effect was observed in those subjects (L-Ds) with little or no ocular counterroll. Author

**N68-19296*#** General Electric Co., Philadelphia, Pa. Missile and Space Div.
**STUDY FOR THE COLLECTION OF HUMAN ENGINEERING DATA FOR MAINTENANCE AND REPAIR OF ADVANCED SPACE SYSTEMS. VOLUME 1: SUMMARY TECHNICAL REPORT Final Study Report, 26 Aug. 1966–31 Dec. 1967**
31 Dec. 1967 112 p
(Contract NAS8-18117)
(NASA-CR-61650; Doc.-67SD4441, V. 1) CFSTI: HC $3.00/MF $0.65 CSCL 05E

Requirements for eight specified experiments, identified as the type of data needed by design engineers, were defined in order to obtain a preliminary description of experimental protocol and procedures, a proposed listing of experiment equipment requirements, and an evaluative and comparative listing of estimated costs and schedules. Neutral buoyancy zero-g simulation procedures, equipment design techniques, underwater facilities and self-contained backpacks were among the experimental methods used. Summary details are presented on experiment 84A, designed to evaluate and

quantify man's ability to generate impulsive and sustained forces under a variety of conditions which simulate various modes of restraint and accessibility, and on Experiment 1A, designed to determine the factors which influence man's ability to transport free masses in zero gravity. Particular consideration is given to the characteristics of the object to be transported, the method of transport, and the path to be traversed. Also reported is the development of a handbook on human engineering design data for reduced gravity conditions. M.G.J.

**N68-19322*#** Syracuse Univ., N. Y. Dept. of Bacteriology and Botany.
**STUDIES ON TRACE ELEMENTS IN THE SPORULATION OF BACTERIA AND THE GERMINATION OF BACTERIAL SPORES Final Report, Jun. 1964–Dec. 1967**
Ralph A. Slepecky Dec. 1967 9 p
(Grant NsG-693)
(NASA-CR-93684) CFSTI: HC$3.00/MF$0.65 CSCL 06M

To determine the relative binding of metals in the *B. megaterium* spores, spore supernatants were examined after each stage during a sequence of treatments: suspension in deionized water for 10 days; 0.02M ethylenediamine tetraacetic acid (EDTA), pH 5.2 for 2 hours; and acidification to pH 2.5 for 2 hours, to pH 1.75 for 2 hours, and to pH 1.30 for two hours. The results indicate that each of the metals analyzed has a characteristic pattern of elution from the intact spore. Based upon their ease of removal from the spores and their distribution in the eluted fractions, the eight metals are grouped as follows: (1) loosely bound, eluted from spores during storage in distilled water (K, Na, Zn, and perhaps Mg); (2) removed by a chelator of divalent cations, EDTA (Fe, Zn, and Mg); (3) replaced by moderate acidification in the range of pH 2.5 to 1.3 (Ca and Mn); (4) tightly bound, found in the residual spore material after acidification (Fe and Ca); and (5) distributed in several fractions, possibly indicating multiple locations or roles in the spore (Mg and Mn). M.G.J.

**N68-19335*#** Oregon State Univ., Corvallis.
**SYSTEMATIC DESCRIPTION AND KEY TO ISOLANTS FROM LITTLE LAKE VOLCANIC AREA, CALIFORNIA Progress Report**
**W. B. Bollen, Fred Au, and Karen M. Byers 1 Dec. 1967 30 p refs Prepared for JPL**
**(Contracts NAS7-100; JPL-950783)**
**(NASA-CR-93671) CFSTI: HC$3.00/MF$0.65 CSCL 06M**

**Descriptive charts are given on 19 bacteria isolated from soils of the Little Lake Volcanic area in California. Of the bacteria described, 50.0% are species of the genus Bacillus, 42.9% are soil diphtheroids, and 7.1% are species of Micrococcus. The charts listed contain the staining, morphological, cultural and physiological characteristics of each type bacteria.** B.S.D.

**N68-19365#** Oak Ridge National Lab., Tenn.
**RADIATION BIOLOGY**
5 Aug. 1965 63 p refs Proc. of Conf held Oak Ridge, Tenn., 2–5 Aug. 1965
(CONF-65087) CFSTI: HC$3.00/MF$0.65

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**N68-19366#** Argonne National Lab., Ill.
**RADIATION IN RELATION TO BASIC BIOLOGY**
M. R. Zelle *In* Oak Ridge Natl. Lab. Radiation Biol. 5 Aug. 1965 p 1–8 refs (See N68-19365 09-04)

**The major objectives of this conference include a survey of fundamental principles and current developments of radiation biology and a consideration of the proper place of radiation biology in undergraduate curricula. It seemed appropriate, therefore, to review briefly some of the major contributions to basic biology resulting from the utilization of radiation in biological research. Obviously, in a short discussion, no pretense at completeness can be made; instead, rather arbitrary choices must be made. Further, these choices were not limited strictly to radiation biology but include many from other applications of radiation such as photobiology and use of radioactive tracers. Since as the student advances through high school, undergraduate, and graduate work, he progresses from the general consideration of the subject to the increasingly advanced and specialized, it seemed of interest to examine a widely used introductory high school biology text, the BSCS green version. Only a relatively few references to radiation were found and these were not discussed in detail.** Author

**N68-19367#** Atomic Energy Commission, Oak Ridge, Tenn.
**RADIATION BIOLOGY AS A SCIENCE**
Walter D. Claus *In* Oak Ridge Natl. Lab. Radiation Biol. 5 Aug. 1965 p 9–15 (See N68-19365 09-04)

The theme is developed that radiation biology is not something apart from biology in general. It is biology. It is the whole of biology, looked at from the viewpoint of what radiation can do to living systems, and how it does it. No claim is made that this idea of viewing biology through the framework of radiation biology is a unique approach. It is somewhat similar to looking at biological organization through the integrating concepts of energy flow through the system, or of ecology and evolution. Author

**N68-19368#** Oak Ridge National Lab., Tenn.
**RADIATION EFFECTS AT THE CELLULAR LEVEL**
J. G. Brewen *In its* Radiation Biol. 5 Aug. 1965 p 17–23 refs (See N68-19365 09-04)

**The first fact that must be established is what cellular structure is the primary target of the radiation. Although there is no clear one-to-one correlation between survival and the production of measurable nuclear damage, the majority of evidence indicates that cellular death is the result of nuclear damage. There are experiments on higher organisms that provide striking evidence that the nucleus is the primary target of radiation.** Author

**N68-19370#** Oak Ridge National Lab., Tenn.
**RADIATION EFFECTS IN PLANTS**
Alan H. Haber *In its* Radiation Biology 5 Aug. 1965 p 37–47 (See N68-19365 09-04)

The prediction of radiosensitivity in various plant types is reviewed. The use of ionized particles to probe biological structures is examined, and the difference in effects seen when charged particles are substituted for electromagnetic radiation is described. Techniques are presented for the radiation-induced spin resonance investigation of dry materials, such as seeds. These techniques, combining radiation biophysics in the dry state and chemical treatments requiring hydration followed by redrying, provide a system for studying the effects of radical decay. The use of radiation as an inhibitor of mitosis, and its relevance to teaching botany in the undergraduate curriculum are discussed. E.J.S.

**N68-19443** Royal Aircraft Establishment, Farnborough (England).
**MENTAL PERFORMANCE IN MILD OXYGEN DEFICIENCY**
L. G. Innes and M. F. Allnutt Jun. 1967 17 p refs
(R-409)

An experiment was conducted to determine the effects of a simulated 10,000 ft altitude on certain selected tests of mental ability over a 100 minute exposure period. The tests, which covered a wide range of mental functioning, were administered to two groups of electronics apprentices, one performing the tests while breathing ambient air and the other while breathing a 15.4% oxygen in nitrogen mixture. The pre-exposure time for both groups prior to testing was 30 minutes. Differences between the groups were not large enough at any stage to reach significant levels of confidence by statistical analysis. However, there are consistent indications that the breathing of the low oxygen mixture caused longer times to understand new problems, and slower reaction times for most test items, although accuracy was not affected. R.N.A.

**N68-19487*#** National Aeronautics and Space Administration, Washington, D. C.
**INFLUENCE OF EAST–WEST AND RETURN TRIPS ON THE CIRCADIAN RHYTHMS OF DIURESIS AND URINARY ELIMINATION OF SODIUM AND POTASSIUM [INFLUENCE DES VOYAGES AGRIENS EST–OUEST ET VICE VERSA SUR LES RYTHMES CIRCADIENS DE LA DIURESE ET DE L'ELIMINATION URINAIRE DU SODIUM ET DU POTASSIUM]**
E. La Fontaine, J. Sirot, J. Pasquet, and J. La Vernhe Mar. 1968 9 p refs Transl. into ENGLISH from Rev. de Med. Aeron. et Spatiale, v. 6, no. 23, 1967 p 11–15
(NASA-TT-F-11621) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Diuresis and urinary elimination of sodium and potassium were measured for a group of 10 subjects by collecting 24-hour urine samples in six 4-hour segments, which allowed us to establish circadian oscillations of the eliminations (2/24 hour percentage in each specimen). Eight and two subjects were used in varying stopover and flight periods in Paris and Anchorage. Author

**N68-19493*#** General Electric Co., Philadelphia, Pa. Missile and Space Div.
**STUDY FOR THE COLLECTION OF HUMAN ENGINEERING DATA FOR MAINTENANCE AND REPAIR OF ADVANCED SPACE SYSTEMS. VOLUME 2: DETAILED TECHNICAL REPORT Final Study Report**
31 Dec. 1967 428 p
(Contract NAS8-18117)
(NASA-CR-61649; Doc.-67SD4441, V. 2) CFSTI: HC $3.00/MF $0.65 CSCL 05E

Experimental techniques and facilities used in neutral buoyancy simulation of zero gravity conditions encountered in space maintenance and repair are described. The experimental conditions consisted of eight types of restraint (including no restraint), three force receiver distances, three force receiver angles, and two handle orientations. Data on maximum impulse and sustained forces were obtained and tabulated for each of four subjects for each experimental condition. The variables investigated were: type of restraint, receiver angle, receiver distance, receiver orientation, force type and direction, subject size, and suit pressurization methods. A description is given of the instrumentation and data recording processes used. These were designed for computerized data reduction as well as for real time monitoring by the test director. The scaling laws used were developed for underwater simulation by defining the equations of motion in orbit or in a partial-g environment and underwater, in a condition of neutral or partial buoyancy, by setting the coefficients of like terms in the equations of motion in space and water equal to each other, and then solving for the model characteristics. E.J.S.

**N68-19582** Pittsburgh Univ., Pa.
**THE EFFECTS OF PHENFORMIN HYDROCHLORIDE ON OXYGEN DEPRIVATION IN RATS AT SIMULATED HIGH ALTITUDE**
Robert Louis Powell (Ph.D. Thesis) 1966 75 p
Available from Univ. Microfilms: HC $4.00/MF $3.00 Order No. 67-7155

An inexpensive decompression chamber capable of accommodating ten rats at a simulated altitude of 29,000 feet (240 mm Hg pressure) is described. Methods for recording physiological parameters such as blood pressure, electroencephalogram, electrocardiogram, respiratory rate, and blood gas composition of animals at simulated high altitude are also described. Phenformin HCl afforded increasing protection from the lethal effects of hypoxia in doses of 18.75, 37.5, and 75 mg/kg when administered orally, 4 hours prior to decompression, to male Wistar rats. However, at a dose level of 150 mg/kg, protection declined. It is postulated the phenformin HCl protects rats from the detrimental effects of hypoxia through a complex series of effects including increased peripheral resistance resulting in increased central perfusion, increased ventilation, decreased alkalosis in response to hypoxia, and possibly by decreasing norepinephrine levels in the heart. Dissert. Abstr.

**N68-19593*#** Texas Christian Univ., Fort Worth.
**VERBAL ESTIMATION OF DISTANCE IN A SIMULATED SPACE ENVIRONMENT**
Malcolm D. Arnoult, Bill R. Brown, Robert J. Vincent, and Sandra Tees [1967] 35 p refs
(Contract NAS2-1481)
(NASA-CR-73206) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Preliminary work has indicated that when subjects (Ss) are given no information other than the real size of the target, verbal estimates of distance over the 200–5000 ft range tend to have a median error of about 55%, with errors on individual trials running as high as 1000%. Two experiments investigated possible ways of improving the accuracy of verbal judgments. Effects due to kind of stimulus sequence (random or sequential), distance range, and the presence of verbal anchors were examined. In the first experiment the limits of the distance range being used were shown and identified to the Ss before each set of 10 judgments of randomly chosen distances. The use of these anchors reduced the median error to about 15%. A second experiment investigated the effect of sequential presentation of distances. The effect of anchors was about the same, but there were also some adaptation effects stemming from the sequential order of stimulation. Author

**N68-19653#** Oak Ridge National Lab., Tenn.
**HEALTH PHYSICS DIVISION Annual Progress Report, Period Ending Jul. 31, 1967**
Oct. 1967 353 p refs
(Contract W-7405-ENG-26)
(ORNL-4168) CFSTI: HC $3.00/MF $0.65

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**N68-19654#** Oak Ridge National Lab., Tenn.
**RADIATION ECOLOGY, PART 2**
S. I. Auerbach *In its* Health Phys. Div. Oct. 1967 p 61–118 refs (See N68-19653 10-05)

The following topics are discussed: (1) *Responses of Animal Populations to Ionizing Radiation*—radiation effects on small mammals, bagworms, and insects, population genetics and survival, and radioactive isotope movements in food chains; (2) *Responses of Plants to Ionizing Radiation*—radiosensitivity and genetic modifications in forest trees, and radionuclide uptake in plants; (3) *Radionuclide Cycling in Terrestrial Ecosystems*—radionuclide movements in forest landscapes, and microcosms; (4) *Radionuclide Cycling in Aquatic Ecosystems*—uptake and metabolism effects in fish, aquatic food chains, macroinvertebrates, and radiation effects on fish reproduction; (5) *Watershed Aquatic Habitat Interactions*—land–water interactions and transport of radionuclides in river water; (6) *Theoretical and Systems Ecology—systems identification, radiant energy budget of forest, vertical periphyton growth, and geochemical denudation; and (7) Forest Management*—linear programming for forest regulation. G.G.

**N68-19656#** Oak Ridge National Lab., Tenn.
**RADIATION DOSIMETRY, PART 4**
J. A. Auxier *In its* Health Phys. Div. Oct. 1967 p 183–230 refs (See N68-19653 10-05)

Reported research covers the areas of: (1) *Ichiban Studies*—radiation attenuation and neutron energy spectrum measurements at Japanese laboratory; (2) *Spectrometry and Dosimetry Research*—possible nuclear accident dosimeter, recoil particle energy spectra, intermediate neutron energy spectrometer, and LiI spectrometry; (3) *Dosimetry Applications*—glass dosimetry, solid state track detectors, activation analyses in animals, neutron production in graphite, copper and tantalum targets, various dose calculations, etc.; and (4) *Health Physics Research Reactor and Low Energy Accelerator Operations*. G.G.

**N68-19657#** Oak Ridge National Lab., Tenn.
**INTERNAL DOSIMETRY, PART 4**
W. S. Snyder *In its* Health Phys. Div. Oct. 1967 p 231–288 refs (See N68-19653 10-05)

Described studies pertain to: (1) *Internal Dose Estimation*—energy calculations for internal radioactive decay caused by gamma radiation, variation of dose in man from exposure to gamma ray point source, body retention model for cesium, administration of labeled neohydrin dose, and excretion data analysis to predict body uptake of plutonium; and (2) *Stable Element Metabolism*—intake and excretion of stable elements, and tissue analysis. G.G.

**N68-19658#** Oak Ridge National Lab., Tenn.
**HEALTH PHYSICS TECHNOLOGY, PART 6**
B. R. Fish *In its* Health Phys. Div. Oct. 1967 p 289–344 refs (See N68-19653 10-05)

Work is reported on: (1) *Aerosol Physics*—particle adhesion to particles and plane surfaces, colorimetric studies on particle electricity, exploding wire aerosol generator, airborne vapor and particle interactions, and particle retention deposition on skin; and (2) *Applied Internal Dosimetry*—gamma ray spectrometry facility for detection and measurement of internal contamination, elimination of injected isotropic mercury, absorption of X-rays from transuranic elements, and radiostrontium for sample analysis. G.G.

**N68-19696** Washington Univ., Seattle.
**ADULT AGE DIFFERENCES IN THE PERCEPTION OF VISUAL ILLUSIONS**
**Frank Douglas Gajo (Ph.D. Thesis) 1966 110 p**
**Available from Univ. Microfilms: HC $5.40/MF $3.00 Order No. 67-7036**

The present experiment thus purported to study the relation between chronological age and susceptibility to these illusions in a study which emphasizes experimental controls, psychophysical procedures, and the criterion measures of the illusory effects. First, it was hypothesized that there is an age x procedure interaction to the effect that differences in susceptibility with age past maturity depend upon the type of procedure used. The second hypothesis tested stated in essence that when procedure is held constant, the magnitude of error in the Müller–Lyer illusion and in the Satellite circles illusion is not a function of chronological age in adult subjects. The third specific hypothesis tested refers to the interaction between age, procedure, and illusion and states that the difference between the Müller–Lyer illusion and the Satellite illusion, associated with chronological age, will be dependent upon the type of procedure used. Dissert. Abstr.

**N68-19705*#** Texas Christian Univ., Fort Worth.
**DISTANCE DISCRIMINATION IN A SIMULATED SPACE ENVIRONMENT**
Robert J. Vincent, Bill R. Brown, and Malcolm D. Arnoult 5 Jan. 1968 17 p refs
(Contract NAS2-1481)
(NASA-CR-73205) CFSTI: HC $3.00/MF $0.65 CSCL 05H

The Just Noticeable Difference (JND) for distance was investigated by a paired-comparisons method using successive comparisons. The research utilized an optically simulated large target located in a textureless environment at distances along the saggital plane out to 12,800 ft. The value of $\Delta D/D$ varied from less than 3% at 200 ft to about 7% at 12,800 ft. The results confirm the power function relationship between distance threshold and observation distance. Author

**N68-19749*#** National Aeronautics and Space Administration, Washington, D. C.
**MECHANISMS OF REGULATION OF THERMAL HOMEOSTASIS IN THE WORK PROCESS [MECANISMELE REGLARII HOMEOSTAZIEI TERMICE IN PROCESUL MUNCII]**
N. Gavrilescu and M. Hilt Apr. 1968 4 p Transl. into ENGLISH from Fiziol. Norm. Patol. (Rumania), v. 12, no. 4, 1966 p 297–300
(NASA-TT-F-11635) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Thermal homeostasis involves numerous regulatory mechanisms. The thermoregulatory systems exhibit a duality, both topographic and functional, in that the centers which react to heat and to cold are not colocated. Specific mechanisms by which the body reacts to heat and cold are described. Author

**N68-19769#** Boeing Scientific Research Labs., Seattle, Wash. Plasma Physics Lab.
**NEW CORRELATION BETWEEN A HUMAN SUBJECT AND A QUANTUM MECHANICAL RANDOM NUMBER GENERATOR**
Helmut Schmidt Nov. 1967 54 p ref
(D1-82-0684)

Between some experimenters and a quantum mechanical random number generator, there appears to exist a type of coupling which contradicts currently accepted physical laws. This tentative conclusion was based on a series of experiments on an apparatus that consists of a device utilizing a quantum process to generate random numbers modulo 4. This random number generator is connected to four lamps and four corresponding pushbuttons in such a way that there is no correlation between the number of the button pressed and the number of the lamp lighted, as well as no correlation between successively generated random numbers. A preliminary study was made in which a large number of human operators was asked to press buttons manually; and it was found that certain individuals consistently scored higher than expected, that is, they pressed buttons to light lamps and make so-called hits. Three of these experimenters later obtained 16,456 hits out of 63,066 trials; and the probability of obtaining such a result by chance alone is less than $2 \times 10^{-9}$. M.W.R.

**N68-19774#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
**ORBITAL EXTRAVEHICULAR MOCKUP DESIGN**
Paul Iribe Jan. 1968 20 p
(Contract NOw-62-0604-c)
(APL-TG-957; AD-665287)

Extravehicular activities (EVA) in space such as inspecting orbiting spacecraft, servicing orbiting equipment (e.g., an orbiting telescope), performing assembly tasks in space, and making space rescues will require an extravehicular work platform. The proposed one-man extravehicular work platform is an example of extreme man-machine integration. A study of the requirements for extravehicular protection and operation for such activities led to the immediate construction of a full-scale mockup of the required type of platform in order that it might serve as a focus for discussion, give a first look at the engineering feasibility of the platform, arbitrarily reduce the number and variety of contending designs, and be useful in future studies. The principal design features of this full-scale mockup are described. Of the contending designs, the one chosen for the mockup was a modularized backpack equipped with a propulsion capability, a backup for a portable life support system (PLSS), a communication subsystem for voice and telemetry, a TV monitoring subsystem, a rechargeable electrical power source, and pack-mounted illumination and mechanical manipulators. The basic design can be augmented by special modules to meet the requirements of particular missions. Author (TAB)

**N68-19802*#** Techtran Corp., Glen Burnie, Md.
**EFFECT OF VARIOUS DRINKING PATTERNS ON DIURESIS UNDER HIGH AIR TEMPERATURE AND PHYSICAL STRESS CONDITIONS [VLIYANIYE RAZLICHNYKH PIT'YEVYKY REZHIMOV NA DIUREZ V USLOVIYAKH VYSOKOY TEMPERATURY VOZDUKHA I FIZICHESKOY NAGRUZKI]**
F. T. Yeronin Washington NASA Mar. 1968 8 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (Moscow), v. 49, no. 10, 1963 p 1249–1253
(Contract NASw-1695)
(NASA-TT-F-11605) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Tests were made to find the effect of heat and work on diuresis for three drinking patterns. Diuresis decreased with each hour in all tests for all drinking patterns, while the specific gravity increased. Losses from the skin and lungs were about 4.7% of the average body weight. Dehydration, caused chiefly by heavy perspiration, affects diuresis, but the main cause of reduced diuresis is reduced blood supply to the kidneys. Economization of water by reduced diuresis is only about 5% of total water losses. Diuresis did not differ greatly for the various drinking patterns. Anuria was not observed. Author

**N68-19813** New School for Social Research, New York.
**THE INFLUENCE OF ATTENTION AND AWARENESS ON VISUAL PERCEPTION**
Dorothy C. Poster (Ph.D. Thesis) 1966 88 p
Available from Univ. Microfilms: HC $4.60/MF $3.00 Order No. 67-4795

The problem of the role of awareness in visual perception was to be investigated by presenting stimulus material in the peripheral field while the subject's attention was actively engaged in the central field. Under these conditions, with the stimulus input sufficient to ensure registration, the question raised was is it possible that the stimulus can affect the nervous system so that psychological after effects such as recall, recognition, etc., can be obtained? It was concluded that when attention is actively engaged and there is unawareness of a critical visual stimulus, even with maximum stimulus input, neither recall nor recognition can occur. Some awareness seems to be a necessary condition for these processes to occur. However, the results provide evidence that a memory trace, in the absence of awareness of the stimulus, can influence the subsequent organization of at least one kind of ambiguous material. Dissert. Abstr.

**N68-19823*#** National Aeronautics and Space Administration, Washington, D. C.
**QUANTITATIVE RELATIONSHIP BETWEEN STIMULUS AND EFFECT IN THE STATIC ORGAN [QUANTITATIEVE BETREKKING TUSSCHEN PRIKKEL EN EFFECT BIJ HET STATISCH ORGAAN]**
Willem Mulder Mar. 1968 111 p refs
(NASA-TT-F-11489)CFSTI: HC $3.00/MF $0.65 CSCL 06C

A literature survey is presented on the experimental data pertaining to static sensations and to the reflexes stimulated by the labyrinth. To show the quantitative relationship between stimulus and effect in the static organ, experiments were conducted on the otolith organs and on the semicircular canals. Pikes, frogs, turtles, and guinea pigs were used. The acceleration stimulus was kept as uniform as possible, and its effect was determined by recording the reflexes or determining the threshold of the sensations. With respect to reflexes in man, the reflex time of the rotation nystagmus was measured. Data are presented on the minimum perception, differentiation threshold, merging of rotation sensations, and progress of the sensation. A reference bibliography is included. M.G.J.

**N68-19828#** Naval Research Lab., Washington, D. C.
**THE SEALAB 2 TRACE-CONTAMINANT PROFILE**
Raymond A. Saunders and Richard H. Gammon 4 Dec. 1967 17 p refs
(NRL-6636; AD-664946)

Adsorption of contaminants on activated charcoal was one of the methods used to sample the atmosphere of Sealab II. The contaminant material was later recovered by slowly heating the charcoal in an evacuated system and retaining the desorbate in liquid-nitrogen-cooled traps. The desorbate mixture was resolved with a vapor-phase chromatograph. The eluted components were passed directly into a rapid-scanning mass spectrometer for positive identification. Components were also collected from the effluent of the chromatograph and identified by means of their infrared spectra. Over 30 different compounds were identified in the charcoal desorbate. Added to those already known, the total number of atmospheric contaminants which have been identified in Sealab II now amounts to 40. These include refrigerants, saturated and unsaturated aliphatic hydrocarbons, cyclic aliphatic hydrocarbons, chlorinated hydrocarbons, and aromatic hydrocarbons. The characteristic feature of the Sealab II contaminant profile, like that of Sealab I, was a predominance of hydrocarbon contaminants. Some of the more prominent contaminants in the Sealab II atmosphere were cyclic aliphatic hydrocarbons which are not generally encountered as dominant trace contaminants in closed environmental atmospheres. Author (TAB)

**N68-19841#** HRB-Singer, Inc., State College, Pa.
**AUDITORY EVALUATION**
W. R. Stover Johnsville, Pa. Naval Air Develop. Center 30 Nov. 1967 74 p
(Contract N156-67-C-0929)
(NADC-AC-6709; AD-665002)

The investigation focused attention upon the development of multi-dimensional hearing tests which could yield new insights to normal and abnormal states of hearing and to auditory communications under a variety of conditions. The broad results indicate that the new approach can provide significant information about auditory mechanisms. Within the limits of the test conditions, background noise affected phoneme recognition by subjects with normal hearing, conductive hearing loss, and sensori-neural hearing loss in qualitatively similar ways, with trends toward quantitative differences. The detailed findings provide a basis for planning the

construction of more precise tests along theoretical and methodological lines. Author (TAB)

**N68-19842#** Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
**A STUDY OF THE PRIMATE VESTIBULAR SYSTEM**
Charles S. Lessard (M.S. Thesis) and James R. Gnuse (M.S. Thesis) Jun. 1967 132 p refs
(GGC/EE/67-6; AD-665132)

A constant-speed, feedback-controlled apparatus suitable for flight in zero-g aircraft, was designed, modeled, tested and constructed for direct, continuous measurement and readout of eyeball counterroll. The results, using Rhesus monkeys as subjects, were compared with human measurements obtained through an indirect system and were found to be qualitatively similar. Transient responses to a step angular velocity were observed to diminish. Amplitude shifts, bias drifts, and variations in the magnitude of the counterrolling were recorded and adaption to consecutive stimuli and suppression of the vestibular response were observed. Author (TAB)

**N68-19844#** School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.
**EFFECTS OF ACETAZOLAMIDE ON PHYSIOLOGIC AND SUBJECTIVE RESPONSES OF MEN TO 14,000 FEET Research Report, Apr.–Sep. 1966**
Richard S. Kronenberg and Stephen M. Cain Sep. 1967 28 p refs Submitted for publication
(SAM-TR-67-81; AD-664901)

A study was carried out to determine the effectiveness of low doses of acetazolamide in ameliorating the symptoms of altitude sickness. Subjects were placed in a low pressure chamber at either 14,000 ft. or 3,000 ft. for 24 hours. Before entering the chamber each subject took a total of 750 mg. of acetazolamide or a placebo. During their 24-hour stay, the subjects filled out a questionnaire designed to evaluate their state of well-being. End-tidal PCO2 was measured, and electrodes were applied for monitoring respiratory pattern and EEG. Subjects were given a ranking of 1 (worst) to 4 (best) comparing individual clinical states. Samples of arterial blood and cerebrospinal fluid were obtained and analyzed for pH, PO2, PCO2, CO2, HCO3(-), and lactate. Twenty-four-hour urine volumes were analyzed for Na, K, and 17-hydroxycorticosteroids. Acetazolamide significantly lowered arterial and CSF HCO3(-), arterial and end-tidal PCO2, and arterial pH. The mean arterial PO2 was higher in those receiving acetazolamide, but the increase was not significant ($P < .10$). Pretreatment with acetazolamide was of sufficient clinical benefit to allow its recommendation prior to altitude exposure. Author (TAB)

**N68-19883#** School of Aerospace Medicine, Brooks AFB, Tex.
**NUMERICAL MARKING ABRASIVE UNIT, JULY–OCTOBER 1966**
Heinz A. Jaeger and William G. Glenn Sep. 1967 13 p refs
(SAM-TR-67-83; AD-664896)

An industrial abrasive unit was modified to enable precise, repetitive abrading of small glass columns. The abraded areas completely circle the tubes at preselected intervals. When such markings are scanned by a light beam - photocell combination, they can be graphically recorded as a series of spikes. The presence or absence of spikes at certain intervals can be transposed into Arabic numbers by using a modification of the conventional binary coded decimal. Using numbers 00 to 99 at the top, bottom, or combination of top and bottom of the tubes permits 9,999 different designations. TAB

**N68-19915#** Naval Research Lab., Washington, D. C.
**A COMPARISON OF THREE TYPES OF MANUAL CONTROLS ON A THIRD-ORDER TRACKING TASK**
P. N. Ziegler and R. Chernikoff 20 Dec. 1967 16 p refs
(NRL-6646; AD-665001)

Three types of control levers--the spring-centered-displacement control, the on-off control, and the pressure control--were compared on a third-order compensatory tracking task. Based on an analysis of the control transfer functions, the predicted ranking of the three controls are: (1) pressure, (2) displacement, and (3) on-off. The results of a study in which five subjects tracked six trials with each control for 18 sessions were as follows: The data at the beginning of training indicated rankings of (1) pressure, (2) on-off, and (3) displacement. However, the data taken during the latter sessions ranked the controls as predicted, although the difference between displacement and on-off was not statistically significant. Differences in results between early and late training and comparisons of these results with other studies are discussed. Author (TAB)

**N68-19940#** Human Engineering Labs., Aberdeen Proving Ground, Md.
**EFFECTS OF MUSIC ON WORK PERFORMANCE**
William Wokoun Jan. 1968 46 p refs
(TM-1-68; AD-664749)

Sixty-three subjects worked at a vigilance task for an hour while listening to one of three musical programs. While all three programs included the same 23 selections, the Ascending Program grew steadily more lively, and the Descending Program grew steadily less lively, while the Increasingly Variable Program progressively increased the contrast between adjacent selections. Results showed that changing the sequence of the 23 selections profoundly affected reaction times and variabilities, as well as individual consistency. Subjects performed the vigilance task better with the Ascending Program than with the other two programs. Author (TAB)

**N68-19949** Maryland Univ., College Park.
**MIGRATION AND TRAPPING OF EXCITATION QUANTA IN PHOTOSYNTHETIC UNITS**
Robert Milton Pearlstein (Ph.D. Thesis) 1966 110 p
CSCL 06C Available from Univ. Microfilms: HC $5.40/MF $3.00 Order No. 67-6143

The cooperative process in which excitation quanta, initially absorbed anywhere in the photosynthetic pigment aggregates, are efficiently transported to specialized trapping sites is treated as the random migration and trapping of localized excitons. The major pigment component, chlorophyll-a in green plants, forms a network of interacting molecules with N molecules per trap; relaxation of the migratory excited state in the entire network is effected by the traps. A set of N Pauli-type, coupled master equations governs the exciton motion, which is diffusive in character. To allow for the possibility that the pigment layers may be multimolecular, both two- and three-dimensional networks are considered. The master equations are solved approximately for regular lattices, using a diffusion equation and radiation boundary condition at each trap. Dissert. Abstr.

**N68-19953#** Naval School of Aviation Medicine, Pensacola, Fla.
**THE NAVAL AVIATOR'S SPEED DISCRIMINATION TEST: INSTRUMENTATION AND TECHNIQUE**
James W. Greene 6 Dec. 1967 25 p refs
(NAMI-1027; AD-665038)

The Naval Aviators Speech Discrimination Test (NASDT), formulated in 1964, is used by the Bureau of Medicine and Surgery to evaluate aviators who fail to meet the hearing standards for aviation. The nature of the test, which involves a listening task for high-level speech signals with a simulated aircraft noise background, requires a tape recorder and earphone configuration.

Two similar systems of test presentation have been developed and are in current use at 18 Navy and Marine Corps installations. The devices produce the properly controlled test signals required for the NASDT and are easily operated by trained corpsmen. Additional information is presented to enable the user of either system to administer the test properly. Author (TAB)

**N68-19957** California Univ., Berkeley.
**THE ROLE OF CHLOROPHYLL AS A CHEMICAL INTERMEDIATE IN PHOTOSYNTHESIS**
Marianne Patterson Byrn (Ph.D. Thesis) 1966 100 p
Available from Univ. Microfilms: HC $5.00/MF $3.00 Order No. 67-5016

The work in this thesis evaluates several chemical mechanisms proposed in the literature using isotope tracers, and a new mechanism is proposed and experimental evidence in its favor is presented. Deuterium and NMR are used to determine the ability of the delta and the 10 position of chlorophyll *a*. Oxygen 18 and infrared were the means of evaluating proposals involving the carbonyl group of the isocyclic ring of chlorophyll *a* and *b*. Model compounds relating to the structure of chlorophyll (cyclic ketone, aromatic aldehydes and beta-ketoesters) were studied to determine the lability of carbonyl groups to hydration. Chlorophylls and chlorophyll derivatives were then examined, and their exchange properties are discussed in relation to the model compounds. Dissert. Abstr.

**N68-19968*#** Miami Valley Hospital, Dayton, Ohio. Dept. of Research.
**THE POTENTIAL HAZARD OF STAPHYLOCOCCI AND MICROCOCCI TO HUMAN SUBJECTS IN A LIFE SUPPORT SYSTEMS EVALUATOR WHILE ON A SIMULATED GT-7 MISSION Final Report, 19 Sep.–1 Nov. 1965**
Leonard P. Lotter and Bonnie S. Horstman Wright-Patterson AFB, Ohio AMRL Sep. 1967 33 p refs
(NASA Order R-85; Contract AF 33(657)-11716)
(NASA-CR-93778; AMRL-TR-67-45; AD-664909) CFSTI: HC $3.00/MF $0.65 CSCL 06I

Four human male subjects participated in a 6-week simulated aerospace study and during confinement were kept under controlled metabolic conditions. During this time 28 consecutive days were spent in a Life Support Systems Evaluator. The subjects ate fresh, heat processed, freeze dehydrated, and compressed bite sized foods while exposed to simulated aerospace stress of confinement, wearing an unpressurized pressure suit, experimental diet, and minimal personal hygienic conditions. Body and environmental areas were sampled and the catalase-positive gram-positive cocci isolated were tested for production of coagulase, deoxyribonuclease, hemolysin, gelatinase, and utilization mannitol. The results show that there were no significant differences in frequency of occurrence of biochemical types among subjects and among environmental areas during the chamber period. There were significant differences in the frequency of occurrence of biochemical types on nose, throat, gingiva, axilla, groin, glans penis, anus, and toe. There was no buildup of biochemical types with time in any test condition. One phage type, 29/UC-18, was recovered and was passed from one subject the environment but not to other subjects. In the concurrent metabolic studies the physiological, biochemical, and nutritional parameters investigated were all in the normal range of clinical values. Confinement under simulated aerospace conditions for at least 28 consecutive days and conditions of minimal personal hygiene show that no unique set of circumstances are operable that would require the establishment of special biomedical criteria. Author (TAB)

**N68-20005#** Flying Personnel Research Committee, London (England).
**FURTHER STUDIES UPON THE HUMAN ASPECTS OF FIRE IN ARTIFICIAL GAS ENVIRONMENTS**
D. M. Denison and W. J. Tonkins Sep. 1967 31 p refs
(FPRC/1270)

This paper extends a series reporting work upon the problems of fire in various artificial gas environments suitable to man. The object of the present study has been limited to obtaining a more precise idea of what would happen to a clothed man if he came in contact with an ignition source in these surroundings. Author

**N68-20016*#** Northrop Corp., Hawthorne, Calif. Corporate Labs.
**INVESTIGATION OF PEROGNATHUS AS AN EXPERIMENTAL ORGANISM FOR RESEARCH IN SPACE BIOLOGY Final Report**
R. G. Lindberg Feb. 1968 262 p refs
(Contract NASw-812)
(NASA-CR-93832) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Pocket mice (genus *Perognathus*) are proposed as particularly suitable subject matter for space biology research by virtue of their unusual physiology which permits significant simplification of the life support systems in biosatellites. The resultant savings in payload, coupled with the small size of the animals, permits the formulation of experimental designs involving large numbers of mammals, and a significantly higher probability of definitive results from this experimentation. Specific data are presented on the following: breeding, growth and development; thermoregulation; hibernation; circadian periodicity; and radiobiology. From these data are derived: (1) metabolic baselines delimiting the nature and complexity of a life support system for pocket mice in space vehicles; (2) baselines of selected physiological traits of pocket mice that are potentially useful for assessing the biological effects of extraterrestrial residence; and (3) specific design for a space biology experiment utilizing pocket mice to study the stability of circadian systems in space. Author

**N68-20022** Illinois Univ., Urbana.
**AN INVESTIGATION OF THE EFFECTS OF INTENSE NONCAVITATING ULTRASOUND ON SELECTED ENZYMES**
Robert Malcolm MacLeod (Ph.D. Thesis) 1966 122 p
(Contract Nonr-1834(29); Grant NSF GB-2050) Available from Univ. Microfilms: HC $6.00/MF $3.00 Order No. 67-6663

Solutions of five enzymes (α-chymotrypsin, trypsin, lactate dehydrogenase, aldolase, and ribonuclease) were irradiated with noncavitating ultrasound under a variety of physical and chemical conditions. Two types of ultrasonic irradiations were performed on the enzyme solutions. In the first type the solutions were exposed to the noncavitating ultrasound and then analyzed to determine if any permanent change in the enzyme molecules was produced. In the second type the enzyme is irradiated in a solution of its substrate, while it is catalyzing a specific biochemical reaction. The results of both types of irradiations show that the noncavitating ultrasound has no effect on either the structure or the function of the enzymes. It is concluded that cavitation is a necessary condition if damage is to be produced by ultrasound in enzyme solutions *in vitro*. Dissert. Abstr.

**N68-20023** Illinois Univ., Urbana.
**DYNAMIC ANALYSIS OF SPEECH SIGNALS**
Ian Bryce Thomas (Ph.D. Thesis) 1966 167 p
Available from Univ. Microfilms: HC $7.80/MF $3.00 Order No. 67-6755

A new experiment is described in which the contributions of first and second formant to the intelligibility of clipped speech are measured. The figures obtained for the second formant test confirm that the second formant is a major contributor to speech intelligibility. A Second Formant Tracker was designed and constructed to examine the behavior of the second formant in connected speech. A transient approach to the analysis of speech

signals was proposed which contrasts sharply with the Fourier methods now in general use. Examination of the outputs of the second formant tracking device shows that there is a logarithmic similarity between these outputs for the same words enunciated by many speakers. Finally, a real-time Speech Analysis-Synthesis Machine was constructed and tested which utilizes only second formant information in the generation of synthetic speech. The results of articulation tests performed with this machine are presented and discussed. Dissert. Abstr.

**N68-20026*#** National Aeronautics and Space Administration, Washington, D. C.
**AEROSPACE MEDICINE AND BIOLOGY—A CONTINUING BIBLIOGRAPHY WITH INDEXES**
Feb. 1968 175 p refs
(NASA-SP-7011(47)) CFSTI: HC$3.00/MF$0.65 CSCL 06S

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

**N68-20027*#** National Aeronautics and Space Administration, Washington, D. C. Scientific and Technical Information Div.
**AEROSPACE MEDICINE AND BIOLOGY—A CONTINUING BIBLIOGRAPHY WITH INDEXES**
Mar. 1968 131 p refs For abstract see N68-20026 10-04
(NASA-SP-7011(48)) CFSTI: HC$3.00/MF$0.65 CSCL 06S

**N68-20050#** Applied Science Associates, Inc., Valencia, Pa.
**EFFECT OF AMBIGUOUS TEST RESULTS ON TROUBLESHOOTING PERFORMANCE Final Report, Apr. 1966–Apr. 1967**
William J. Pieper and John D. Folley, Jr. Wright-Patterson AFB, Ohio AMRL Nov. 1967 39 p refs
(Contract AF 33(615)-3966)
(AMRL-TR-67-160; AD-664891)

Forty-eight high school boys, used as subjects, were divided into eight groups of six each. Four of the groups were composed of medium electronic aptitude subjects having scores in the 40 to 65 percentile range on the Airman Qualifying Exam - 62. The other groups contained subjects with high, 75 to 99 percentile, electronic aptitude. Each subject received 11 hours of training and practice in isolating malfunctioning components in data-flow diagrams using the half-split strategy. During testing each subject group worked 24 paper and pencil between-stage troubleshooting problems, one set of 6 at each of four levels of ambiguity (0%, 10%, 20%, and 40%). The performance measures used were: (1) isolation time, (2) number of isolation tests, and (3) identification errors. Subject aptitude had the greatest effect on speed (isolation time) and accuracy of identifying the guilty component (identification errors). On the other hand, aptitude had no effect on the application of the troubleshooting strategy since both medium and high aptitude subjects used the same number of tests in solving the problems. Ambiguity of test results affected speed, accuracy, and application of the strategy. The greater the percentage of ambiguous test results, the more time required, the less accuracy attained, and the greater the number of checks used in solving the problems. As expected, the four problem sets had significant effects on speed, accuracy, and the number of tests used to solve the problems. However, there were no significant interactions between this variable and aptitude, ambiguity, or the aptitude by ambiguity interaction.

**N68-20060#** School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.
**THE CHANGING PARAMETERS OF THE HABITUATING VESTIBULAR SYSTEM, JUNE 1964–JANUARY 1967**
Robert L. Cramer, Patrick J. Dowd, Edwin W. Moore, and Frederick G. Collins Sep. 1967 12 p refs
(SAM-TR-67-85; AD-664898)

Nystagmic responses to a Coriolis stimulation were recorded from a human subject over a period of ten sessions of four stimuli each. The response can be approximated by simple negative exponential growth and decay functions. Repeated exposure results in a reduction of the subjects sensitivity to the stimulus. At the same time the dynamic characteristics of the system mediating the response change so as to provide a more rapid recovery from the stimulus. Both of these changes are beneficial to a pilot, as they improve his resistance to some forms of spatial disorientation. Author (TAB)

**N68-20061#** State Univ. of New York at Buffalo. Dept. of Psychology.
**EFFECTS OF PRIOR AGREEMENT FROM OTHERS ON TASK CONFIDENCE AND CONFORMITY**
James W. Julian, C. Robert Regula, and Edwin P. Hollander Nov. 1967 26 p refs
(Contract Nonr-4679(00))
(TR-9; AD-664819)

An experiment was conducted to explore further the relationship between prior agreement from others and subsequent conformity to their erroneous judgments. 240 Ss were arrayed in a 2 x 6 x 2 factorial design with sex, levels of prior agreement, and two questionnaire conditions defining each of the factors respectively. Two related hypotheses were tested: (1) that task confidence is a direct function of the level of prior agreement experienced, and (2) that conformity is curvilinearly related to the level of task confidence and prior agreement. Task confidence was thus hypothesized to mediate the relationship between agreement and conformity. During phase one of the procedure, Ss responded in the first position of a modified Crutchfield apparatus, where they saw either 100%, 75%, 50%, 25%, or 0% of their peers agree with them on each of 20 judgments of an unambiguous stimulus. In a control condition, no feedback was provided. In phase two, Ss shifted to the usual last response position and their conformity was assessed. Results confirmed the hypotheses. In addition, sex differences in reaction to prior agreement were explored. Author (TAB)

**N68-20077#** Naval Personnel Research Activity, San Diego, Calif. Navy Training Research Lab.
**PREDICTION TABLES FOR AVIONICS FUNDAMENTALS COURSE, CLASS A**
Robert O. Baldwin and Kirk A. Johnson Feb. 1968 32 p refs
(SRM-68-15; AD-665288)

In September 1966 a 16 week Avionics Fundamentals course was implemented in place of the 19 week course. Tables to predict the expected grades of students in the new course were constructed. Graphs for predicting the probability of receiving a setback and the probability of graduating after receiving a setback were also constructed. Author (TAB)

**N68-20089#** University of Southern Calif., Los Angeles.
**MODIFICATION OF STRESS RESPONSES TO COLD AND ELECTRIC SHOCK: THE USE OF AUTOHYPNOTIC TECHNIQUES Final Technical Report, 1 Jul. 1965–31 May 1967**
Perry London and Ronald A. McDevitt Wright-Patterson AFB

(Contract AF 33(615)-2958; Grants NIH 1-K3-MH-31; NIH 1-K3-MG-209-01)
(AMRL-TR-67-142; AD-664940)

This project was undertaken to determine the usefulness of autohypnotic training for overcoming the debilitating effects of stress on performance and physiological processes. The experiment was performed on 64 male volunteers, one-half high in hypnotic susceptibility and one-half low. Each subject then went through three experimental sessions, one without stress and two with stress, in each of which he was given two performance tasks and monitored on eight physiological measures. Cold (35C) and electric shock (15 second average interval) were used as the stressors. After the non-stress and first stress sessions, the subjects in the experimental group received 6 hours of autohypnotic training, oriented toward enabling them to function optimally under stress without excessive discomfort. Author (TAB)

**N68-20092*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
**GROWTH OF AEROBIC AND ANAEROBIC BACTERIA IN AGAR SUBJECTED TO FREEZING AND DIURNAL FREEZING AND THAWING**
R. E. Cameron, G. B. Blank, and N. H. Horowitz 15 Jun. 1967 15 p refs
(Contract NAS7-100)
(NASA-CR-93790; JPL-TM-33-331) CFSTI HC $3.00/MF $0.65 CSCL 06M

Surface soils were collected from nine sites on the premises of the Jet Propulsion Laboratory. All samples were mixed and sieved to provide a composite soil sample. The abundance of aerobic and anaerobic bacteria in the sample was determined in trypticase soy agar plates subjected to temperature conditions of (1) room temperature, +25°C; (2) diurnal freezing, −75°C for 16 hr, and thawing, +25°C for 8 hr; and (3) continuous freezing at −75°C. Following two weeks of incubation at the above temperatures, all sets of agar plates were incubated for an additional two weeks at +25°C. No bacteria grew during continuous freezing at −75°C. Aerobes grew during diurnal freezing and thawing at dilutions of $10^{-3}$ to $10^{-4}$. Anaerobes did not grow during diurnal freezing and thawing. All sets of plates showed growth of aerobes and anaerobes by the end of the final two weeks of incubation at +25°C. The abundance of aerobes was greater than anaerobes, but regardless of the first two weeks of temperature conditions, after the second two weeks of incubation at room temperature, survival rates were comparable for sets of aerobic and anaerobic agar plates. Author

**N68-20098** Pennsylvania State Univ., University Park.
**MECHANISMS INVOLVED IN THE RADIATION INTERRUPTION OF TRANSCRIPTION**
Thomas Francis Barone (Ph.D. Thesis) 1966 68 p
Available from Univ. Microfilms: HC $3.80/MF $3.00 Order No. 67-5895

The emphasis of this investigation was to determine whether irradiated medium could be used to measure messenger RNA half-life. The following aspects of the action of ionizing radiation were studied: (1) the effect of irradiation on β-galactosidase expression in the presence of catalase; (2) the effect of irradiated medium on β-galactosidase expression; (3) the effect of irradiated medium on proline and histidine incorporation into protein over the temperature range 10°–40°C; (4) effect of irradiated medium on the proline pool in the cell; (5) effect of irradiated medium on glucose uptake and incorporation; (6) effect of irradiated medium on uracil incorporation. Since the effects of irradiated medium on protein synthesis are largely unknown the following experiments were performed: (1) measurement of the half-lives of tryptophanase and β-galactosidase mRNA by pulsed induction; (2) measurement of the pool of valyl-sRNA after treatment with hydrogen peroxide. Dissert. Abstr.

**N68-20120*#** Hayes International Corp., Birmingham, Ala.
**A STUDY TO DETERMINE THE FEASIBILITY OF USING PHYSICAL METHODS FOR BIOCHEMICAL ANALYSIS UNDER SPACE FLIGHT CONDITIONS Final Report, 16 Jan.–16 Sep. 1967**
16 Sep. 1967 196 p refs
(Contract NASw-1560)
(NASA-CR-93831; Rept.-1428) CFSTI: HC $3.00/MF $0.65 CSCL 06A

The study was initiated with literature searches, both computerized and manual, culminating in a massive search of *Chemical Abstracts* for the period from 1906 through 1966. The result is a comprehensive survey of analytical techniques and methodology, effectively defining the present state of the art relative to the biochemical constituents included in this study. The review of each constituent is complete in itself, including a merit evaluation of analytical methods with effective figures of merit and an annotated bibliography. This information is presented in summary form in a table. A concerted attempt was made to find or propose new physical methods and techniques of analysis. Three new analytical methods are presented. Recommendations concerning the further development of methodologies are offered. Author

**N68-20125*#** Naval School of Aviation Medicine, Fla.
**CROSS-VALIDATION OF A BRIEF VESTIBULAR DISORIENTATION TEST ADMINISTERED BY A VARIETY OF PERSONNEL**
Rosalie V. Ambler and Fred E. Grady, Jr. 24 May 1967 7 p refs
(NASA Order R-93)
(NASA-CR-93836; NAMI-1009; USAARU-JR-67-4) CFSTI: HC $3.00/MF $0.65 CSCL 05H

A Brief Vestibular Disorientation Test (BVDT) was developed that involves observer assessment of subjects' reactions produced by head movements in a rotating chair. Promising validity coefficients have been reported for a criterion of pass versus separation from pilot training. This study cross-validated the BVDT under observer conditions approximating field use. The test was administered to 239 aviation trainees during pre-flight training. The number of observers per subject varied from two to four. Thirteen observers with a variety of backgrounds participated. BVDT scores were correlated with four criteria: (1) students separated from training for all causes versus completions; (2) tension separations versus all others; (3) airsick separations versus all others; and (4) tension and/or airsick separations versus all others. Significant relationships existed between high sensitivity scores on the BVDT and membership in all four groups. The addition of the BVDT significantly augmented the magnitude of the multiple correlations of the existing aviation selection variables with the criteria. Author

**N68-20151*#** National Academy of Sciences—National Research Council, Washington, D. C.
**PHYSIOLOGY IN THE SPACE ENVIRONMENT. VOLUME 2: RESPIRATION**
1967 147 p refs Conf. held by NAS-NRC, Woods Hole, Mass., Jun.–Jul. 1966
(Contract NSR-09-012-036)
(NASA-CR-93455; Publ.-1485-B, V. 2) CFSTI: HC $3.00/MF $0.65 CSCL 06S

CONTENTS:

**N68-20152*#** National Academy of Sciences—National Research Council, Washington, D. C.

**INTRODUCTION, SUMMARY AND RECOMMENDATIONS**

Robert E. Forster *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 3–18 (See N68-20151 10-04)

An overview is presented on respiratory physiology and relevant medical problems, with attention directed to the problems introduced by the artificial environment and other supportive mechanisms necessary for maintaining a man in space. Summaries and research recommendations are included on the major topics of lung functions, the atmosphere, and lung infection and treatment. Consideration was also given to bioinstrumentation requirements. These include: (1) An instrument to measure inspired and expired gas volumes such as a waterless spirometer to be connected to the airway. (2) A method for measuring lung volume changes while performing work free in the cabin, and when in the pressure suit, without obstructing the mouth. (3) An instrument to measure the number and size of particles suspended in the air, including the full range of sizes that might be deposited in the lung, and similarly to monitor the particles in the inspired and expired breath. (4) Methods of estimating the capillary blood flow in the periphery, and the peripheral oxygen tension. M.G.J.

**N68-20153*#** National Academy of Sciences—National Research Council, Washington, D. C.

**STRUCTURAL CHANGES IN LUNG AND THORAX**

Norman C. Staub *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 21–25 refs (See N68-20151 10-04)

While there is no apparent reason to expect prolonged space flight to cause changes in primary lung structure, general deconditioning of the body could extend to the thoracic cage and muscles, altering the mechanics of ventilation. Such factors as radiation, inhalation of particulates and contaminants, and possible tissue damage resulting from higher than normal $P_{O_2}$ could lead to cellular changes in the lungs. It is recommended: (1) Quantitative histological techniques should be applied to the lung to determine changes of its cellular structure. (2) The effects of acceleration deformation and damage should be studied, with the use of rapid freezing techniques. (3) Functional, structural, and chemical analyses of the lungs should be made on animals exposed to various patterns of simulated space radiation. Author

**N68-20154*#** National Academy of Sciences—National Research Council, Washington, D. C.

**RESPIRATORY MECHANICS**

Jere Mead *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 26–30 refs (See N68-20151 10-04)

Data show that sufficient acceleration will limit or prevent lung movements during launch, but such periods will probably not exceed the limits of breath holding. The mechanical strength of the lung may place a limit on the accelerative forces to which the human body can safely be subjected. Probably the pulmonary blood vessels would rupture before the parenchyma tore. During zero G, changes in lung mechanics would be minimal. One would predict a decrease of about 20% in end-expiratory lung volume and a resulting small decrease in airway conductance. Inspiration of particulate matter might be more common, in which case the cough mechanism is more important. On theoretical grounds, the air velocity with a cough would probably be greater, but the decreased density of the gas might make the cough less effective. Research recommendations are presented. Author

**N68-20155*#** National Academy of Sciences—National Research Council, Washington, D. C.

**PULMONARY GASEOUS DIFFUSION**

Norman C. Staub *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 31–37 refs (See N68-20151 10-04)

It is shown that there is no reason to suppose that gaseous diffusion processes will be affected by zero G, unless the lung parenchyma sustains chronic or acute damage secondary to accelerations at launch or reentry. It is recommended that the pulmonary diffusion capacity should be investigated as a general test of lung function in space flight. It should give a convenient estimate of changes in the lung that might make reentry dangerous, such as those secondary to toxic contaminants in the cabin atmosphere, parenchymal changes due to increased oxygen tension, and changes in the pulmonary vasculature secondary to weightlessness. Author

**N68-20156*#** National Academy of Sciences—National Research Council, Washington, D. C.

**PULMONARY CIRCULATION AND THE DISTRIBUTION OF BLOOD AND GAS IN THE LUNGS**

Solbert Permutt *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 38–56 refs (See N68-20151 10-04)

Although prolonged space travel appears to offer no significant problems in this respect, the relations between blood flow and ventilation are likely to be optimal in the weightless state. Acceleration may produce adverse effects, however, and it is important to be able to evaluate risks and the physiological tolerances involved. Basic knowledge is needed concerning the effect of acceleration on the blood volume and capacitance of the systemic circulation, and of changes of volume in the vascular structures of the thorax presumably caused by reflex and hormonal mechanisms. The effects of gravity are so profound in altering the distribution of blood and gas within the lungs that many problems in basic pulmonary physiology can be studied more effectively under weightlessness than in a normal gravitational field. One of the dividends of space flight will be the opportunity to carry out experiments on the lungs that are impossible on earth. Author

**N68-20157*#** National Academy of Sciences—National Research Council, Washington, D. C.

**REGULATION OF BREATHING**

Jere Mead *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 57–58 ref (See N68-20151 10-04)

The slight alterations in pulmonary mechanics to be expected under zero G and possible deviations in inspired oxygen and carbon dioxide, depending on the composition of the cabin atmosphere, could affect the level of ventilation through well-known mechanisms. Current knowledge indicates that these effects would be too small to be physiologically significant. Minute volume tends to decrease during acceleration even to the point of apnea, but as long as its duration is brief no more serious stress than that of ordinary breath holding would exist. Hyperventilation can occur under stress, but it is not a problem unique to space flight. Recommendations include: (1) Minute ventilation during increased G at launch and reentry and during weightlessness should be monitored both during exercise and at rest. (2) The ventilatory response to exercise and to hyperoxia, particularly in the capsule and in the space suit, should be monitored under chronic conditions. Author

**N68-20158*#** National Academy of Sciences—National Research Council, Washington, D. C.

**EXCHANGE OF FLUIDS IN LUNGS**

Arthur B. du Bois *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 59–65 refs (See N68-20151 10-04)

Data are presented to show that fluid which enters the lungs through aspiration of secretions or by transudation from the lung capillaries would normally be removed by the various lung-clearing mechanisms, which should operate sufficiently well in space flight. Intentional filling of the lungs or pleural space with liquid to support the pulmonary blood vessels and lung parenchymal tissues during accelerations greater than 15 G may be tried experimentally in anticipation of life support systems for flights far in the future and for the reentry phase of the flight. Recommendations for research include: (1) Measurements should be made of those pressures related to filtration of fluid in the lungs. (2) Arterial oxygen saturation and pressure-volume curve of the lungs should be investigated as indicators of filtration into the tissue. Author

**N68-20159*#** National Academy of Sciences—National Research Council, Washington, D. C.

**RESPIRATORY TRACT CLEARANCE MECHANISMS FOR NONGASEOUS MATERIALS**

Paul E. Morrow *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 66–78 refs (See N68-20151 10-04)

Three physiological mechanisms are identified for keeping the epithelial surfaces of the respiratory tract relatively free of contaminants: (1) ciliary mucous transport, (2) endocytosis, and (3) lymphatic drainage. Ciliary mucous transport may be affected, probably slightly, by gravity and may also be influenced by the high concentration of ions presumed to exist in space capsules. In vitro and in vivo preparations exist for study of mucous transport and should be employed to test responses under appropriate conditions. There is no evidence that endocytosis is influenced by gravity, but on the other hand there is insufficient data on endocytosis in mammals. It is recommended: (1) Mucous clearance and sinus drainage as a function of posture, humidity, and drugs at 1 G, zero G, and increased G should be studied. (2) Ciliary preparations (animal trachea) should be used as one means of studying the toxicology of contaminants. Author

**N68-20160*#** National Academy of Sciences—National Research Council, Washington, D. C.

**DIFFUSION OF GASES IN PERIPHERAL TISSUE**

Kenneth L. Zierler *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 79–86 refs (See N68-20151 10-04)

If translocation of $O_2$ within tissues is, as the evidence suggests, caused purely by diffusion driven by gradients in $P_{O_2}$, the gravitational field or lack of it should not have any important effect on the diffusion coefficient or on diffusion itself. To insure adequate delivery of $O_2$ to the tissues, arterial capillary $P_{O_2}$ should be maintained at the normal value at sea level. Given this condition, adequate oxygenation of tissues will depend on functional capillary blood flow, which determines the volume of tissue supplied by each capillary. The distribution of functional capillary blood flow conceivably can be affected by variations in and lack of gravity. Recommendations include: (1) Methods should be applied to assess tissue hypoxia in intact man, including measurement of chemicals in the blood. (2) Methods for monitoring tissue oxygen tension directly should be investigated. (3) Distribution of peripheral capillary blood flow under flight conditions should be investigated. Author

**N68-20161*#** National Academy of Sciences—National Research Council, Washington, D. C.

**TEMPERATURE REGULATION**

David Minard *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 87–90 refs (See N68-20151 10-04)

It is not anticipated that the role of the respiratory system as a heat exchanger will be significantly altered during space travel. If the space cabin atmosphere has a lower total pressure or uses helium as an inert gas, the decreased air density will cause a slight and physiologically insignificant decrease in body heat lost to the inspired air. Except for the possibility of heat hyperpnea under unusual or emergency situations, heat loads encountered in space travel should have minor influence on the level of minute ventilation. The possibility of untoward temperature regulation resulting from altered circulation in the weightless state is conceivable but on the basis of present knowledge is unlikely. Recommendations include: (1) The rate of evaporation from the respiratory tract at zero G should be studied. (2) The nature of heat hyperpnea should be elucidated to determine whether it is adaptive to heat exposure. Author

**N68-20162*#** National Academy of Sciences—National Research Council, Washington, D. C.

**OXYGEN TOXICITY AT NEAR-NORMAL PARTIAL PRESSURES**

Robert E. Davies *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 93–98 refs (See N68-20151 10-04)

The basic metabolic defect associated with the physiological changes caused by $O_2$ toxicity are still unknown. It is pointed out that the literature fails to demonstrate that increased inspired $P_{O_2}$ (at least to 5 psi) is safe for prolonged use by man. Further testing for long periods with human subjects is essential before such a conclusion can be drawn. Normal (sea level) partial pressures of inspired $O_2$ are known to be acceptable. Reduced partial pressures may also be acceptable, and sometimes unavoidable, but the conditions and limits have yet to be pinpointed. Research recommendations include: (1) A normal inspired oxygen tension, as contrasted with an elevated inspired oxygen tension, is recommended. (2) The advantages and disadvantages of an inspired $P_{O_2}$ less than and greater than, normal sea level should be investigated for times adequate to demonstrate a steady-state response. (3) Cabin $P_{O_2}$ and total pressure should be monitored for a mixed gas environment. Author

**N68-20163*#** National Academy of Sciences—National Research Council, Washington, D. C.

**CONSIDERATIONS OF CARBON DIOXIDE CONCENTRATION**

Robert E. Forster *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 99–101 refs (See N68-20151 10-04)

Ideally, from the physiological point of view, it would be best to keep inspired $P_{CO_2}$ close to zero, as it is under normal sea-level conditions. In the manned space flights to date the circulating atmospheric $P_{CO_2}$ has apparently been kept to less than 7.6 torr, although this may be because of engineering (thermal exchange) rather than physiological considerations. A maximum limit of 7.6 torr was chosen because chronic exposure to $CO_2$ concentrations just above that limit has demonstrated adaptive changes. The effect of chronic exposure to low inspired concentrations of $CO_2$ should be explored. Furthermore, a time-concentration-response curve to $CO_2$ exposure should be obtained to guide procedure in the event that the $CO_2$-removing equipment fails. Author

**N68-20164*#** National Academy of Sciences—National Research Council, Washington, D. C.
**INERT GASES**
Wallace O. Fenn *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 102–112 refs (See N68-20151 10-04)

Advantages of adding an inert gas or gases to the space cabin atmosphere are cited as (1) fire danger is reduced; (2) aural and pulmonary atelectasis is inhibited; (3) there is a possible, but unproved, long-term physiological need for at least low pressures of nitrogen; and (4) ventilation and heat dissipation within the cabin may require a total gas pressure greater than the ceiling recommended for cabin $P_{O_2}$. The only physiological disadvantage is the risk of the gas's producing the bends. There may be engineering disadvantages in that a double monitoring system is required and, depending on cabin leakage, there will be the extra cost of carrying a supply of inert gas. With a possible exception if absolute lack of nitrogen for long periods proves deleterious, a deficit not overcome by helium, there is little to choose between nitrogen and helium. It was concluded that some inert gas should be added, at least until an effective method of controlling fires in 100 percent oxygen becomes available. A pressure of 2 or 3 psia (assuming total pressure remains at 5 psia) is suggested as a reasonable concentration. Further research is suggested. Author

**N68-20165*#** National Academy of Sciences—National Research Council, Washington, D. C.
**TRACE CONTAMINANTS**
Joseph C. Ross *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 113–122 refs (See N68-20151 10-04)

Because the capsule gas is recycled, contaminants that are normally present in only negligible amounts may increase to toxic levels and may concentrate on airborne particulate matter, which in turn will be increased in the absence of the sedimentation process. All the existing and possible atmospheric contaminants in the spaced capsule, including gases, particles, and infectious agents, have not been identified, nor have their effective concentrations been determined. These contaminants should be monitored and regulated, preflight and in-flight (manned), with particular attention to contaminants produced by fire or unusual heat in the vehicle. The threshold limit value of tolerance to various contaminants should be determined for continuous exposure, as contrasted with the more usual intermittent exposure, and the possibly additive effect of stress and infection should be included. Author

**N68-20166*#** National Academy of Sciences—National Research Council, Washington, D. C.
**PARTICULATE MATTER: GENERAL CONSIDERATIONS AND AEROSOL DEPOSITION IN MAN**
Paul E. Morrow *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 123–130 refs (See N68-20151 10-04)

In zero G at hypobaric pressure, airborne stability of dusts will be affected by inertial impaction (large particles), by diffusion or deposition by Brownian motion (smallest particles), but not by sedimentation. Interception of fibers (small diameter, great length) may increase in the bronchial tree. A different distribution of aerosol deposition in the respiratory tract is thus anticipated with respect both to particle size and to site. This has important implications for production of pulmonary disability. It is recommended that studies of aerosol composition (size and association of contaminants with various particle sizes) be instituted. Moreover, tests should be made in simulated respiratory tracts to determine the size and site of deposition of aerosols under flight conditions. Additional studies of aerosol-removal methods are also indicated. Author

**N68-20167*#** National Academy of Sciences—National Research Council, Washington, D. C.
**INFECTION**
Joseph C. Ross *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 133–142 refs (See N68-20151 10-04)

The likelihood of microbial infections increases with (1) the size of the space crew; (2) less than ideal facilities for personal hygiene over long periods; (3) possibly altered viability of microorganisms, autoflora, and mechanisms of challenge; and (4) individual susceptibility associated with the space cabin environment. It is recommended that the microbial content of the space vehicle be controlled, that consideration be given to selection of space crews on the basis of similar immunological patterns (including cross matching for blood types), and that crews be isolated as a group before the flight both to prevent exposure to infection and to allow cross-immunity to develop. Author

**N68-20168*#** National Academy of Sciences—National Research Council, Washington, D. C.
**RESPIRATORY DRUGS AND MANNED SPACE FLIGHT**
Paul E. Morrow *In its* Physiol. in the Space Environment. Vol. 2: Respiration 1967 p 143–148 refs (See N68-20151 10-04)

Space flight conditions may lead to nasal congestion, obstructed sinuses, and the like, and to the increased possibility of inhaling food and large particles. Decongestants and dilators would probably be needed in such instances. Pulmonary infection would require a battery of therapeutic agents similar to those used at sea level. Otherwise, there appear to be no specific considerations peculiar to space flight. A critical review of possible problems and of the methods by which drugs have been selected, tested, and dispensed, indicates that the subject needs thorough study and, possibly, continuing evaluation by an advisory board. Author

**N68-20183*#** School of Aerospace Medicine, Brooks AFB, Tex.
**CARBON DIOXIDE TOLERANCE STUDIES**
H. A. Glatte, Jr., G. J. Motsay, and B. E. Welch Sep. 1967 29 p refs
(NASA Order T-41829-G)
(NASA-CR-93751; SAM-TR-67-77; AD-664899) CFSTI: HC $3.00/MF $0.65 CSCL 06P

Seven normal volunteers were exposed to an environment of 21 mm. Hg CO2 (3%) for a 5-day experimental period bracketed by two 5-day control periods. Measurements included daily serum and urine electrolytes, blood gas studies, and net acid excretion studies. Also included were detailed investigations of respiratory physiology, exercise response, and psychomotor performance. All subjects tolerated the experimental atmosphere with no undue problems. Arterial and alveolar PCO2s increased 3 to 4 mm. Hg with a mild reduction in arterial pH from 7.40 to 7.37. Arterial pH values returned to near control values by the fourth day. No increases were noted in net acid excretion. Exercise was tolerated remarkably well. Author (TAB)

**N68-20190** California Univ., Berkeley.
**DIFFUSION OF OXYGEN IN PROTEIN SOLUTIONS**
Thomas Karl Goldstick (Ph.D. Thesis) 1966 185 p
Available from Univ. Microfilms: HC $8.40/MF $3.00 Order No. 67-5061

To improve the understanding of oxygen transport in biological fluids, the oxygen diffusion coefficient, D, was determined in two protein solutions and one salt solution, over the complete range of solute concentrations. The two proteins studied were bovine serum albumin and human oxyhemoglobin, the salt was KCl. To determine D, the oxygen tension at the bottom of a layer of solution is continuously recorded after changing the tension at the top. A mathematical analysis of the transient curve gives D. This method requires neither solubility data nor empirical constants. The experimental results give a value for D in water at 25°C of $2.13 \times 10^{-5}$ $cm^2/sec$. The studies on solutions show that solutes tend to lower D. Both albumin and hemoglobin appear to lower D by similar amounts, but KCl has much less effect. A value of $0.76 \times 10^{-5}$ $cm^2/sec$ is indicated for D at the hemoglobin concentration in normal red cells. Dissert. Abstr.

**N68-20208#** School of Aerospace Medicine, Brooks AFB, Tex.
**ADRENOCORTICAL STEROIDS, BODY ORGAN WEIGHTS, AND HEMATOLOGY OF RATS EXPOSED TO A PURE OXYGEN ENVIRONMENT AT 210 MM HG, ABSOLUTE**
**Research Report, Sep. 1965–Jan. 1967**
William E. Repelko Sep. 1967 18 p refs
(SAM-TR-67-78; AD-664897)

Continuing interest in the possible use of low pressure, normoxic environments in spacecraft has led to investigation of the effect of such environments upon hematologic parameters, organ weights, and plasma corticosteroids. Experiments were conducted with rats exposed up to 11 months in an environment containing 98% oxygen at 210 mm. Hg, absolute. Blood levels of corticosterone and body and organ weights of experimental animals were measured after specified periods of exposure. Hematologic parameters (hematocrit, hemoglobin, red cell, white cell, eosinophil, and reticulocyte counts) were also determined. Except for the first few days of exposure to altitude, the results of plasma corticosterone determinations gave no evidence of prolonged stress to the animals. In general, changes in body organ weights and hematologic parameters were minor and did not appear to affect the animals adversely even after 11 months of continuous exposure. Author (TAB)

**N68-20238** Oregon State Univ., Corvallis.
**EFFECTS OF VARIATIONS IN SALINITY AND TEMPERATURE ON SOME ESTUARINE MACRO-ALGAE**
Chris Kelvin Kjeldsen (Ph.D. Thesis) 1967 168 p
Available from Univ. Microfilms: HC $7.80/MF $3.00 Order No. 67-5654

Eight species, *Ulva expansa, Enteromorpha linza, Laminaria saccharina, Sargassum muticum, Alaria marginata, Odonthalia floccosa, Iridaea splendens* and *Gigartina californica*, were used in laboratory studies to determine the effect of variations in temperature and salinity on rates of respiration and photosynthesis, thus determining the control these ecological factors may exert in nature. A series of experiments were also undertaken to determine the effect of adaptive exposure upon the metabolic rates of macro-algae in media of various salinities. *Ulva expansa, Laminaria saccharina, Sargassum muticum, Alaria marginata,* and *Gigartina californica* showed tolerances to variations in salinity and temperature in laboratory experiments correlating with their distribution in the estuary, and with its physical-chemical regime. In laboratory experiments, *Enteromorpha linza, Odonthalia floccosa,* and *Iridaea splendens* showed tolerance to variations of salinity and temperature exceeding the variations they encountered in nature and therefore, their distribution must be limited by some other factors. Dissert. Abstr.

**N68-20250#** School of Aerospace Medicine, Brooks AFB, Tex. Biosciences Branch.
**EFFECTS OF MONOMETHYLHYDRAZINE ON LIVER GLYCOGEN CONTENT OF RATS AT GROUND LEVEL AND AT ALTITUDE, SEPTEMBER 1965–JANUARY 1966**
Lawrence E. Brown and Walter N. Scott Sep. 1967 16 p refs
(SAM-TR-67-79; AD-664900)

Histologic sections of liver samples taken at altitude and ground level from rats having received monomethylhydrazine (MMH), 46.4 mg./kg., were stained for glycogen. Results revealed that nonfasted MMH-injected animals maintained at altitude (18,000 ft.) contained a decreased content of intracellular liver glycogen. The livers of nonfasted rats injected at ground level did not manifest changes in glycogen content. The hepatic glycogen content of the fasted MMH-injected rats (both ground level and altitude) did not differ from that of the controls. Chemical analyses revealed a decrease in hepatic glycogen in rats fed at altitude and an increase in rats fasted at altitude. Author (TAB)

**N68-20258** California Univ., Los Angeles.
**ELECTROPHYSIOLOGICAL CORRELATES OF PERCEPTUAL MASKING IN MONKEYS**
Lester George Fehmi (Ph.D. Thesis) 1966 196 p
Available from Univ. Microfilms: HC $9.00/MF $3.00 Order No. 67-6176

Retroactive perceptual masking is well documented in human subjects when a brief flash of light containing a figure to be perceived is followed closely by a second flash, perception of the figure is masked. Such masking has been interpreted as due to interactions occurring peripherally (within the eye), centrally visual pathways and cortex), or to a combination of peripheral and central factors. This study has sought to investigate experimentally the nature and locus of the masking effect. Perceptual masking has been produced in monkeys, using a trained behavioral response as an index of masking. Electrical potentials were recorded simultaneously from optic nerve or tract, lateral geniculate body and visual cortex. These electrical responses were correlated with the monkey's ability to make a correct behavioral response. Dissert. Abstr.

**N68-20263#** Army Medical Research Lab., Fort Knox, Ky. Experimental Psychology Div.
**SENSE MODE AND COUPLING IN A VIGILANCE TASK**
**Progress Report**
Jimmy L. Hatfield and Michel Loeb 18 Oct. 1967 90 p refs
(USAMRL-753; AD-664760)

The investigation examined the performance of thirty-six subjects on three 90-minute vigilance tasks. Response measures for signals were available in three basic forms: hits, false alarms, and response latency. In addition, parameters of signal detection, decreased sensitivity (d) and observers criteria (beta) were derived from the data. There was a significant decrease in hits and false alarms with increasing time on task, regardless of sense mode and coupling conditions, or the number of signal intensities. In general, when detection rate decreased, reaction time increased. The consistent sequential relationship between the stimulus conditions suggests that there are uniform trends among conventional response measures. There was a significant decline in sensitivity (d) with increasing time on task for the closely coupled tasks, regardless of sense mode involved, but d remained fairly stable for the loosely coupled visual task. In this experiment, beta values increased significantly for all vigilance tasks. There is a tendency, therefore, for the observer to adopt a more conservative mode of responding with increasing time on task. Orthogonal comparisons of that portion of the variance due to stimulus conditions clearly establish coupling effects as a critical independent variable. Numerous significant correlation coefficients of vigilance performance are reported and current methodological problems associated with this area of research are discussed in detail. Author (TAB)

**N68-20265*#** Serendipity Associates, McLean, Va.
**THE PROBLEM OF OFF DUTY TIME IN LONG DURATION SPACE MISSIONS. VOLUME 1: SUMMARY AND RESEARCH RECOMMENDATIONS**
John W. Eberhard Oct. 1967 33 p refs
(Contract NASw-1615)
(NASA-CR-93834; TR-55-67-13(U), V. 1) CFSTI: HC $3.00/MF $0.65 CSCL 05E

As the psychological and social problems related to long duration space flights warrant careful consideration of off-duty time, an analysis was conducted to determine the amount of available time and effective ways of using it. Representative long duration missions were reviewed to obtain estimates of the scheduled and unscheduled off-duty time, and the time allocated to work, sleep, and contingencies. The summary tabulation shows a total off-duty time of 9.8 to 12.6 hours per 24-hour day. Data on the off-duty time patterns of both general and special populations were also reviewed, and the key facts about time utilization are summarized. Discretionary activity possibilities were determined. The results indicate that the off-duty time and activity patterns of isolated groups differ from those of the general population, and that the activity patterns of individuals in confinement change over time. Research requirements are considered in the context of design criteria for including man in long duration space missions. Potential discretionary activities are listed. M.G.J.

**N68-20339*#** Environmental Research Associates, Randallstown, Md.
**A STUDY OF THE PERFORMANCE OF AN ASTRONAUT DURING INGRESS AND EGRESS MANEUVERS THROUGH AIRLOCKS AND PASSAGEWAYS**
Harry L. Loats, Jr. and William J. Bruchey, Jr. Washington NASA Apr. 1968 163 p refs
(Contract NAS1-4059)
(NASA-CR-971) CFSTI: HC $3.00/MF $0.65 CSCL 05H

The performance characteristics of a pressure-suited astronaut during ingress–egress through various geometry airlocks were studied by water immersion techniques. The buoyancy force induced by water displacement of a totally immersed subject was used to counteract all or part of his adjusted total weight to provide the desired simulated gravity level. The subject performed real-time maneuvers as determined from functional analysis of representative extravehicular and intravehicular tasks. The purpose of this phase of the contract was to generate additional data on refined experiments initiated under previous contractual phases and to expand the experiment scope to include rescue, replenishment and general maneuvers exterior to the airlock. The effect of the variation of airlock dimension and shape on the capabilities to perform manual ingress–egress was evaluated by comparative time-task analysis. Author

**N68-20346*#** Northrop Corp., Hawthrone, Calif.
**FEASIBILITY STUDY FOR CONDUCTING BIOLOGICAL EXPERIMENTS ABOARD A PIONEER SPACECRAFT**
Robert G. Lindberg, ed. Feb. 1968 250 p
(Contract NAS2-4491)
(NASA-CR-73178; NCL-68-10R) CFSTI: HC $3.00/MF $0.65 CSCL 06C

A study was conducted to determine the feasibility and practicality of conducting biological experiments aboard a Pioneer spacecraft in heliocentric orbit. Among the biological problems amenable to study on such a vehicle is the question of the stability of circadian systems divorced from geophysical cues. The study included experiment definition; conceptual design of experiment hardware; where necessary, studies of the susceptibility of biological material to simulated launch stresses; identification of requirements for monitoring devices to characterize the physical environment during biological experimentation; cost and development schedule estimates for individual experiments; and selection of representative combinations of biological and physical sciences payloads. The study was specifically directed toward engineering feasibility. The results of the study demonstrated the practicality of implementing biological experiments aboard a Pioneer spacecraft and recommend a follow-on study for program definition preparatory to initiation of a BioPioneer Program. Author

**N68-20354*#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
**EFFECTS OF PRESSURE SUITS AND BACKPACK LOADS ON MAN'S SELF-LOCOMOTION IN EARTH AND SIMULATED LUNAR GRAVITY**
Amos A. Spady, Jr. and Randall L. Harris Washington Apr. 1968 46 p refs
(NASA-TN-D-4464) CFSTI: HC $3.00/MF $0.65 CSCL 05E

Studies were conducted to evaluate the effect of a state-of-the-art full pressure suit on man's self-locomotion capabilities in earth and simulated lunar gravity. Separate tests, with subjects wearing lightweight coveralls, were also conducted in simulated lunar gravity to determine the effect on locomotion of carrying backpack loads of up to 500 earth pounds. The simulated lunar tests were conducted on a modified version of the reduced-gravity walking simulator. Tests in earth gravity were performed on a portion of asphaltic concrete road of length equal to that provided by the modified lunar-gravity simulator. The gait characteristics of the subjects were determined by having the subjects walk and run at various speeds. The results obtained with the pressure suit indicated that pressurizing the suit to 3.7 psig did not appreciably affect the subject's self-locomotive gait characteristics in lunar gravity. The results of the load-carrying tests indicated that a subject, dressed in lightweight coveralls, could carry a backpack loaded with 500 earth pounds while walking, loping, and sprinting in lunar gravity. Author

**N68-20357*#** National Aeronautics and Space Administration, Washington, D. C.
**AN INTRODUCTION TO THE ASSURANCE OF HUMAN PERFORMANCE IN SPACE SYSTEMS**
1968 42 p refs Prepared by Martin Co.
(NASA-SP-6506) CFSTI: HC $3.00/MF $0.65 CSCL 05H

To assess the role that man plays as a potential source of error in space technology, studies were conducted to determine what human performance assurance effort is appropriate for various projects and to show how this effort relates to various phases in the development cycle. A method for classifying programs and systems according to mission complexity and significance is developed, and human engineering and serviceability functions appropriate for specific development phases of the programs are categorized and described. Man–machine capabilities are summarized as an aid in determining the relative superiority of each. An example is presented in which the techniques are applied to a hypothetical micrometeoroid deep space satellite, a concept based on studies of an unmanned satellite program of medium-to-small cost and complexity. The reliability program provision for space system contractors, concerning prevention of human error, is included. M.G.J.

**N68-20369*#** Texas Univ., Austin. Defense Research Lab.
**[CONDUCT STUDIES OF AUDITORY INFORMATION PROCESSING EMPHASIZING THE APPLICATION OF SIGNAL DETECTABILITY THEORY TO THE AUDITORY SENSORY RESPONSES] Semiannual Report, 1 Jun.–30 Nov 1967; Quarterly Status Report, 1 Sep.–30 Nov. 1967**
Lloyd A. Jeffress 3 Jan. 1968 44 p
(NASA Order R-129; Contracts Nonr-3579(04); NObsr-93124)
(NASA-CR-93854; QSR-14) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Visual and auditory signal recognition research efforts are summarized. Effects of chromatic adaptation on color naming were studied, saturation estimates were made for chromatic adaptation, and effects of adaptation on visual detection were studied. The Bezold–Brücke hue shift was considered, and unique green loci for two classes of observers at two luminance levels were determined. Binaural research efforts deal with (1) time and intensity differences and lateralization, (2) masking-level differences for tone and narrowband noise, (3) binaural detection as a function of the bandwidth of the masking noise, and (4) binaural electrical models and detection. Among the monaural phenomena studied are (1) the effect of vigilance in an auditory detection experiment, (2) width and shape of the critical band involved in masking, (3) gated noise and signal, and (4) the role of signal detection. Mathematical and electrical models were investigated; and the electrical model was studied as a predictor of observers' responses. Noncentral chi distribution and psychometric data are presented. M.W.R.

**N68-20385#** National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
**BIOLOGY**
*In its* Space Res. Direc. for the Future 1966 p 477–500 refs (See N68-20376 10-30)

Recommendations are made for further research in the areas of environmental biology; exobiology, the role of man in space in broad programs of environmental space biology and planetary exploration; and specific NASA structures, practices, and policies that pertain to support of fundamental biological objectives. Three fields of basic biological research are singled out as candidates for benefiting by exploitation of conditions and facilities for experimentation that are only available in space. These are: radiation biology, studies of circadian rhythms, and investigations of gravitational influences in the range of G values between zero and 1. The NASA Biosatellite Program and a similar U. S. Air Force program are reviewed. M.G.J.

**N68-20386#** National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
**MEDICINE AND PHYSIOLOGY**
*In its* Space Res. Direc. for the Future 1966 p 501–621 refs (See N68-20376 10-30)

Medical and behavioral findings from the United States and Soviet manned space flights are reviewed, and the available information from ground-based and aircraft experience is appraised. Gaps in biomedical knowledge that could affect the progress of the manned program are identified. The manned and unmanned programs studied include Gemini, Apollo, Apollo Applications Program, U. S. Air Force Manned Orbiting Laboratory, biosatellites, and ground-based research. Man's scientific role in space missions is evaluated, with emphasis on the biomedical investigations that he may perform in space. Biomedical experiments planned for the manned space flight program are listed, along with scheduled biosatellite experiments. Capabilities and requirements for manned planetary missions are defined. A status-of-knowledge review on weightlessness (1965) is presented, along with an assessment of needed experimental work on circulation and respiration, and metabolism and nutrition. M.G.J.

**N68-20408#** Association Francaise pour l'Etude et le Development des Applications de l'Energie Solaire, Paris.
**UTILIZATION OF SOLAR ENERGY BY PLANTS. MEASUREMENT OF SOLAR RADIATION AND YIELD OF PHOTOSYNTHESIS [L'UTILISATION DE L'ENERGIE SOLAIRE PAR LES VEGETAUX. MESURE DU RAYONNEMENT SOLAIRE ET DU RENDEMENT DE LA PHOTOSYNTHESE]**
1967 70 p refs In FRENCH Symp. held in Paris, 28 Sep. 1967
CFSTI: HC $3.00/MF $0.65

Instruments and methods for measurement of terrestrial radiation are discussed. The report concludes with measurement of photosynthetic activity per area unit of leaves. ESRO

**N68-20451#** Naval Radiological Defense Lab., San Francisco, Calif.
**AN IMMEDIATE IRRADIATION EFFECT ON RESISTANCE OF RATS TO LOW TEMPERATURE**
Richard D. Phillips and Donald J. Kimeldorf 4 Jan. 1968 22 p refs
(USNRDL-TR-68-6; AD-665664)

A study was made of the effect of whole-body X-irradiation (50-2000 rads) on the resistance of male rats exposed to a low environmental temperature (-17.0 plus or minus 1C). The animals were subjected to the test environment at 1/2, 4, 8, 16, or 24 hours after irradiation. A change in resistance was observed after irradiation with doses of 100 rads or more. Irradiation had a detrimental effect on the survival of rats exposed to low temperature at all times tested. The radiation-induced decrease in cold resistance was greater in groups tested early after irradiation than in groups tested at 16 or 24 hours postirradiation. The magnitude of the radiation effect was dose dependent. At doses greater than 100 rads, the median survival time of rats in the cold was inversely related to radiation dose. Author (TAB)

**N68-20453*#** Massachusetts Inst. of Tech., Cambridge. Engineering Projects Lab.
**MEASUREMENT AND DISPLAY OF CONTROL INFORMATION. REMOTE MANIPULATION AND MANUAL CONTROL Progress Report, 1 Apr.–30 Sep. 1967**
Thomas B. Sheridan and William R. Ferrell 30 Sep. 1967 28 p
(Grant NsG-107-61)
(NASA-CR-93853; DSR-70283-6) CFSTI: HC $3.00/MF $0.65
CSCL 05H

An experimental program is described in which the microstructure of human controlled remote manipulation is investigated. On the basis of this study, all motion commands were classified as belonging to five routines: search, grasp, carry, put, and error adjustment. It is shown that the number of commands increases with increasing ambiguity in feedback, that this ambiguity depends on the number and size of touch sensors, and on the shape and size of the object being grasped, and that the size of the commanded motions decreases with increasing risk related to the human estimation of the probability of making an error. Based on these results, a computer program was written to provide a variable time delay for two analog voltage signals to be used with a two dimensional, continuous control task to determine the effect of time delay on control of a plant with dynamic lag. Data are compiled on the optimality of human controllers as time optimal, bang–bang state regulators for second order systems. The switching performance of each of three subjects for each of four second order systems using each of four types of displays is described. E.J.S.

**N68-20455#** Ohio State Univ., Columbus. Human Performance Center.
**SOME PRINCIPLES FOR THE DESIGN OF DECISION SYSTEMS: A REVIEW OF SIX YEARS OF RESEARCH ON A COMMAND-CONTROL SYSTEM SIMULATION Final Report, 1 Apr. 1960–31 Aug. 1966**
William C. Howell Wright-Patterson AFB, Ohio AMRL Sep. 1967 42 p refs
(Contracts AF 33(615)-2248; AF 33(616)-7122; AF 33(657)-10763)
(AMRL-TR-67-136; AD-665469)

A set of general principles for guidance in decision system development is presented based upon research findings obtained in a simulated (but highly generalized) command-control system. The chief objective of the research was evaluation of an automated procedure for assisting man in making diagnostic decisions. Briefly, this procedure involved aggregation by the machine of human evaluations of a number of separate items of reconnaissance data. Comparisons were made between performance of the system in assessing environmental states (e.g., enemy strategies) when the automated procedure was and was not in effect under a variety of task circumstances (e.g., load, level of information fidelity, feedback, etc.). The 13 principles thus formulated generally support the use of an automated aggregation procedure in diagnosis. Furthermore, they show that machine aggregation is most beneficial in circumstances which produce large amounts of low-quality data or those in which the human is placed under some sort of stress. Several of the principles suggest possible limitations on the use of machines in decision making. Author (TAB)

**N68-20457#** Naval Air Development Center, Johnsville, Pa.
**AN INVESTIGATION OF THE EFFECTS OF ISOLATION ON TIME PERCEPTION AND ITS PHYSIOLOGICAL CORRELATES**
Barry K. Schwartz 9 Nov. 1967 94 p refs
(NADC-MR-6718; AD-665517)

A review of the literature on physiological correlates of time perception, the effects of drugs on time perception, and changes in time perception due to sensory deprivation indicated that: (a) time perception is quite possibly a physiologically controlled phenomenon, (b) that body temperature, and possibly heart and respiratory rate, are indicators of the course of changes in time perception, and that (c) sensory deprivation may induce errors in time perception, the direction of which errors is apparently related to activation level--a function of severity of isolation. Twenty Ss were confined for three hours in an extremely restricting isolation environment. Severity of isolation was manipulated by the introduction of auditory and/or visual stimulation. Ss task was to produce intervals of 1, 5, 15, and 30 seconds duration before and during isolation. Heart rate, respiratory rate, axillary body temperature, and skin temperature were recorded immediately before each trial. Heart and respiratory rate were clearly uncorrelated with time production errors. Axillary temperature and skin temperature were not clearly related or unrelated to time production errors. The time production data indicated differences in length of interval to be produced interacting with the presence or absence of auditory stimulation. The physiological data indicated that amount of time in isolation affected activation differentially for Ss with and without stimulation. Without visual stimulation, activation tended to increase slightly over time. With visual stimulation, there was a slight decrease in activation over time. Author (TAB)

**N68-20471#** School of Aerospace Medicine, Brooks AFB, Tex.
**EFFECTS OF HIGH ACCELERATION ON VESTIBULO-OCULAR RESPONSES, AUGUST 1966–JUNE 1967**
Patrick J. Dowd, Morgan E. Wing, Robert L. Cramer, and Frederick G. Collins Sep. 1967 14 p refs
(SAM-TR-67-93; AD-665413)

Preliminary investigations into the effects of high linear accelerations on the vestibulo-ocular responses to both caloric and Coriolis stimulations were made. Pilots were subjected to short-duration accelerations on the USAF School of Aerospace Medicine centrifuge. A spontaneous slow-phase downward nystagmus was observed in some pilots in post-centrifuge tests. Some peripheral and central-neural modification resulting from centrifugation was observed. Author (TAB)

**N68-20480*#** Northrop Space Labs., Hawthorne, Calif.
**DETERMINATION OF APOLLO EMERGENCY IMPACT LIMITS**
C. F. Lombard, S. H. Advani, A. Roy, and M. S. Estes [1966] 122 p refs
(Contract NAS9-4539)
(NASA-CR-92039; NSL-65-179) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Pathophysiological responses by guinea pigs and monkeys to tailward acting impact accelerations were studied to develop a theoretical model of the mechanisms of injury to the heart and large vessels exposed to such impact forces. The theoretical analog is described by a modified van der Pol equation, and subsystem study of aorta dynamics furnished data on cardiovascular system responses to the accelerations. Use of bradycardia as a symptom of pending injury with increased acceleration is not considered feasible for the two species tested; this symptom occurred too early in the guinea pig and too late in the monkey. Rupture of the heart and great vessels did not occur as predicted because of compensatory pressure in the thoracic cavity, although lacerations of some pulmonary vessels occurred at very high G levels. At levels of 300 G with velocity change of 60 ft/sec, the subjects were dazed but not unconscious. It is believed that, with a proper support/restraint system, man can survive with recoverable injuries at approximately 100 G with such velocity changes. M.W.R.

**N68-20515#** Lockheed Missiles and Space Co., Sunnyvale, Calif.
**WEIGHTLESS SIMULATION USING WATER IMMERSION TECHNIQUES: AN ANNOTATED BIBLIOGRAPHY**
J. H. Duddy, comp., O. T. Kallos, comp., V. D. Caswell, comp., and A. T. Vogt, comp. Dec. 1967 322 p refs Revised
(LMSC-5-24-65-3/SB-65-2, Rev. 2; AD-665278)

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

**N68-20543#** School of Aerospace Medicine, Brooks AFB, Tex.
**ABDOMINAL GAS VOLUME AT ALTITUDE AND AT GROUND LEVEL**
Alan J. Greenwald, Thomas H. Allen, and Richard W. Bancroft Nov. 1967 16 p refs
(SAM-TR-67-102; AD-665848)

The effect of decreasing pressure on abdominal gas volume in eighteen young military men was studied under simulated flight conditions and using a displacement volumeter. Studies showed that decompression causes the abdomen to expand but that relatively slight increase in intra-abdominal pressure occurs. Young military men at ground level ordinarily average 0.111 liter (BTPS) of abdominal gas--a statistically significant amount. This amount, in turn, is significantly less than the mean 0.218 liter (BTPS) occurring in subjects when a water-filled naso-gastric catheter connected to a pressure transducer was used. Expansion of the 0.104 liter of dry gases, with concomitant wetting, resulted in 0.500 liter (BTPS) of abdominal gas at an ambient pressure of 230 torr (29,600 ft. pressure: altitude). At this point, 50% of the subjects would be expected to report symptoms of abdominal fullness. At yet lower pressures, subjects reported pain in 6 among 36 man-flights, and at this time the average abdominal gas volume was computed to be 1.09 liters (BTPS). Author (TAB)

**N68-20545#** School of Aerospace Medicine, Brooks AFB, Tex.
**LECTURES IN AEROSPACE MEDICINE, SIXTH SERIES**
1967 570 p refs Lectures held at Brooks AFB, Tex., 6–9 Feb. 1967
(AD-665107)

A collection of lectures is presented on aerospace medicine with emphasis placed on problems of manned orbital and interplanetary space flight; human body reactions to weightlessness, acceleration, immobilization, cabin atmosphere, and stress situations during space flight simulation studies are evaluated. For individual titles, see N68-20545 through N68-20574.

**N68-20547#** School of Aerospace Medicine, Brooks AFB, Tex.
**PRE-GEMINI MEDICAL PREDICTIONS VERSUS GEMINI FLIGHT RESULTS**
Charles A. Berry and A. D. Catterson *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 28–61 (See N68-20545 10-04)

The Mercury and Gemini space flights provided approximately 2000 man-hours of weightless exposure for evaluating predicted effects of space flight versus actual findings. In general, the environmental hazards and the effects on the man appear to be of less magnitude than originally anticipated. The principal physiologic changes noted were orthostatism for some 50 hours postflight as measured with a tilt table, reduced red cell mass (5 to 20 percent), and reduced X-ray density (calcium) in the os calcis and the small finger. No abnormal psychological reactions have been observed, and no vestibular disturbances have occurred that were related to flight. Drugs have been prescribed for inflight use. The role of the physician in supporting normal space flight is complex, requiring the practice of clinical medicine, research, and diplomacy. Although much remains to be learned, it appears that if man is properly supported, his limitations will not be a barrier to the exploration of the universe. Author

**N68-20548#** School of Aerospace Medicine, Brooks AFB, Tex.
**ADVANCED ASPECTS OF PRESSURE SUIT DEVELOPMENTS**
Jefferson C. Davis *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 62–76 refs (See N68-20545 10-04)

New concepts in full pressure suit joint designs use bellows, mechanical joints or stove pipe joints. Mechanical pressure suits with passive pressurization inflate automatically at altitudes providing mechanical pressure. They contain an outer inelastic layer and an inner elastic layer sewn together so that they provide multiple pockets between them. Into these pocket are inserted expandable tubes containing a specific volume of room air. The helmet may be either a soft inflatable configuration or a hardhat for buffeting protection. Mobility in this suit at altitudes below 20,000 feet is comparable to conventional flying coveralls. G.G.

**N68-20549#** School of Aerospace Medicine, Brooks AFB, Tex.
**A STUDY OF HIGH ALTITUDE DECOMPRESSION**
Alfred G. Koestler, Martin L. Reite, and Clyde H. Kratochvil *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 77–98 refs (See N68-20545 10-04)

Seventeen chimpanzees were decompressed in 18 separate tests from 179 mm. Hg (breathing 100 percent oxygen) to less than 2 mm. Hg in 0.8 seconds and remained at this altitude from 5 to 210 seconds. After recompression with 100 percent oxygen to 179 mm. Hg, the subjects were maintained at this pressure environment for 4 to 24 hours post decompression. Results of these tests, have established and substantiated the fact that chimpanzees can survive sudden exposure to a near vacuum and recover within 4 hours to once again satisfactorily perform complex behavioral schedules on which they have had extensive training. EKG, respiration, and skin temperature were recorded as standard procedure from all subjects, some of which were instrumented for EEG. All subjects demonstrated tachycardia immediately following decompression which was regularly followed by a rather sudden bradycardia. There was an initial drop in skin temperature immediately after decompression with an ensuing gradual fall resulting in a total decrease of 1.7 to 2.0°C. Visual inspection of the EEG as well as power spectral density computer analysis indicated the expected greater subcortical resistance to anoxia when compared to cortical responses. Author

**N68-20550#** School of Aerospace Medicine, Brooks AFB, Tex.
**LEX COSMICA**
William R. Rule *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 99–109 refs (See N68-20545 10-26)

Projected is the creation of codes of law, both Civil and Criminal, concerning the conduct of man and his interrelationships on celestial bodies as well as the enforcement of such codes by an international police and international courts. The underlying principle is that no one nation will reign over specific celestial bodies and that the use of outer space is open to all nations of the world. G.G.

**N68-20551#** School of Aerospace Medicine, Brooks AFB, Tex.
**NONPATHOLOGIC HYPERCAPNIA IN MAN**
H. Glatte, B. O. Hartman, and B. E. Welch *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 110–128 refs (See N68-20545 10-04)

By our studies we have clarified some of the effects of hypercapnia on the physiology and performance of normal man. It seems apparent that man can adapt to 3% and 4% carbon dioxide in the atmosphere. At these levels, we were not able to document any state of prolonged acidosis. Indeed, adaptive mechanisms returned the extracellular pH to quite near control values, as was predicted by earlier animal studies. This was achieved without increasing net renal acid excretion. No biphasic swings of euphoria and depression were noted over the five-day period. There were no undue problems with discomfort from the atmosphere and no sleep difficulties. In addition, moderate exercise was well tolerated for one-hour periods at 3% carbon dioxide though this was no longer feasible at 4%. Not only was physiologic adaptation accomplished but no decrements were seen in the programmed psychological and psychomotor tests. Although we are not advocating a high carbon dioxide environment for spacecraft atmospheres, perhaps too much emphasis has been placed on the deleterious effects of this gas at even lower levels than encompassed in our study. Author

**N68-20552#** School of Aerospace Medicine, Brooks AFB, Tex.
**BENDS IN SIMULATED EXTRAVEHICULAR ACTIVITY**
Robert G. McIver, Thomas H. Allen, Sarah E. Beard, and R. W. Bancroft *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 129–138 refs (See N68-20545 10-04)

In order to avoid decompression sickness in subjects during simulated manned space flight experiments, four hours of denitrogenation time are recommended before decompression to 5 psia or less. If the MOL atmosphere is mixed gas and the subject has equilibrated with this atmosphere then the oxygen breathing time can be reduced to one hour before evacuation takes place. The development of neurological symptoms, circulatory symptoms, chokes, paesthesias, and pronounced joint pains calls for recompression to 14.5 psia and 100 percent oxygen breathing before a re-ascent to 5 psia can be undertaken. The author recommends to subject MOL pilots to safe decompression profiles as part of their training. G.G.

**N68-20553#** School of Aerospace Medicine, Brooks AFB, Tex.
**WHAT HAS SPACE EXPERIENCE TAUGHT US ABOUT DISORIENTATION?**
Paul A. Campbell *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 139–149 refs (See N68-20545 10-04)

The importance of the summed activities of the kinesthetic and proprioceptive senses emanating from muscles, viscera, skin, etc. is outlined and their functions of identification with the orbiting spacecraft through the media of seats, couches, restraints, etc. are discussed. Flight experience in itself is also a selection device and qualification criterion for participation in space flight as well as man's adaptation to various g forces. G.G.

**N68-20554#** School of Aerospace Medicine, Brooks AFB, Tex.
**VESTIBULAR EXPERIMENTS IN GEMINI FLIGHTS 5 AND 7**
Ashton Graybiel, Earl F. Miller, II, John Billingham, Richard Waite, Charles A. Berry et al *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 150–178 refs (See N68-20545 10-04)

One experiment dealt with nonvisual influences which might affect egocentric visual localization of the horizontal. The astronauts' task was to set a dim line of light, in an otherwise dark field, to an external horizontal reference; in weightlessness this reference was the recollection of an element of the spacecraft horizontal with respect to their seat; preflight and postflight it was their recollection of things horizontal with reference to the Earth while they were in a device upright with respect to gravity. Comparisons were made between the astronauts' inflight and preflight and postflight settings and between the settings made by the astronauts and by subjects in earlier experiments. The outstanding inflight findings were the small intratest and intertest variances manifested by all of the astronauts and the high degree of accuracy in the settings made by three of the four astronauts. From the theoretical point of view these findings imply that the E and A phenomena and the oculogravic illusion are the positive results of sensory inputs mainly of otolith and tactile and kinesthetic origin, responding, respectively, to gravitoinertial accelerations and weight. The second experiment consisted in the preflight and postflight measurement of ocular counterrolling which depends, for the greater part at least, on a reflex response having its genesis in the otolith apparatus. No significant differences between preflight and postflight responses were demonstrated. Author

**N68-20555#** School of Aerospace Medicine, Brooks AFB, Tex.
**HUMAN TOLERANCE OF PROLONGED EXPOSURE TO A ROTATING ENVIRONMENT**
D. B. Cramer *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 179–202 refs (See N68-20545 10-04)

Human adaptation to prolonged rotation shows an early ataxia period and the appearance of the nausea syndrome after some delay; during this period the rate of adaptation is greatest in more alert and active human subjects. A later perrotation period is characterized by a fatigue syndrom followed in the postrotation period by ataxia with rapid readaptation to the earth environment. Individual subjects show widely varying degrees of adaptation and can be classified into groups with high, average, or low levels of potential adaptation ability. Drugs might improve resistance to canal sickness by temporary suppression of the vestibular function. G.G.

**N68-20556#** School of Aerospace Medicine, Brooks AFB, Tex.
**CALCIUM AND NITROGEN BALANCE STUDIES DURING GEMINI 7 FLIGHT**
Leo Lutwak *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 203–232 refs (See N68-20545 10-04)

An attempt was made to perform complete metabolic balance studies on two astronauts during ten days pre-flight control phase, fourteen days of space flight, and four days of post-flight recovery phase, measuring intake and excretion of calcium, magnesium, phosphate, sulphate, nitrogen, sodium, potassium, and chloride. Considerable inter-individual variability was demonstrated, as would be expected, in all experimental parameters measured. Significant losses of phosphate were found inflight for both subjects with rapid recovery post-flight. Little change in nitrogen metabolism was noted in either subject. Patterns of excretion of sodium, potassium and chloride were different for each subject and were suggestive of changes in adrenal corticosteroid production. Sweat losses of calcium, magnesium, sulfate, nitrogen, phosphate were insignificant during all three phases. In order to arrive at generalizations concerning the effects of space flight on bone and muscle metabolism, more studies will have to be carried out in more subjects to account for individual variability, and under better control of dietary intake and collection of excreta. Author

**N68-20557#** School of Aerospace Medicine, Brooks AFB, Tex.
**HYPODYNAMICS: CARDIOVASCULAR ASPECTS**
Timothy N. Caris *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 233–239 refs (See N68-20545 10-04)

Changes in the cardiovascular regulatory mechanism during orbital flight, prolonged bed rest, or total body water immersion are used to explain the orthostatic postural intolerance that some pilots exhibit after assuming an erect posture. If man is maintained in a recumbent position, the hydrostatic column of blood due to gravity shortens considerably by a shift from the lower extremities to the rest of the body, primarily into the vascular beds within the chest. Thus, increasing amounts of sodium and water are excreted until the shifted fluid is eliminated and the increased circulating blood volume results in increased filling of the heart chambers and inhibition of the normal antodiuretic hormone by the pituitary gland. Exposure of the lower half of the body to negative pressures for two or three days after prolonged bed rest results in plasma volume repletion and complete tolerance to orthostasis. G.G.

**N68-20558#** School of Aerospace Medicine, Brooks AFB, Tex.
**ERYTHROKINETIC CHANGES IN MAN ASSOCIATED WITH BED REST**
Bernard S. Morse *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 240–254 refs (See N68-20545 10-04)

A significant reduction in red cell mass was observed at the completion of 35 days of bed rest. A decreased rate of erythropoiesis was documented by serial reticulocyte counts. Upon resuming ambulation at the completion of bed rest, there was an accelerated rate of erythropoiesis and evidence suggestive of a mild hemolytic process. Author

**N68-20559#** School of Aerospace Medicine, Brooks AFB, Tex.
**HYPODYNAMICS: METABOLIC ASPECTS**
Malcolm C. Lancaster *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 255–263 refs (See N68-20545 10-04)

The metabolic changes associated with prolonged bed rest that appear to be significant at present are those that seem to be the result of the decrease in physical activity. The atrophy and weakness of muscles and the calcium loss appear to be from this effect. The potential deleterious effects of the calcium loss are weakening of trabecular bone structure and renal lithiasis. Author

**N68-20560#** School of Aerospace Medicine, Brooks AFB, Tex.
**VISION IN THE VOID**
Hans-Georg Clamann *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 264–281 refs (See N68-20545 10-04)

Optical illusions are used to demonstrate that astronaut vision during space flights is not capable of objective recordings

nor free from psychological errors. Without the indication of measurable distances by optical measurements or radar, the subjective distance estimate leads to misjudgements. Greater occurrences of visual illusions in color vision are partly attributed to the effect of simultaneous contrasts. There is strong evidence that the centers upward from the retina in the visual pathway toward the cortex act as parts of a computer mechanism and produce a mental visual image from the physical image. Thus, an astronaut outside of his spaceship might see the sky wrapped around the Earth and the Moon, forming an ellipsoid-like cavity. This ellipsoid may take various shapes depending on what celestial body is closest to it. G.G.

**N68-20561#** School of Aerospace Medicine, Brooks AFB, Tex.
**APPLICATION OF AEROSPACE MEDICAL DEVELOPMENTS IN CLINICAL MEDICINE**
Thomas H. Crouch *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 282-298 (See N68-20545 10-04)

Applications of aerospace hardware and pressure chamber methods in clinical usage is discussed together with a step-by-step planning system for coordinated efforts mounted against specific diseases. Information collection, manipulation, retrieval, and communication aspect absorption into hospital information systems and research programs allows the physician to use his time more efficiently and to continue and update his education. Applied aerospace hardware constitute silicone parts, artificial heart valves, electronic pacemakers, radiotelemetry monitors for the critically ill, pressure respirators, hyperbaric pressure in surgical techniques, prostheses, etc. G.G

**N68-20562#** School of Aerospace Medicine, Brooks AFB, Tex.
**CARDIAC RESPONSES TO ACCELERATION STRESS. 1: INSTRUMENTATION AND TECHNICS**
H. Fred Stegall *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 299-311 refs (See N68-20545 10-04)

Measurements of pressure, volume, flow, and vascular resistance in various body sites by appropriate techniques are needed in order to define the cardiovascular system responses to acceleration stress. Techniques which give reasonable quantitative measurements constitute pressure measurements by implanted transducers, sonic dimension gages for cardiac and vascular volume measurements, and dye dispersions and Doppler effects for blood flow measurements. G.G.

**N68-20563#** School of Aerospace Medicine, Brooks AFB, Tex.
**CARDIAC RESPONSES TO ACCELERATION STRESS. 2: RESULTS IN HUMAN VOLUNTEERS AND EXPERIMENTAL ANIMALS**
Hubert L. Stone *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 312-324 refs (See N68-20545 10-04)

Gas sensitive electrodes were implanted into supine animals in order to study the regional distribution of cardiac output during acceleration stress. Animals inhaled small amounts of hydrogen gas during determination of the tissue flow and desaturation of hydrogen from the tissues was recorded and replotted for analysis. At all levels of back angle above supine position, the tissue blood flow changed when the animal's head was raised above the horizontal; tissue blood flow declined rapidly until at 30° head-up a 68 percent reduction occurred at 3.7 with the body organs moving toward the vertebral column. Acceleration seems to effect the baroreceptor activity to maintain the cerebral blood flow and to prevent unconsciousness. Cardiac output and heart rate responses differed in man and dogs at positive accleration because the heart of a dog moved posteriorly to a much greater extent than than of man. G.G.

**N68-20564#** School of Aerospace Medicine, Brooks AFB, Tex.
**RESPONSE OF THE BODY TO MECHANICAL FORCES—AN OVERVIEW**
Henning E. von Gierke *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 325-344 refs Conf. Presented on Prevent. of and Protect. Against Accidental Explosion, Ammunitions, Fuels and Hazardous Mixtures, New York, 10-13 Oct. 1966 Submitted for publication (See N68-20545 10-04)
(AMRL-TR-66-251)

Starting with present-day knowledge of the dynamic and strength properties of various types of tissue, the dynamic response of the complex body structure to the various types of force application is reviewed. The different methods for the collection of experimental data on man and animals are described and the combined information is used to give an integrated overview of the body's dynamic response to environmental pressure (acoustic loading, blast overpressure or decompression) as well as force changes (whole body vibration, whole body impact and small area impact). Examples of theoretical models describing the response of the whole body as well as models describing specific subsystems such as the respiratory system, the skull or the ear are presented. The discussion covers the status, value, and limitations of such theoretical models for explaining physiological and pathological findings, for predicting the body's response to force environments not yet experienced, for extrapolating biodynamic data among the mammalian species including man, and for aiding in formulating biomedical criteria for not only estimating various human hazards but for guiding those interested in safety and protection engineering. Author

**N68-20565#** School of Aerospace Medicine, Brooks AFB, Tex.
**SPACE CABIN TOXICOLOGY**
Anthony A. Thomas *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 345-368 refs (See N68-20545 10-04)

Simulated space cabin toxicology experiments on groups of animals exposed to atmospheres containing pulmonary irritants, fundamental cabin atmospheres, or off-gas products from cabin materials are reported. Results show that continuous exposure to contamination leads to a "summation of interest" type of toxic effect because daily recuperative periods from exposure do not exist. Both reduced barometric pressure and oxygen rich atmospheres influence the toxic damage effect. G.G.

**N68-20566#** School of Aerospace Medicine, Brooks AFB, Tex.
**PROPELLANT TOXICOLOGY**
Kenneth C. Back *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 369-383 refs (See N68-20545 10-04)

Propellant toxicology was evaluated by observing possible changes in subcellular elements as they relate to enzyme systems and energy kinetics in correlation with histopathological microscopy. Toxicity tests with hydrazines showed that 25 mg/kg of pyridoxine protect man against convulsions in case of severe exposure to UDMH. Monomethylhydrazine toxicity caused specific changes in kidney and liver functions of monkeys and needs the combined administration of glucose as well as pyridoxine to prevent convulsions and deaths. Fluorine toxicity tests on rats concentrated in thyroid uptake of fluoride concentrations with return to normal after a few weeks. G.G.

**N68-20567#** School of Aerospace Medicine, Brooks AFB, Tex.
**PERSONAL HYGIENE AND SANITATION IN AEROSPACE SYSTEMS**
Alton E. Prince *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 384-395 refs (See N68-20545 10-04)

The nutritional requirements of young men, confined for various periods of time in simulated space environments, and the

establishment of criteria for personnel hygiene and sanitation were evaluated. Microbiological sampling analyses found that corynebacteria keep staphylococci under some degree of control regardless of body cleansing procedures or environmental changes. Recommendations developed for space missions up to 30 days advocated the cleaning of body surfaces with moistened disposable paper wipes; an average of three per day was considered sufficient. Teeth should be cleaned once a day with a tooth brush and plain water and a rubber interdental stimulator should be used if desired.
G.G.

**N68-20571#** Aerospace Medicine, Brooks AFB, Tex.
**WORLD-WIDE AEROMEDICAL EVACUATION AND RECENT DEVELOPMENTS**
Harold F. Funsch *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 440–463 refs (See N68-20545 10-04)

Long and extensive experience has demonstrated that any patient capable of being moved can be transported by air. Aerial movement has played a key role in improving survival rates of the wounded. Rapid, safe movement of casualties to field hospitals, and thence to larger medical centers, has made prompt specialized care possible. During his transportation, the patient is kept under continuous medical surveillance. He is carefully screened at the casualty staging centers of both the aerial ports of embarkation and debarkation. He receives medication and ancillary care in flight. Special equipment is utilized for cases requiring suction, oxygen, respiratory assistance, traction and the like. Second, early and safe evacuation of patients reduces the strain on the overseas medical facilities in the field, thereby increasing their potential for managing casualty surges. And finally, aeromedical evacuation permits the conservation and centralization of the large but by no means unlimited resources of military medicine, limiting the requirement for constructing additional expensive fixed medical facilities overseas.
Author

**N68-20572#** School of Aerospace Medicine, Brooks AFB, Tex.
**INFORMATION PROCESSING ASPECTS OF BIONICS**
Hans L. Ostreicher *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 464–480 refs (See N68-20545 10-04)

Information processing systems in bionics constitute interactions of living organisms with their environment primarily by motions of their bodies. The information enters the system through signal reception, is converted into the receptor organs routine operations and passed on to a central information processing stage. The output mechanism converts the internal code then into appropriate action and enables the system to interact with its environment. The powerful method of pattern recognition has evolved in all higher animals and enables them to organize the stream of input data. An estimate of the information contained in output mechanisms shows a strong increase due to genetic and learned programs stored in the bionic system.
G.G.

**N68-20574#** School of Aerospace Medicine, Brooks AFB, Tex.
**SOLVED AND UNSOLVED SPACE MEDICAL PROBLEMS INTERNATIONAL STATUS: 1966/1967**
Hubertus Strughold *In its* Lectures in Aerospace Med., 6th Ser. 1967 p 520–535 refs (See N68-20545 10-04)

Longer orbital space flight durations for manned lunar and planetary landing missions require spacecraft protection against puncture by meteors, preventive measures against corrosion effects on windows and communication equipment, as well as shielding against energetic particle rays. Communications from earth bases can advise orbiting astronauts on imminent dangers from solar flares and proton showers. Electromagnetic radiation effects on the physiological circadian cycle can be reduced by alternating sleep and activity phases within nearly the inherited time frame. Gravitational stimulation of the gravireceptors in near weightlessness environments can be provided by carrying some ballast. A Mars landing mission is feasible when proper precautions are taken in regard to atmospheric pressure, temperature, logistics problems, etc.
G.G.

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# IAA ENTRIES

**A68-21793** #

MECHANISM OF STIMULATION OF THE SEMICIRCULAR CANALS IN HUMANS DURING ROTATION IN TWO MUTUALLY PERPENDICULAR PLANES [MEKHANIZM RAZDRAZHENIIA POLUKRUZHNYKH KANALOV PRI VRASHCHENII CHELOVEKA V DVUKH VZAIMNO PERPENDIKULIARNYKH PLOSKOSTIAKH].

F. A. Solodovnik, L. M. Vorob'ev, and G. F. Khlebnikov.

Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, Jan.-Feb. 1968, p. 78-88. 20 refs. In Russian.

Investigation of the effects arising in the human semicircular canals during simultaneous rotation in two mutually perpendicular directions, using a rotating chair and straightening the subject's head from a position initially inclined at 90°. Rotation with a simultaneous inclination or straightening of the head causes a shift of the endolymph in the semicircular canals due to the formation of a pair of inertial Coriolis forces. Rotation with simultaneous displacement of the head relative to the axis of rotation and without inclination causes identical (in magnitude and direction) Coriolis acceleration at all points of the canal. The inertial shift of the endolymph does not arise in this case nor does the pair of rotational forces. To avoid stimulation of the canals during manual labor under space-flight conditions it is necessary to move the head in a forward direction - i.e., without rotation relative to the vehicle. T.M.

**A68-21794** #

FEATURES OF HUMAN SLEEP UNDER CONDITIONS OF CONTINUOUS LONG-TERM ACTION OF WIDEBAND NOISE OF AVERAGE INTENSITY [OSOBENNOSTI SNA CHELOVEKA V USLOVIIAKH NEPRERYVNOGO DLITEL'NOGO VOZDEISTVIIA SHIROKOPOLOSNOGO SHUMA SREDNEI INTENSIVNOSTI].

V. I. Miasnikov, O. P. Kozerenko, I. Ia. Iakovleva, E. I. Matsnev, I. P. Lebedeva, V. N. Nesterenko, and E. Z. Tambiev (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR).

Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, Jan.-Feb. 1968, p. 89-98. 37 refs. In Russian.

**Experimental investigation of the features of human sleep and transition (from sleep to wakefulness) states during protracted action on the organism by wideband noise ranging from 75 to 78 db in intensity. An extended stay in a noisy environment may lead to a deterioration of the quality of sleep. It is shown that the unpleasant sensations associated with the action of the noise are caused by the uneven disturbance of the auditory adaptation at different frequencies of the sonic spectrum and by the unequal changes in the functional status of the peripheral and central regions of the auditory analysor. The degree of recovery of the disturbed functions of the analysor is directly dependent on the sleep quality. The necessity of evaluating an astronaut's functional capabilities in terms of his sleep in a noisy environment is stressed, and the adaptive capability of the auditory organ is suggested as one of the test criteria.** T.M.

**A68-21795** #

GROWTH KINETICS OF SOLID LYMPHOSARCOMA NKLy UNDER THE ACTION OF VARIOUS DOSES OF IONIZING RADIATION [KINETIKA ROSTA SOLIDNOI LIMFOSARKOMY NKLy PRI VOZDEISTVII RAZLICHNYKH DOZ IONIZIRUIUSHCHEGO IZLUCHENIIA].

I. I. Pelevina, G. G. Afanas'ev, L. P. Lipchina, and N. M. Emanuel' (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR).

Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, Jan.-Feb. 1968, p. 99-108. 24 refs. In Russian.

Investigation of the nonexponential growth of solid lymphosarcoma NKLy in mice during local X-ray irradiation of the tumors. It is **shown that the regularities in the growth of solid lymphosarcoma NKLy after various radiation doses remain unchanged. The factor characterizing the tumor growth rate is significantly reduced only after radiation doses of 1500 and 2000 r. A varying reaction of the tumors to irradiation is described which consists of increased dispersion and a disturbed distribution of tumor-diameter values. These effects may be related to a varying radiation-sensitivity of the tumors.** T.M.

**A68-21796** #

FREE RADICALS IN THE HARDING-PASSEY MELANOMA AFTER IRRADIATION BY AN UNFOCUSED LASER BEAM [SVOBODNYE RADIKALY V MELANOME GARDING-PASSI POSLE OBLUCHENIIA NESFOKUSIROVANNYM LUCHOM KVANTOVOGO GENERATORA].

L. A. Piruzian, L. Kh. Barsegian, V. A. Dement'ev, and G. S. Savchenko (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR).

Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, Jan.-Feb. 1968, p. 121-123. 10 refs. In Russian.

Investigation of the tissue temperature, free-radical concentration, and histology of the Harding-Passey melanoma after irradiation with an unfocused laser beam. After irradiation with energies of 20, 40, and 60 joules, the free-radical concentration in the tested samples differs from that in control samples only within the range of experimental error. No histological changes were observed due to the slight temperature rise in the tumors caused by the irradiation. T.M.

**A68-21797** #

INVESTIGATION OF THE ACTION OF β-MERCAPTOPROPYLAMINE ON THE INDUCTION OF THE PHAGE PRODUCTION OF THE LYSOGENIC CULTURE E. COLI K-12 λ IN EXPERIMENTS ON THE SPACE VEHICLES VOSTOK 5 AND VOSTOK 6 [ISSLEDOVANIE DEISTVIIA β-MERKAPTOPROPILAMINA NA INDUKTSIIU FAGOPRODUKTSII LIZOGENNOI KUL'TURY E. COLI K-12 λ V EKSPERIMENTAKH NA KOSMICHESKIKH KORABLIAKH "VOSTOK-5" I "VOSTOK-6"].

N. I. Rybakov, V. A. Kozlov, E. D. Aniskin, and A. V. Kolobov.

Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, Jan.-Feb. 1968, p. 123-126. 13 refs. In Russian.

**Determination of the effect of β-mercaptopropylamine on the induced phage production of the E. coli K-12 λ lysogenic culture irradiated during flight in Vostok 5 and Vostok 6 space vehicles. Comparison of the effect of radiation safeguards during these flights with laboratory results is used to evaluate the efficiency of chemical safeguards in minimizing radiation dangers in space. The results concerning the effect of the β-mercaptopropylamine are tabulated in terms of the mean number of phage particles in the samples. A similar regularity in the inhibitory effect of β-mercaptopropylamine on phage development is demonstrated for orbital and ground-based experiments.** T.M.

**A68-21798** #

INFLUENCE OF SPACE-FLIGHT CONDITIONS ON THE COSMOS 110 VEHICLE ON THE SEEDS OF CERTAIN HIGHER-ORDER PLANTS [VLIIANIE USLOVII KOSMICHESKOGO POLETA NA KORABLE-SPUTNIKE "KOSMOS-110" NA SEMENA NEKOTORYKH VYSSHIKH RASTENII].

N. L. Delone, E. M. Morozova, V. V. Antipov, G. P. Parfenov, A. S. Trusova, and Z. I. Ukstina.

Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, Jan.-Feb. 1968, p. 126-129. 8 refs. In Russian.

Investigation of the influence of the space environment on the seeds of pine, wheat, barley, and peas carried on board the Cosmos 110 satellite. After recovery, the seeds were grown together with comparative control seeds and subjected to physiological and cytological studies. Seeds having a reduced germination percentage exhibited increased germination percentage after the flight. The growth rate of barley was stimulated up to the budding stage after which no differences were observed relative to the control samples. The percentage of chromosome reorganization in the samples did not exceed that of the control samples with the exception of the pine where an increased number of reorganizations were noted. T.M.

**A68-21799** #
NITROGEN-CONTAINING COMPOUNDS OF CERTAIN BLUE-GREEN ALGAE [AZOTSODERZHASHCHIE SOEDINENIIA NEKOTORYKH SINEZELENYKH VODOROSLEI].
G. N. Rzhanova (Akademiia Nauk SSSR, Institut Mikrobiologii, Moscow, USSR).
Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, Jan.-Feb. 1968, p. 143-149. 7 refs. In Russian.

Determination of the content and composition of 17 amino acids in four representative types of blue-green algae, using the method of ion-exchange chromatography. The total nitrogen content of the species examined ranges from 6.5 to 7.5%. Amino acids comprise 30 to 35% of the algae organic substance, while the nitrogen of the amino acids consists of 60 to 65% of the overall nitrogen content. T. M.

**A68-21899** #
PSYCHOPHYSIOLOGICAL ASPECTS IN WEIGHTLESSNESS [ASPEKTY PSYCHOFIZJOLOGICZNE W NIEWAŻKOŚCI].
Julian Walawski.
Astronautyka, vol. 11, no. 1, 1968, p. 2-5. In Polish.

Discussion of the influence of functional disturbances due to weightlessness on human physical and psychological capabilities. It is noted that psychological experiences often cause changes in the heart rate, respiration, digestion, tissue metabolism, and other functions. In view of these effects, there is a necessity for a new branch of applied psychology, dealing with the psychosomatic behavior of man in space. The effects of weightlessness on the nervous system are briefly outlined within the framework of currently available knowledge. Similar treatment is given to the disturbances in the circulatory, digestive, and motor systems. T. M.

**A68-21920**
LIFE SUPPORT OF SPACECRAFT CREWS [ZHIZNEOBESPECHENIE EKIPAZHEI KOSMICHESKIKH KORABLEI].
G. I. Voronin and A. I. Polivoda.
Moscow, Izdatel'stvo Mashinostroenie, 1967. 215 p. In Russian.

This book contains the basic design concepts for spacecraft environmental support systems. Systems involving the transportation of the necessary oxygen, water, and nutrients from the ground base (without regeneration) are described, citing the Vostok, Voskhod, and Gemini systems as examples. Attention is then given to regenerative systems involving the regeneration of contaminated water into nutrients and carbon dioxide into oxygen. The energy-supply and radiative-heat-transfer systems required for the regenerative arrangements are analyzed. Mass and energy transfer in spacecraft systems is studied, together with environmental support systems involving regeneration of water, oxygen, and nutrients on the basis of biosynthesis. Certain special problems concerning the use of solar energy and the removal of surplus heat are examined in detail. The described support systems are represented in the form of functionally interconnected modules or component units. A feature of the book is the description of a long-term support system capable of flying to Mars and back. T. M.

**A68-21934**
ECOLOGICAL TECHNOLOGY: SPACE-EARTH-SEA. VOLUME 1 - TECHNOLOGICAL TRANSFERENCE SYMPOSIUM, 1ST, SMITHSONIAN INSTITUTION, WASHINGTON, D.C., FEBRUARY 14, 15, 1966, PROCEEDINGS.
Symposium sponsored by the National Cybernetics Foundation.
Edited by E. B. Konecci (Texas, University, Austin, Tex.).
Austin, Tex., University of Texas (Transference of Technology Series No. 1), 1967. 308 p.
$5.00.

CONTENTS:



**A68-21935** #
FEEDING MAN IN A CLOSED ECOLOGICAL SYSTEM.
Norman G. Roth (Whirlpool Corp., St. Joseph, Mich.).
IN: ECOLOGICAL TECHNOLOGY: SPACE-EARTH-SEA. VOLUME 1 - TECHNOLOGICAL TRANSFERENCE SYMPOSIUM, 1ST, SMITHSONIAN INSTITUTION, WASHINGTON, D.C., FEBRUARY 14, 15, 1966, PROCEEDINGS. [A68-21934 09-05]
Symposium sponsored by the National Cybernetics Foundation.
Edited by E. B. Konecci.
Austin, Tex., University of Texas (Transference of Technology Series No. 1), 1967, p. 13-26. 11 refs.

Discussion of two types of methods for the regenerative feeding of man in space environments. The two classes of feeding systems examined are the physicochemical and the biological systems. It is thought that the physicochemical production of carbohydrates is at present feasible, although there exists much less optimism concerning the physicochemical production of proteins, fats, vitamins, and minerals. With respect to the biological systems, the use of algae, broadleaf plants, nonphotosynthetic microorganisms, tissue cultures, and ecological pyramids for the regenerative production of food is discussed. R. B. S.

**A68-21936** #
BIOREGENERATION IN A CLOSED ECOLOGICAL SYSTEM.
Leonard Bongers (Martin Marietta Corp., Aerospace Group, Research Institute for Advanced Studies, Baltimore, Md.).
IN: ECOLOGICAL TECHNOLOGY: SPACE-EARTH-SEA. VOLUME 1 - TECHNOLOGICAL TRANSFERENCE SYMPOSIUM, 1ST, SMITHSONIAN INSTITUTION, WASHINGTON, D.C., FEBRUARY 14, 15, 1966, PROCEEDINGS. [A68-21934 09-05]
Symposium sponsored by the National Cybernetics Foundation.
Edited by E. B. Konecci.
Austin, Tex., University of Texas (Transference of Technology Series No. 1), 1967, p. 39-86. 62 refs.

Discussion of some of the means by which bioregeneration may be accomplished. Among the systems discussed is the algal gas exchanger, a system based on the use of hydrogen bacteria in conjunction with water electrolysis. Also examined are mixed systems of photosynthetic algae and bacteria with chemosynthetic bacteria. The limitations and performance of these systems are evaluated with respect to power and weight requirements based on the use of algae and hydrogen bacteria. It is concluded that biological regeneration in a closed environment is technically feasible, although problems associated with harvesting and food acceptability have yet to be completely solved. R. B. S.

**A68-21937** #
INSTRUMENTAL MONITORING FOR ENVIRONMENTAL CONTROL.
Robert D. Gafford (Beckman Instruments, Inc., Fullerton, Calif.).
IN: ECOLOGICAL TECHNOLOGY: SPACE-EARTH-SEA. VOLUME 1 - TECHNOLOGICAL TRANSFERENCE SYMPOSIUM, 1ST, SMITHSONIAN INSTITUTION, WASHINGTON, D.C., FEBRUARY 14, 15, 1966, PROCEEDINGS. [A68-21934 09-05]

Symposium sponsored by the National Cybernetics Foundation. Edited by E. B. Konecci.
Austin, Tex., University of Texas (Transference of Technology Series No. 1), 1967, p. 87-98.

Discussion of a number of specific techniques for atmospheric monitoring. Beginning with a description of electrochemical sensors for the detection and measurement of $CO_2$ and $O_2$, the discussion treats two specific applications of gas chromatography in monitoring closed atmospheres (the Apollo gas chromatograph and the Mark V submarine atmosphere analyzer) and finally the monitoring of space craft or undersea atmospheres by means of the mass spectrometer. This instrument physically separates the various constituents in a gaseous sample by first ionizing the sample, then separating the ionized particles in a magnetic or rf field. R.B.S.

**A68-21938** #
BIOLOGICAL WASTE TREATMENT TECHNOLOGY - PRESENT AND FUTURE.
E. Alan Cassell (Clarkson College of Technology, Potsdam, N.Y.).
IN: ECOLOGICAL TECHNOLOGY: SPACE-EARTH-SEA. VOLUME 1 - TECHNOLOGICAL TRANSFERENCE SYMPOSIUM, 1ST, SMITHSONIAN INSTITUTION, WASHINGTON, D.C., FEBRUARY 14, 15, 1966, PROCEEDINGS. [A68-21934 09-05]
Symposium sponsored by the National Cybernetics Foundation. Edited by E. B. Konecci.
Austin, Tex., University of Texas (Transference of Technology Series No. 1), 1967, p. 99-163. 224 refs.

Survey of current municipal waste-water treatment practice. Particular emphasis is placed on various nonphotosynthetic aerobic methods of biological waste treatment and their application to closed ecological subsystems designed for water reuse purposes. The relationship between biochemical oxygen demand and primary and secondary sewage-treatment operations and sludging operations is discussed in detail. R.B.S.

**A68-21939** *#
WATER RECLAMATION AND CONSERVATION IN A CLOSED ECOLOGICAL SYSTEM.
V. G. Collins and D. C. Popma (NASA, Langley Research Center, Hampton, Va.).
IN: ECOLOGICAL TECHNOLOGY: SPACE-EARTH-SEA. VOLUME 1 - TECHNOLOGICAL TRANSFERENCE SYMPOSIUM, 1ST, SMITHSONIAN INSTITUTION, WASHINGTON, D.C., FEBRUARY 14, 15, 1966, PROCEEDINGS. [A68-21934 09-05]
Symposium sponsored by the National Cybernetics Foundation. Edited by E. B. Konecci.
Austin, Tex., University of Texas (Transference of Technology Series No. 1), 1967, p. 165-195.

Review of some of the basic water-reclamation techniques to be used in future space missions. The four chief methods discussed include multifiltration, distillation, reverse osmosis, and electrodialysis. It is seen that the selection of a flight system can best be made on the basis of its reliability, launch weight, recovery efficiency, recovery cost, and the quantity of expendables required for its operation. The numerous problems associated with the reclamation of usable water from wash water, urine, and humidity are investigated. R.B.S.

**A68-21940** #
ECOLOGICAL SIGNIFICANCE OF WASTE HEAT UTILIZATION.
Alfred A. Bacher (Department of the Interior, Office of Saline Water, Washington, D.C.) and Samuel A. Zwickler (Burns and Roe, Inc., New York, N.Y.).
IN: ECOLOGICAL TECHNOLOGY: SPACE-EARTH-SEA. VOLUME 1 - TECHNOLOGICAL TRANSFERENCE SYMPOSIUM, 1ST, SMITHSONIAN INSTITUTION, WASHINGTON, D.C., FEBRUARY 14, 15, 1966, PROCEEDINGS. [A68-21934 09-05]
Symposium sponsored by the National Cybernetics Foundation. Edited by E. B. Konecci.
Austin, Tex., University of Texas (Transference of Technology Series No. 1), 1967, p. 197-221.

Discussion of actual and planned methods for the utilization of waste heat generated by the combustion of rubbish and by industrial furnaces, electrical fixtures, and human beings. Some of the uses to which this surplus heat could be put include the distillation of sea water and the heating of industrial buildings. R.B.S.

**A68-21943**
"BIOCYCLERGOLOGY" AND ASTRONAUTICS [BIO-CYCLERGOLOGIE ET ASTRONAUTIQUE].
G. Cantoni (Ministère des Armées, Service de Santé de l'Air, Centre de Recherches, Paris, France) and J. Borsarello.
Revue Française d'Astronautique, Dec. 1967, p. 21-27. In French.

Consideration of the circulation of energy in a system under conditions where this cyclic energy may be regulated or rebalanced by acupuncture. This study leads to an estimation of the consequences which a sudden and prolonged change of magnetic, gravitational, or ionic environment may have upon the organism of an astronaut. It is, however, concluded that man's adaptive faculties will carry him through this stage of progress. F.R.L.

**A68-21955** *
OCULOMETER FOR "HANDS-OFF" POINTING AND TRACKING.
John Merchant (Honeywell, Inc., Radiation Center, Boston, Mass.).
Space/Aeronautics, vol. 49, Feb. 1968, p. 92-95.
NASA-supported research.

Description of pointing and tracking systems that sense and respond to the motion of the operator's eyes instead of the forces exerted by his hand. The hand is invariably slower and often less accurate than the eye. The key element of such an "eye-control" system is the oculometer, or eye direction monitor. Eye control of pointing and tracking is possible because the sensory capability of the human retina has a very sharp maximum in a small central region known as the fovea. The oculometer illuminates one of the operator's eyes with invisible radiation from a known direction. The oculometer consists of an optical system, the electrooptical sensor, and an electronic system. The optical system emits IR radiation in the band from 0.83 to 0.90 $\mu$. A radiation source is imaged onto the retina, and a fraction of the radiation incident there is reflected out of the eye, imaging the pupil onto the sensitive screen of the sensor. At the same time, a virtual image of a radiation source is formed in the area of the pupil by reflection at the spherical interface of cornea and air, and this reflection, too, is imaged onto the sensor. P.v.T.

**A68-22028** *
LUMINANCE REQUIREMENTS FOR HUE PERCEPTION IN SMALL TARGETS.
Mary M. Connors (NASA, Ames Research Center, Moffett Field, Calif.).
Optical Society of America, Journal, vol. 58, Feb. 1968, p. 258-263. 28 refs.

Investigation of the luminances necessary to perceive red (642 nm), green (521 nm), and blue (468 nm) at nine visual angles ranging from over 1° to 21 sec of arc diam. Monocular, foveal measurements were made by the method of constant stimuli at exposures of 44 and 700 msec duration. Three color normals served as observers. The results show that, with sufficient luminance, these hues can be seen even for stimuli as small as 0.35 min of arc diam. Red is generally perceived at lower luminances than blue or green. There is an inverse relationship between stimulus size and luminance necessary for hue perception which can be represented as two linear functions. At small angles, the area-luminance slopes bracket, but tend to be somewhat larger than the slope predicted by Ricco's law; at larger angles, the function resembles that predicted by Piper's law. The change of function from approximately $A \cdot I = C$ to approximately $A^{1/2} \cdot I = C$ occurs at higher visual angles for shorter exposures. (Author)

**A68-22116** *
SYNERGISTIC EFFECTS IN SONOCHEMICAL STERILIZATION.
Raymond M. G. Boucher, Michael A. Pisano, George Tortora, and Edward Sawicki (Macrosonics Corp., Rahway, N.J.; Saint John's University, Dept. of Biology, Jamaica, N.Y.).
Applied Microbiology, vol. 15, Nov. 1967, p. 1257-1261. 9 refs.
Grant No. NsG-684.

## A68-22130

The synergistic effects observed during the sterilization of Bacillus subtilis var. niger ATCC 9372 by the combined action of ethylene or propylene oxide with high-intensity airborne sound waves (34.8 kc) were investigated. It has been shown that the number of surviving spores deposited on paper strips decreases exponentially with the sound intensity at sample level. Reductions of the order of 1/3 of the time required for standard propylene oxide sterilization have been observed by using the combined action of sound waves with gaseous sterilization. At the present time, maximal synergistic effects seem to be achieved for the following experimental conditions: propylene oxide concentration, 500 to 1000 mg/liter; acoustic intensity, 161 to 162 db; contact time, 80 min; temperature, 60°C; and relative humidity, 40%. The basic mechanism involved in sonochemical sterilization seems to be more of a physical (accelerated gas diffusion) than a chemical nature. (Author)

**A68-22130** *
SPACE-FLIGHT-RELATED STRESSES ON THE CENTRAL NERVOUS SYSTEM.
R. L. Schoenbrun and W. R. Adey (California, University, Dept. of Anatomy and Center for Health Sciences, Brain Research Institute, Los Angeles, Calif.).
Radiation Research Supplement, vol. 7, 1967, p. 423-438. 18 refs.
AEC Contract No. AT (11-1)-34; Grants No. AF AFOSR 61-81; No. NsG-203-62; No. NsG-05-007-001.
Description of computerized methods for the precise specification of different states of the central-nervous-system function. The effects of centrifuging acceleration, whole-body vibration, and focal-brain irradiation on cerebral electrical activity are discussed, with emphasis on temporal-lobe structures. M. M.

**A68-22166** *
ENERGY METABOLISM IN HIBERNATION.
F. E. South and W. A. House (Missouri, University, Space Sciences Research Center and Dept. of Physiology, Columbia, Mo.; Colorado State University, Dept. of Physiology, Fort Collins, Colo.).
IN: MAMMALIAN HIBERNATION III.
Edited by K. C. Fisher, A. R. Dawe, C. P. Lyman, Eduard Schönbaum, and F. E. South, Jr.
Edinburgh, Oliver and Boyd, Ltd., 1967, p. 305-322; Discussion, p. 322-324.
NIH Grant No. GM-9584; Grant No. NGR-06-002-015.
Review of investigations of the general energy metabolism, behavioral regulation, and metabolic paths in animal hibernation. It is pointed out that present knowledge indicates that in general the food habits of hibernators are similar to ecologically equivalent nonhibernators, and that animals from both broad categories show preferences for some foods and reject others. At present there is no reason to suspect that the digestive enzymes of hibernators differ from those of nonhibernators. Studies concerning the acquisition of energy by hibernators, while important, shed little light on the physiological mechanisms peculiar to the phenomenon of hibernation. The importance of the method by which hibernators are able to metabolize the energy made available to them under the conditions of deep hibernation is stressed. M. M.

**A68-22169**
THE ORIGIN OF LIFE.
J. D. Bernal (London, University, London, England).
London, George Weidenfeld and Nicolson, Ltd., 1967. 360 p.
In this book, life is viewed, basically, as a complex of chemical interactions out of which, at a later date, individual organisms appeared. The process of metabolism involves the production of identical molecules, mainly proteins and enzymes, by mechanisms coded by nucleic acid and located on the ribosomes in the cell. From these molecules are derived all the chemical reactions and biological structures. Thus the actual evolution of organisms can be seen to be preceded by the chemical evolution of complex molecules. This evolution is directed by the same type of natural selection that occurred in the evolution of organisms. P. v. T.

**A68-22191**
CARDIOVASCULAR REACTIONS DURING SPACE FLIGHTS [LES REACTIONS CARDIOVASCULAIRES AU COURS DES VOLS COSMONAUTIQUES].
R. Grandpierre and G. Neverre (Bordeaux, Université, Chaire de Physiologie, Bordeaux, France).
La Recherche Spatiale, vol. 7, Jan. 1968, p. 1-7. In French.
Study of the effect of space flights on the cardiovascular system, with particular attention to the effect of acceleration and deceleration. Acceleration usually provokes a sinus tachycardia, and sometimes leads to an alveolar collapse. After the propulsion stage, when weightlessness sets in, an abrupt decrease in the heart rhythm is observed. This short-phase bradycardia, together with a decrease in blood pressure, occurs at the time of an abrupt reoxygenation following hypoxia. The effects of transverse acceleration and physical exercise in the absence of gravity on the cardiovascular system are also discussed. M. F.

**A68-22194** *
DISCRIMINATING AMONG STATES OF CONSCIOUSNESS BY EEG MEASUREMENTS - A STUDY OF FOUR SUBJECTS.
Donald O. Walter, J. M. Rhodes, and W. Ross Adey (California, University, Dept. of Physiology and Dept. of Anatomy and Center for Health Sciences, Brain Research Institute, Los Angeles, Calif.).
Electroencephalography and Clinical Neurophysiology, vol. 22, 1967, p. 22-29. 6 refs.
PHS Grant No. NB-02501; NIH Grant No. FR-3; Contracts No. AF 49(638)-1387; No. Nonr-233(91); No. NAS 9-1970; Grant No. NsG-237-62.
Calculation of activity intensity for mean frequency, equivalent bandwidth, and coherence values in four frequency ranges for four channels of EEG recorded from each of four normal human adult males in five experimental situations, including rest and attention periods. Stepwise discriminant analysis is applied to the calculated values for all subjects simultaneously to develop formulas for automatic categorization of records into the situation in which they were recorded. When the records from each subject were separately analyzed and the four parameters for best discriminating his own records were applied, a higher proportion of records was correctly categorized; the parameters chosen only partially overlapped those chosen for the simultaneous discrimination. B. B.

**A68-22198** *
OBSERVING BEHAVIOR IN THE SQUIRREL MONKEY IN A SITUATION ANALOGOUS TO HUMAN MONITORING.
John O. De Lorge, Jonathan Hess, and Fogle C. Clark (Evansville State Hospital, Evansville, Ind.).
Perceptual and Motor Skills, vol. 25, 1967, p. 745-767. 41 refs.
National Institute of Mental Health Grants No. MH 35062-1; No. MH-14401-01; Grants No. NsG-446; No. NsG-15-002-001.
Observing and detection behavior were examined in four squirrel monkeys under schedule conditions similar to those employed in human monitoring experiments. Observing responses produced either a visual signal ($S^d$) indicating availability of food reinforcement for an instrumental (detection) response or an $S^\Delta$ indicating nonavailability of reinforcement. Signals were terminated by a detection response and followed by reinforcement. $S^\Delta$ exposures in the absence of signals were 0.5 sec in duration. Detection responses in $S^\Delta$ had no consequence. Signal availabilities were programed according to random interval schedules. Mean intersignal availability times of 1, 2, 4, and 8 min corresponding to average signal rates of 60, 30, 15, and 7.5 per hour were examined in that order. All schedules used generated a constant high rate of observing responses with short detection latencies in the presence of signals and very few detection responses in the absence of signals. No decrease in observing rate or increase in detection time was obtained within 2-hr sessions. Neither observing rate nor detection latency varied systematically as a function of signal frequency. Distributions of observing interresponse times in the absence of stimuli were random except in one animal Results are discussed in relation to data from other experiments on operant behavior. (Author)

**A68-22340 ***
ANALYSIS OF A RECENT HYPOTHESIS OF PLASMA FLOW IN PERICAPILLARY SPACES.
John T. Howe and Yvonne S. Sheaffer (NASA, Ames Research Center, Moffett Field, Calif.).
Circulation Research, vol. 21, Dec. 1967, p. 925-934. 22 refs.

Hydrodynamic examination of the hypothesis that the observed fluid annulus outside the wall of some capillaries is the reservoir of plasma responsible for ratios of organ hematocrit to large-vessel hematocrit less than 1. The extent to which the hematocrits can be reconciled on the basis of flow through a single capillary is examined. Results show that ratios between 0.5 and 1.0 can be accounted for even if plasma and cells travel the same distance through a common capillary without a plasma annulus. With the annulus, ratios as low as 0.27 can be explained (ratios as low as 0.35 have been measured), and the corresponding capillary pressure gradients agree better with those cited elsewhere. M.G.

**A68-22357 ***
MINERAL INTAKE AND BONE LOSS.
D. M. Hegsted (Harvard University, Harvard School of Public Health, Dept. of Nutrition, Boston, Mass.).
(Federation of American Societies for Experimental Biology, Annual Meeting, 51st, Symposium on Nutrition and Bone Loss, Chicago, Ill., Apr. 17, 1967.)
Federation Proceedings, vol. 26, Nov.-Dec. 1967, p. 1747-1754. 44 refs.
Research supported by Harvard University and the Nutrition Foundation; National Institute of Arthritis and Metabolic Diseases Grant No. 5-K6-AM-18 455; Grants No. NsG-679; No. NsG-22-007-017.

Discussion of arguments in support of the thesis that equating bone and calcium metabolism is too narrow a view and may lead to untenable hypotheses. The role of nutrition in the formation and maintenance of bone is explored upon a broader base than most of the studies available. It is pointed out that, although interest has centered on calcium intakes and calcium-balance studies in relation to bone disease, this interest may be partially misdirected. Many of the metabolic studies may have to be reevaluated or may not be interpretable, since often they have not been clean experiments, in the sense that several variables may have influenced the results. Since the relationships between nutrients such as calcium, phosphorus, magnesium, fluoride, and the like are not clearly understood, it would probably be difficult to interpret the data even if information on such variables were available. M.M.

**A68-22361 ***
MODIFICATION OF MOTIVATED BEHAVIOR ELICITED BY ELECTRICAL STIMULATION OF THE HYPOTHALAMUS.
Elliot S. Valenstein, Verne C. Cox, and Jan W. Kakolewski (Fels Research Institute, Yellow Springs, Ohio).
Science, vol. 159, Mar. 8, 1968, p. 1119-1121. 16 refs.
NIH Grant No. M-4529; Grant No. NsG-437.

Reexamination of previous reports which demonstrated that hypothalamic stimulation may elicit either eating, drinking, or gnawing and emphasized both the specificity at the neural circuits mediating these behaviors and the similarity to behavior during natural-drive states such as hunger and thirst. It has now been found that, after a period of very consistent elicitation of one of these behaviors, the animal may exhibit an equally consistent alternate behavior. A learning component is implicated in the association of hypothalamic stimulation with a particular behavior pattern. P.v.T.

**A68-22369 ***
EFFECT OF HYPOXIA ON MYOCARDIUM IN HEART-LUNG PREPARATION.
N. S. Nejad and Eric Ogden (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.; U.S. Naval Aviation Medical Center, Aerospace Medical Institute, Pensacola, Fla.).
Society for Experimental Biology and Medicine, Proceedings, vol. 126, 1967, p. 767-770. 19 refs.

Description of the ventilation of heart-lung preparations according to the method of Starling (Knowlton and Starling - 1912) with various mixtures of oxygen, nitrogen, and carbon dioxide, and evaluation of the heart by relating stroke work to left arterial pressure. At arterial oxygen tensions of arterial blood between 65 and 25 mm Hg, performance improved. At 20 mm Hg or lower the performance was impaired, but the impairment was reversible. The impairment was accompanied by an accumulation of lactate and pyruvate in the blood (which was also reversible as oxygen tension was restored). The possible mechanism of these changes is discussed. B.B.

**A68-22373 ***
PREBIOTIC PORPHYRIN GENESIS - PORPHYRINS FROM ELECTRIC DISCHARGE IN METHANE, AMMONIA, AND WATER VAPOR.
G. W. Hodgson (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.; Research Council of Alberta, Edmonton, Alberta, Canada) and Cyril Ponnamperuma (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
National Academy of Sciences, Proceedings, vol. 59, Jan. 1968, p. 22-28. 25 refs.

Discussion of the prebiotic genesis of organic compounds such as porphyrin from the primitive atmosphere. It is indicated that microgram quantities of free-base porphyrin are generated under electric discharge conditions in methane-ammonia-water systems. Pyrrole markedly augments the porphyrin yield and is known to be active in the formation of porphine. The formation of porphyrins in the prebiotic context is significant because they are vital for many biological systems and may have been incorporated into such evolving systems because of their prebiotic availability. B.B.

**A68-22383 ***
AVOIDANCE CONDITIONING WITH CENTRAL AND PERIPHERAL AVERSIVE STIMULATION.
Verne C. Cox (Fels Research Institute, Yellow Springs, Ohio).
Canadian Journal of Psychology, vol. 21, no. 5, 1967, p. 425-435. 25 refs.
NIH Grant No. M-4529; Grants No. NsG-437; No. NsG-36-005-001.

Shuttle-box avoidance conditioning with aversive midbrain stimulation, in the rat, was considerably inferior to that observed with aversive foot shock. However, rats were capable of efficient passive avoidance when exposed to aversive midbrain stimulation. Extensive training, amphetamine, and pretraining with aversive foot shock failed to facilitate shuttle-box avoidance learning with midbrain stimulation. (Author)

**A68-22466 ***
CONCEPTS OF PERCEIVED NOISINESS - THEIR IMPLEMENTATION AND APPLICATION.
K. D. Kryter (Stanford Research Institute, Menlo Park, Calif.).
Acoustical Society of America, Journal, vol. 43, Feb. 1968, p. 344-361. 58 refs.
NASA-supported research.

Proposal of a general method, called Effective Perceived Noise Level (EPNL), for estimating the perceived noisiness of a single sound or a total sound environment taken over a 24-hr period. The relation of the EPNL to the Effective Composite Noise Rating (ECNR) scheme is discussed. The virtue of using EPNL and ECNR, which in essence are the same in certain applications as CNR, $\overline{\text{NNI}}$, and $\overline{Q}$ quantities developed in the U.S., Great Britain, and Germany respectively, is that they can combine the variable factors of duration, number of occurrences, spectrum, and intensity of sounds into a single unit that allows meaningful intercomparisons of the overall effect upon human behavior of noises and noise environments that may differ markedly from each other in these dimensions. Tolerable limits are proposed in terms of EPNL, ECNR, CNR, NNI, and $\overline{Q}$ for: (1) annoyance due to noise generated and measured outdoors but heard outdoors and/or indoors, (2) annoyance due to noise present indoors, and (3) damage risk to the ear for noise present at the listener's ear. M.G.

**A68-22475**
THE PYROLYSIS PRODUCTS OF PLASTICS - PROBLEMS IN DEFINING THEIR TOXICITY.
H. N. MacFarland (Hazelton Laboratories, Inc., Falls Church, Va.).
American Industrial Hygiene Association Journal, vol. 29, Jan.-Feb. 1968, p. 7-9. 5 refs.

Discussion of the toxic effects and hazards of inhalation exposures to thermal decomposition products of plastics. Reliable studies must provide good qualitative and quantitative descriptions of the exposure system, if valid data on dose response are to be obtained. The dynamic nature of thermal-decomposition processes makes such a description very difficult. The conditions of decomposition will affect both the reaction rates and the identity of the products present in the system at a given time. F.R.L.

**A68-22476 ***
TOXICITY OF FLUORINE SHORT-TERM INHALATION.
M. L. Keplinger and L. W. Suissa (Miami, University, School of Medicine, Research and Teaching Center of Toxicology, Coral Gables, Fla.).
American Industrial Hygiene Association Journal, vol. 29, Jan.-Feb. 1968, p. 10-18. 10 refs.
Grant No. NGR-10-007-012.

Rats, mice, guinea pigs, rabbits and dogs are exposed to fluorine for 5, 15, 30 or 60 min. The $LC_{50}$s and effects at lower concentrations were determined. High concentrations of fluorine caused marked irritation of the eyes and respiratory tract and damage to the lungs, liver, and kidneys. Exposure at or below 100 ppm for 5 min, 70 ppm for 15 min, 55 ppm for 30 min, or 45 ppm for 60 min caused no apparent effects in the animals. Exposure of volunteer human subjects revealed very little irritation at concentrations up to 25 ppm. There was marked irritation of the eyes and nose at 100 ppm. (Author)

**A68-22477**
THE INHALATION TOXICITY OF PYROLYSIS PRODUCTS OF POLYTETRAFLUOROETHYLENE HEATED BELOW 500 DEGREES CENTIGRADE.
R. S. Waritz and B. K. Kwon (Du Pont de Nemours and Co., Inc., Haskell Laboratory for Toxicology and Industrial Medicine, Wilmington, Del.).
American Industrial Hygiene Association Journal, vol. 29, Jan.-Feb. 1968, p. 19-26. 16 refs.

Quantitative evidence has been obtained which indicates that the principal toxic component in the pyrolysate from polytetrafluoroethylene (Teflon 5) at the first temperature at which rat mortality is observed (Approximate Lethal Temperature, ALT) is a particulate material which may have other toxicants adsorbed on it. The toxicity of this particulate varies, depending upon the conditions under which it is generated. At 30°C above the ALT, perfluoroisobutylene could be the principal toxic agent. The data correlate well with known chemical reactions as well as observations and hypotheses of other investigators. (Author)

**A68-22480**
THE TOXICITY OF POLYTETRAFLUOROETHYLENE PYROLYSIS PRODUCTS - INCLUDING CARBONYL FLUORIDE AND A REACTION PRODUCT, SILICON TETRAFLUORIDE.
Lester D. Scheel, William C. Lane, and W. Emile Coleman (U.S. Public Health Service, National Center for Urban and Industrial Health, Cincinnati, Ohio).
American Industrial Hygiene Association Journal, vol. 29, Jan.-Feb. 1968, p. 41-48. 11 refs.

The toxicity of pyrolysis products (550°C) of polytetrafluoroethylene (PTFE) was evaluated by exposure of dogs, rabbits, guinea pigs, rats, and mice. Carbonyl fluoride ($COF_2$) was identified as the principal toxic component. One-hour exposures of rats showed a 24-hr $LC_{50}$ of 370 ppm for the pyrolysis products and an $LC_{50}$ of 360 ppm for $COF_2$. When PTFE is pyrolyzed in the absence of silica, the products are less toxic to a slight degree. Pathology revealed changes in the lungs and livers of exposed animals. Irritation of the lungs may persist for some days. (Author)

**A68-22481**
BIOCHEMICAL CHANGES ASSOCIATED WITH TOXIC EXPOSURES TO POLYTETRAFLUOROETHYLENE PYROLYSIS PRODUCTS.
Lester D. Scheel, Lofton McMillan, and Frederick C. Phipps (U.S. Public Health Service, National Center for Urban and Industrial Health, Cincinnati, Ohio).
American Industrial Hygiene Association Journal, vol. 29, Jan.-Feb. 1968, p. 49-53. 9 refs.

Rats were exposed to the products of pyrolysis of polytetrafluoroethylene (PTFE) containing hydrolyzable fluoride equivalent to 50 ppm $COF_2$ for one hour daily. After one exposure, urinary excretion of fluoride was four times normal. Weight loss of exposed animals indicated inhibition of metabolism. Changes in succinic dehydrogenase activity in vivo correlated with exposure to pyrolysis products of PTFE and with urinary fluoride concentrations. Toxic effects of daily sublethal exposures were found to be cumulative. The metabolic inhibition observed was reversible. The toxic syndrome of daily inhalation of pyrolysis products of PTFE is compatible with descriptions of fluoride poisoning. (Author)

**A68-22483**
THE TOXICOLOGY OF THE PYROLYSIS PRODUCTS OF POLYCHLOROTRIFLUOROETHYLENE.
H. A. Birnbaum (Minnesota Mining and Manufacturing Co., St. Paul, Minn.), L. D. Scheel, and W. E. Coleman (Minnesota Mining and Manufacturing Co., St. Paul, Minn.; U.S. Public Health Service, National Center for Urban and Industrial Health, Cincinnati, Ohio).
American Industrial Hygiene Association Journal, vol. 29, Jan.-Feb. 1968, p. 61-65. 5 refs.

The toxicity of the products of pyrolysis of polychlorotrifluoroethylene (CTFE) was studied by exposure of rats for one hour and three hours. The concentration of the exposure was controlled by the rate of pyrolysis. The three-hour $LC_{50}$ was 31.5 g/hr for pyrolysis at 375°C whereas it was 23.5 g/hr at 400°C. The greater toxicity of the products of pyrolysis at higher temperature was not accompanied by an increase in hydrolyzable fluoride (associated with $COF_2$). It appears that the toxicity may be associated with the particulate products of pyrolysis. (Author)

**A68-22509 ***
CORRELATION OF γ-RAY INACTIVATION AND STRAND SCISSION IN THE REPLICATIVE FORM OF ϕX174 BACTERIOPHAGE DNA.
William D. Taylor and William Ginoza (Pennsylvania State University, Dept. of Biophysics, University Park, Pa.).
National Academy of Sciences, Proceedings, vol. 58, Oct. 1967, p. 1753-1757. 22 refs.
AEC Contract No. AT (30-1)-3116; Grants No. NsG-324; No. NsG-39-009-008.

Test of two hypotheses which attempt to account for the inactivation of double-stranded RF-DNA of ϕX174 by γ radiation. It was found that the γ-ray inactivation of the bacteriophage is caused mainly by single-strand scissions, base or other damage, and to a very small extent by double-strand scissions. The efficiency of inactivation by single-strand breaks and base or other damage is 0.25. F.R.L.

**A68-22624 ***
METABOLIC AND THERMAL RESPONSES OF THE RAT TO A HELIUM-OXYGEN ENVIRONMENT.
R. A. Rhoades, R. A. Wright, E. P. Hiatt, and H. S. Weiss (Ohio State University, College of Medicine, Dept. of Physics, Environmental Physiology Laboratory, Columbus, Ohio).
American Journal of Physiology, vol. 213, Oct. 1967, p. 1009-1014. 20 refs.
Grants No. NsG-295; No. NsG-36-008-004.

Discussion of the results of exposing rats to a 79% He and 21% $O_2$ mixture at ambient temperatures between 23 and 33°C, either acutely (3 hr) or chronically (10 days). At the lower ambient temperatures, the major effects of He were increases in food intake (avg 18%), urine osmolarity (avg 10%), oxygen uptake (avg 6 ml/kg per min, STPD), heart rate (avg 35 beats/min), respiratory rate (avg 14 breaths/min), and a decrease in subcutaneous temperature (avg -1°C). Results were similar in acute and chronic rats, indicating little adaptive response to $He-O_2$. M.G.

**A68-22637** *

DNA DEGRADATION BY IONIZING RADIATION IN BACILLUS SUBTILIS - SYNERGISTIC EFFECT OF ACTINOMYCIN D.

Leo J. Grady and Ernest C. Pollard (Pennsylvania State University, Biophysics Dept., University Park, Pa.).

Biochimica et Biophysica Acta, vol. 145, 1967, p. 837-839. 13 refs.
Grants No. NsG-324; No. NsG-39-009-008.

Investigation of the relation between the effect of actinomycin D and ionizing radiation in Bacillus subtilis. DNA degradation is shown to occur in a manner similar to that in Escherichia coli although at doses higher than the 10% survival dose of 7000 R reported by Kaplan and Zavarine (1962). Experimental results indicate that the two-component feature of DNA degradation found by Huston and Pollard (1967) is also seen in B. subtilis, because the fraction of DNA degradation which is influenced by actinomycin D is only a part of the whole amount of degradation. Results suggest that the action of actinomycin D in potentiating radiation effects in mammalian cells may well be concerned with the potentiation of radiation-induced DNA degradation. M.G.

**A68-22652** *

PATTERNS OF CIRCADIAN ACTIVITY RHYTHMS IN ANIMALS AND MAN [GESETZMAESSIGKEITEN CIRCADIANER AKTIVITAETS-RHYTHMEN BEI TIER UND MENSCH].

R. Wever (Max-Planck-Institut für Verhaltensphysiologie, Seewiesen über Starnberg and Erling Andechs, West Germany).

IN: TIME DISTRIBUTION OF HUMAN AND ANIMAL ACTIVITIES; UNION INTERNATIONALE DES SCIENCES BIOLOGIQUES, SECTION DE PSYCHOLOGIE EXPERIMENTALE ET COMPORTEMENT ANIMAL, STUDY SESSION, 4TH, MARSEILLE, FRANCE, OCTOBER 4, 5, 1965, PAPERS [LA DISTRIBUTION TEMPORELLES DES ACTIVITES ANIMALES ET HUMAINES; UNION INTERNATIONALE DES SCIENCES BIOLOGIQUES, SECTION DE PSYCHOLOGIE EXPERIMENTALE ET COMPORTEMENT ANIMAL, SESSION D'ETUDES, 4TH, MARSEILLE, FRANCE, OCTOBER 4, 5, 1965, EXPOSES].
Edited by Rémy Chauvin.
Paris, Masson et Cie., 1966, p. 3-17. 20 refs. In German.
Grants No. NsG-259-62; No. NsG-52-015-001.

Results of biological experiments in circadian activity rhythms. In some of the experiments reported, it was found that the period of an activity rhythm deviates from the period of vegetative functions; in these cases the persisting vegetative rhythm demonstrates the **endogenous origin of circadian rhythms. From a study of the circadian rule a general theory of circadian rhythms is postulated. This theory states a correlation between the natural frequency (as measured under constant conditions) and the phase-angle difference between activity rhythm and time-signal rhythm. It is pointed out that this theory alloys the prediction of the general behavior of circadian activity rhythms under any conditions.** Several examples are given which indicate agreement between biological and theoretical results. R.B.S.

**A68-22658** #

INDICATIONS OF A RELATION BETWEEN THE MAGNITUDE OF THE PHYSIOLOGICAL INDICES OF THE HUMAN AND ANIMAL STATES AND THE DEGREE OF DISTURBANCE OF THE GEOMAGNETIC FIELD [PRIZNAKI SVIAZI MEZHDU VELICHINOI FIZIOLOGICHESKIKH POKAZATELEI SOSTOIANIIA CHELOVEKA I ZHIVOTNYKH I STEPEN'IU VOZMUSHCHENNOSTI MAGNITNOGO POLIA ZEMLI].

A. K. Podshibiakin, R. V. Smirnov, T. G. Uzhva, and V. I. Shakhova (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii and Morskoi Gidrofizicheskii Institut and Institut Geofiziki, Kiev, Ukrainian SSR).

IN: GEOPHYSICS AND ASTRONOMY [GEOFIZIKA I ASTRONOMIIA].
Edited by S. I. Subbotin.
**Kiev, Izdatel' stvo Naukova Dumka (Akademiia Nauk Ukrainskoi SSR, Mezhvedomstvennyi Geofizicheskii Komitet, Informatsionnyi Biulleten', No. 11), 1967, p. 209-213. 10 refs. In Russian.**

Investigation showing that (according to preliminary data) during magnetic storms and sudden-commencement geomagnetic disturbances, the conditioned nutritional reflex of dogs diminishes, and the survival rate of dogs reanimated after an electric shock decreases. It is also noted that fewer human subjects volunteer for tests during these periods. Most people exhibit certain effects as a prelude to the occurrence of magnetic storms. A typical effect of this type is a pronounced increase in the (static electricity) potentials of the skin and in the asymmetry of their distribution. V.P.

**A68-22719** #

PARTICIPATION OF ARTERIAL, VENOUS AND TISSUE RECEPTORS IN REGULATING EXTERNAL RESPIRATION DURING HYPOXIA [OB UCHASTII ARTERIAL'NYKH, VENOZNYKH I TKANEVYKH RETSEPTOROV V REGULIATSII VNESHNEGO DYKHANIIA PRI GIPOKSII].

L. I. Ardashnikova.

(Simpozium Posviashchennyi Izucheniiu Kislorodnogo Rezhima Organizma i Ego Regulirovaniia, Kanev, Ukrainian SSR, 1965.)
IN: OXYGEN REGIME OF AN ORGANISM AND ITS CONTROL [KISLORODNYI REZHIM ORGANIZMA I EGO REGULIROVANIE].
Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 87-92. In Russian.

Regulation of external respiration in an organism is primarily concerned with maintaining a normal oxygen partial pressure ($p_{O_2}$) in arterial blood. An increased respiratory minute volume (RMV) increases the $p_{O_2}$ of alveolar air and arterial blood higher than the norm, but cannot increase the $p_{O_2}$ of the tissues and venous blood. However, ventilation of the lungs with a lowered $p_{O_2}$ of inspired air and alveolar air is an important adaptive response; under these conditions the $p_{O_2}$ of the arterial blood and tissues is increased (approximating the norm). Theoretically, it appears that the signalization source of the respiratory center on oxygen conditions in the organism should be the $p_{O_2}$ level of the arterial blood. Study and literature data show that the chemoreceptor zones of the cardioaortal and sinocarotid areas serve as a signalization source. The $p_{O_2}$ of the arterial blood proved to be an adequate stimulus for these zones, and respiration changes take place only with $p_{O_2}$ in a below normal range. It was also established that these chemoreceptors are the only ones to induce more intense respiration in acute hypoxemia, and that other receptors cannot compensate for the loss. Also, it was shown that a lowered oxygen level in the arterial blood with a normal $p_{O_2}$ (with hemal forms of hypoxia) does not act as a stimulus on the chemoreceptors of the sinocarotid region. Under hypoxic conditions, tissue receptors do not participate in the regulation of external respiration. **Possibly, venous receptors participate in external respiration under certain conditions, but not with lowering of the $p_{O_2}$ in the arterial blood.** (ATD/LC)

**A68-22720** #

INTERRELATIONSHIP OF CERTAIN INDICES OF THE ORGANISM'S OXYGEN REGIME DURING DECREASED BAROMETRIC PRESSURE AND ACCELERATIONS [VZAIMOOTNOSHENIE NEKOTORYKH POKAZATELEI KISLORODNOGO REZHIMA ORGANIZMA PRI PONIZHENNOM BAROMETRICHESKOM DAVLENII I USKORENIIAKH].

E. I. Sorokina and A. S. Barer.

(Simpozium Posviashchennyi Izucheniiu Kislorodnogo Rezhima Organizma i Ego Regulirovaniia, Kanev, Ukrainian SSR, 1965.)
IN: THE OXYGEN REGIME OF THE ORGANISM AND ITS CONTROL [KISLORODNYI REZHIM ORGANIZMA I EGO REGULIROVANIE].
Kiev, Izdatel'stvo Naukova Dumka, 1966, p. 291-294. In Russian.

Experimental study of the effects of hypoxic hypoxia during reduced barometric pressure and hemodynamic hypoxia during long-term transverse accelerations on three interdependent indices of the oxygen metabolism in rats. The indices considered consisted of the redox potential in muscle tissue, the tissue oxygen tension, and oxygen consumption. It is shown that both oxygen tension and the **redox potential drop sharply at the initial stage of both tests. Lower barometric pressures inhibit metabolic processes involving oxygen and intensify anaerobic oxidative processes. Aftereffects consist of** a gradual restoration of the initial baseline conditions. The oxygen tension is the first index to return to normal from a pressure of 199 mm Hg, while the redox potential recovers more slowly. Graphs are given demonstrating the changes in all three indices during the course of both tests. T.M.

**A68-22726 *#**
QUANTITATIVE ANALYSIS OF THE SPONTANEOUS AND STIMULATED ACTIVITY OF PURKINJE CELLS [ANALYSE QUANTITATIVE DE L'ACTIVITE SPONTANEE ET EVOQUEE DES CELLULES DE PURKINJE].
C. Batini and R. T. Kado (California, University, Center for Health Sciences, Brain Research Institute, Los Angeles, Calif.).
Association des Physiologistes, Réunion Complémentaire, Bordeaux, France, Feb. 9-11, 1967, Paper. 2 p. In French.
Contract No. AF 49(638)-1387; Grants No. NsG-237-62; No. NsG-05-007-003.

Analysis of 54 discharge sequences of Purkinje cells, 18 of which were in anesthetized animals and 36 in nonanesthetized subjects. Twenty discharges occurred spontaneously and 34 with stimulation of structures projecting on the cortex of the cerebellum. Intervals between the discharges are extremely variable. F. R. L.

**A68-22914**
CHANGES IN BLOOD LIPID CONCENTRATION AND CELL COUNTS FOLLOWING DECOMPRESSION SICKNESS IN RATS AND THE INFLUENCE OF DIETARY LIPID.
R. B. Philp, C. W. Gowdey, and M. Prasad (Western Ontario, University, Dept. of Pharmacology, London, Ontario, Canada).
Canadian Journal of Physiology and Pharmacology, vol. 45, 1967, p. 1047-1059. 24 refs.
Research supported by the Defence Research Board of Canada and the Medical Research Council of Canada.

The effects were studied of dietary fat, alimentary lipemia, and a lipemia-clearing agent (partially depolymerized hyaluronic acid) on decompression sickness by means of a standardized technique which produces a high incidence of "bends" in rats of suitable weight. Hematological changes were studied in rats fed meals of different fat contents and in rats with bends of different severities. The results indicated that alimentary lipemia increased susceptibility to bends, that this trend could be reversed partially with a lipemia-clearing agent, and that platelet counts decreased (1) after a fatty meal, (2) after decompression, and (3) after an attack of bends. In rats severely affected with aeroembolism both platelet counts and plasma lipids (as indicated by the plasma optical density) were greatly reduced, and marked hemoconcentration was observed. It is postulated that intravascular bubbles triggered the aggregation of platelets and that lipemia, which increases platelet adhesiveness, exaggerated this effect. The obstruction of small vessels by thrombi composed of bubbles, platelets, and lipids could cause a loss of fluid from the vascular bed with subsequent hemoconcentration. (Author)

**A68-22916 ***
ACCEPTABILITY OF FOOD ITEMS DEVELOPED FOR SPACE FLIGHT FEEDING.
Robert A. Nanz (NASA, Manned Spacecraft Center, Biomedical Research Office, Houston, Tex.) and Paul A. Lachance (Rutgers University, Dept. of Food Science, New Brunswick, N. J.).
Food Technology, vol. 21, no. 10, 1967, p. 71-77. 23 refs.

Assessment of the space-flight value of a cross-sectional group of rehydratable foods, with a review of their organoleptic ratings made under laboratory and simulator conditions. The food items include cereal, fruit, vegetable and meat products, and soups. A tabulated summary of the food preference ratings is given. It is indicated that the ratings obtained in the tests may serve as a qualitative index of ultimate shelf life, which exceeds one year when these foods are packaged adequately and are stored at low temperatures. V. Z.

**A68-22917 ***
EVOLUTION OF SPACE FEEDING CONCEPTS DURING THE MERCURY AND GEMINI SPACE PROGRAMS.
Robert A. Nanz, Edward L. Michel (NASA, Manned Spacecraft Center, Biomedical Research Office, Houston, Tex.), and Paul A. Lachance (Rutgers University, Dept. of Food Science, New Brunswick, N. J.).
Food Technology, vol. 21, no. 12, 1967, p. 52-58. 12 refs.

Discussion of the evolution of the concepts of feeding used in the Mercury project and Gemini program missions and envisioned for the Apollo Spacecraft Program. The latest developments in packaging techniques and in container and dispenser designs are outlined. A greater variety of food items is envisioned as spacecraft durations are extended beyond 14 days. Sterile natural foods in foil laminate pouches could be provided if the engineering constraints now applicable could be eased. A continuous screening program for innovations and improvements applicable to space feeding, now underway, is mentioned. V. Z.

**A68-23028**
HUMAN FACTORS IN DETECTION SYSTEMS [LES FACTEURS HUMAINS DANS LES SYSTEMES DE DETECTION].
P. Abraham (Société Industrielle des Nouvelles Techniques Radioélectriques et de l'Electronique Française, Asnières, Seine, France).
(Société Française des Electroniciens et Radioèlectriciens, Réunion, France, Mar. 15, 1967.)
L'Onde Electrique, vol. 48, Feb. 1968, p. 113-117. In French.

Study of the problems of human factors arising from a study of detection systems both from the technical point of view and the point of view of operational management. Examples are given, ranging from the simple, conventional panoramic radar to modern electronic-scanning radar, which show, in particular, the types of images most appropriate, in various cases, for various operating positions. M. F.

**A68-23151**
THE ACTION OF MICROWAVE RADIATION ON THE EYE.
Russell L. Carpenter and Clair A. Van Ummersen (Tufts University, Dept. of Biology, Medford, Mass.).
(International Microwave Power Institute, Symposium on Microwave Power, Stanford University, Stanford, Calif., Mar. 30, 1967.)
Journal of Microwave Power, vol. 3, Mar. 1968, p. 3-19. 29 refs.
Public Health Service Grant No. GM 09495; Contract No. AF 41(657)-86.

Microwave power can cause formation of opacities in the lens of the rabbit eye exposed to continuous wave or pulsed wave radiation at frequencies from 2.45 to 10 GHz. When the eye is irradiated in a free field, the opacity (cataract) develops in the posterior part of the lens; in location, form, and growth, it resembles cataracts caused by ionizing radiation. When the eye is irradiated at the same frequencies as part of a "closed" waveguide system, the cataract develops in the anterior part of the lens, like those caused by IR radiation. Although for every power level there is a minimal exposure period which will cause an opacity, repeated shorter exposures can have a cumulative effect, the main determining factor being the time interval between successive exposures. Experimental evidence suggests that microwave cataracts are not simply a result of microwave heating but are caused by some other property of the radiation. (Author)

**A68-23157**
TRAUMATIC PATHOLOGY OF THE SPINES OF FLIGHT PERSONNEL - SYNTHETIC STUDY [LA PATHOLOGIE TRAUMATIQUE DU RACHIS DU PERSONNEL NAVIGANT - ETUDE SYNTHETIQUE].
Roland-Paul Delahaye, Roger Pannier (Service de Santé des Armées, France), and Henri Seris.
Revue de Médecine Aéronautique et Spatiale, vol. 6, Oct.-Dec. 1967, p. 33-35. 7 refs. In French.

Study of the clinical and radiological aspects of traumatic injury caused in flight. A review is given of the flight aggression factors causing trauma. The use of radiographs makes possible easy isolation and effective therapy of posttraumatic arthroses and residual back pains. M. G.

**A68-23196 ***
NOREPINEPHRINE - TURNOVER IN RAT BRAINS AFTER GONADECTOMY.
Fernando Anton-Tay and Richard J. Wurtman (Massachusetts Institute of Technology, Dept. of Nutrition and Food Science, Cambridge, Mass.).

Science, vol. 159, Mar. 15, 1968, p. 1245. 10 refs.
PHS Grants No. AM-11709; No. AM-11237; Grant No. NGR-22-009-272.

Observation of the rate at which $^{3}H$-norepinephrine disappears from rat brains after gonadectomy. The rate is shown to increase and this effect is observed 6 days after the operation and 24 hr after introduction of the labeled material. The effect is not reproduced by hypophysectomy. The content of endogenous brain norepinephrine does not decline after removal of the ovaries or testes; thus synthesis of the catecholamine is probably increased by these procedures. These observations demonstrate that the pituitary-gonadal axis regulates the rates at which brain norepinephrine is synthesized and turns over in the rat. M.G.

**A68-23282** #

GENETIC EXPERIMENTAL STUDIES OF LYSOGENIC BACTERIA DURING THE COSMOS 110 FLIGHT [EKSPERIMENTAL'NO-GENETICHESKIE ISSLEDOVANIIA NA LIZOGENNYKH BAKTERIIAKH PRI POLETE ISZ "KOSMOS-110"].

N. N. Zhukov-Verezhnikov, M. N. Volkov, I. N. Maiskii, M. A. Guberniev, N. I. Rybakov, V. V. Antipov, V. A. Kozlov, P. P. Saksonov, G. P. Parfenov, A. V. Kolobov, K. D. Rybakova, and E. D. Aniskin.

Kosmicheskie Issledovaniia, vol. 6, Jan.-Feb. 1968, p. 144-149. 6 refs. In Russian.

Discussion of the effects of a space environment on the genetic behavior of E. coli K-12 bacteria carried by Cosmos 110. Statistical evidence is obtained for the induction during the flight of moderately active bacteriophage strains in a process which gradually faded as the flight progressed. No positive difference could be established, however, between the duration of the latent period and the patterns of the formation of bacteriophage components. In experimental and control bacteria specimens. The high antimutogenic effect of aminothiol compounds is noted. V. Z.

**A68-23395** #

AERONAUTICAL BIOTELEMETRY [LETECKÁ BIOTELEMETRIE].

Jan Hanousek and Stanislav Blažka.

Zpravodaj VZLÚ, no. 3, 1967, p. 28-34. 27 refs. In Czech.

Description of a five-channel biotelemetry system for recording physiological data during flight with an accuracy comparable to laboratory conditions. **At present, only three of the channels are utilized and are assigned to ECG, respiration-rate, and transverse aircraft-acceleration measurements. Solutions to problems involving proper positioning of the leads, electrode attachment, and minimum contact resistance are outlined, and a new type of electrode is described. The respiration rate is measured by external variations of the chest in the course of breathing and is detected with the aid of a resistance-rubber sensor. The respiration data** are converted into rectangular pulses corresponding to the exhalation and inhalation periods. This manner of signal processing minimizes distortion due to random motion and shock effects. Schematic diagrams are given for the transistorized amplifier circuits used with the sensing elements. T.M.

**A68-23527** *

EFFECT OF ERYTHROPOIETIN IN VITRO WHICH SIMULATES THAT OF A MASSIVE DOSE IN VIVO.

Henry Borsook, Karen Ratner, Brenda Tattrie, Dian Teigler (California, University, Space Sciences Laboratory, Berkeley, Calif.), and L. G. Lajtha (Holt Radium Institute, Paterson Laboratories, Christie Hospital, Manchester, England).

Nature, vol. 217, Mar. 16, 1968, p. 1024-1026. 9 refs.
PHS-AEC-NASA-supported research.

Discussion of certain cells which develop during the differentiation of erythrocytes and contain a high concentration of hemoglobin and no cytoplasmic basophilia. Erythropoietin has the effect of increasing the proportion of these cells in preparations of marrow. A representative effect of erythropoietin (EP) and a calf-serum erythropoietin enhancing factor (EH) on an erythroblast fraction from a normal rabbit is described. Some exploratory experiments were carried out on the effect of EP + EH on the ability to synthesize heme and protein. Cells exposed to EP + EH incorporated from 20 to 25% more $^{14}C$-2-glycine into the heme and total protein. Observations on the effects of actinomycin D on the accelerated loss of cytoplasmic basophilia are summarized. M.G.

**A68-23530** *

NUTRITIONAL EVALUATION OF BACTERIAL DIETS IN GROWING RATS.

Jacob Shapira and Adrian D. Mandel (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.).

Nature, vol. 217, Mar. 16, 1968, p. 1061, 1062. 12 refs.

Discussion of results obtained when weanling rats were fed on diets containing acetone-killed Escherichia coli B or Hydrogenomonas eutropha as a minimal nitrogen source, and of feeding diets which utilize these bacteria as the chief source of calories. When 17% H. eutropha was compared with 12% casein in the diet, growth, food and water consumption, and urine excretion were the same, but excretion of feces increased. These data agree with the findings with E. coli that whole bacterial cells are digested and provide protein with approximately the same biological value as casein. When H. eutropha was fed at a much higher level (72%), there was a highly significant decrease in growth rate and food consumption when compared with the casein control. In addition, the excretion of urine and feces was significantly increased with the diet containing H. eutropha. M.G.

**A68-23536**

HEAT TRANSFER IN BIOTECHNOLOGY.

Alice M. Stoll (U.S. Naval Material Command, Naval Air Development Center, Aerospace Medical Research Dept., Johnsville, Pa.).

IN: ADVANCES IN HEAT TRANSFER. VOLUME 4.
Edited by J. P. Hartnett and T. F. Irvine, Jr.
New York, Academic Press, Inc., 1967, p. 65-141. 120 refs.

General survey of the field of heat transfer between the human organism and its various environments, providing particular information concerning the medium supporting the thermal interface between the organism and its envelope - the skin. Natural environments (terrestrial, terraqueous, and extraterrestrial) are discussed. Artificial environments considered are (1) normal indoors, (2) underwater vessels, and (3) space vehicles. In examining the role of the skin in heat transfer, its functions and characteristics, its thermal sensation, the results of injury to the skin, and its capacity to protect against thermal injury are outlined. F.R.L.

**A68-23596** *

**FOOD FOR SPACEFLIGHT.**

**John R. Bannister (NASA, Goddard Space Flight Center, Greenbelt, Md.).**

Spaceflight, vol. 10, Apr. 1968, p. 118-121.

Review of the progress achieved since John Glenn's flight, and summary of current trends in space-food preparation techniques, noting weight requirement and weightlessness as the basic problems to be overcome. The freeze-drying process used is assessed positively. Menu cycles, human waste removal, and emergency rations are discussed. V.Z.

**A68-23641** #

LIFE AND INTELLIGENCE IN THE UNIVERSE - BOTTOMLESS SPECULATIONS.

E. J. Öpik.

(Irish Astronomical Society, Armagh, Northern Ireland, Nov. 14, 1967, Lecture.)
Irish Astronomical Journal, vol. 8, Dec. 1967, p. 128-139.

Discussion of the possibility of life elsewhere in the universe. The temperature limits and climatic extremes which can be withstood by various types of living organisms are investigated, and the chronology of life on earth is outlined. B.B.

**A68-23676** *#

APOLLO FLIGHTCREW TRAINING IN LUNAR LANDING SIMULATORS.

Samuel H. Nassiff (NASA, Manned Spacecraft Center, Flight Crew Support Div., Project Support Office, Houston, Tex.) and Neil A. Armstrong (NASA, Manned Spacecraft Center, Astronaut Office, Houston, Tex.).
American Institute of Aeronautics and Astronautics, Flight Test, Simulation and Support Conference, 2nd, Los Angeles, Calif., Mar. 25-27, 1968, Paper 68-254. 9 p.
Members, $1.00; nonmembers, $1.50.

Fixed-base and free-flight simulators are used for training the Apollo flight crews in a simulated "real-lunar" environment. This paper discusses the flight crew training and simulators involved for a portion of the total Apollo mission, that is, the lunar landing phase. Functional simulation requirements are discussed which include mathematical model, spacecraft systems, computers, visual displays, and pilot controls and displays. A brief description of each simulator, its capabilities, and the technique of realistically simulating lunar conditions is presented. Flights of typical terminal-phase lunar landing trajectories are presented to illustrate vehicle-maneuver capability and man-machine relationship required for executing an automatic or manually controlled descent and landing. The lunar module navigation and guidance system along with the various control modes available to the pilot are also discussed. (Author)

**A68-23693** #
A SYSTEMS ANALYSIS APPROACH TO THE DESIGN OF AIR CREW TRAINING EQUIPMENT.
Dominick J. Gibino (USAF, Wright-Patterson AFB, Ohio).
American Institute of Aeronautics and Astronautics, Flight Test, Simulation and Support Conference, 2nd, Los Angeles, Calif., Mar. 25-27, 1968, Paper 68-274. 8 p.
Members, $1.00; nonmembers, $1.50.

The paper describes the concept of the development of an integrated training system for aircrew members. The impetus for taking a systems analysis approach to training is based upon an examination of the mission flight simulator. It is shown that the use of increasingly complex simulators is directly related to decreasing system effectiveness, and that functional separation of training equipments can be more cost-effective than large multipurpose devices. The important system variables are: (1) training requirements, (2) student population group, (3) student training rate, (4) facility operating rate, (5) component utilization factor, and (6) procurement and operating costs. The overall systems analysis problem is postulated in terms of operations research. The benefits of implementing the systems concept are: (1) more effective usage of equipment at relatively lower cost, and (2) a high degree of training program flexibility. (Author)

**A68-23701** #
REAPPRAISAL OF BIODYNAMIC IMPLICATIONS OF HUMAN EJECTIONS.
John H. Henzel, G. C. Mohr, and H. E. von Gierke (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 39, Mar. 1968, p. 231-240. 20 refs.

Vertebral compression represents a significant percentage of the morbidity associated with upward ejection. Vertebral and intervertebral structure reacts to and is sometimes irreversibly altered by ejection acceleration. Design and material properties of the normal vertebral column are sufficiently constant that when structural characteristics are defined and acceleration profiles known, prediction of failure may be made. Compressive load analyses of vertebra-disk complexes have demonstrated that the vertebral endplates are the initially failing structures of the spinal column. From experimental data on vertebral breaking-loads, acceptably accurate probability-of-injury curves for static loading have been generated. These data together with data describing the dynamic response characteristics of the human body permit calculation of the probability-of-injury for dynamic loading produced by exposure to impact accelerations. As an aid to the designer of ejection systems, application of these concepts should refine the estimate of "safe" acceleration profiles and minimize the risk of irreversible vertebral deformation. (Author)

**A68-23702**
VENTILATION, GAS EXCHANGE AND BLOOD ACID-BASE BALANCE DURING PROLONGED REBREATHING.
Earl T. Carter (Mayo Clinic and Mayo Foundation, Section of Medicine, Rochester, Minn.) and H. Frederic Helmholz, Jr. (Mayo Clinic and Mayo Foundation, Section of Physiology, Rochester, Minn.).
Aerospace Medicine, vol. 39, Mar. 1968, p. 241-248. 21 refs.
NIH Grant No. HE-7814.

Each of 10 dogs rebreathed approximately 40 liters of atmospheric air without benefit of gas regeneration. Each of another series of six dogs rebreathed the same volume of pure oxygen without gas regeneration. The dogs rebreathing atmospheric air survived from 85 to 154 min. The dogs rebreathing oxygen manifested no evidence of impending collapse during the experimental period (arbitrary termination after 170 to 217 min). The dogs breathing oxygen manifested a more severe respiratory acidosis than did the dogs breathing air. However, air-breathing dogs developed a greater bicarbonate deficit. Carbon dioxide accumulated in the rebreathing system in an essentially linear fashion in both experimental series. Oxygen disappearance from the system was also essentially linear. Carbon dioxide was stored in the blood and tissues of the dogs but an even greater amount was stored in the closed-circuit rebreathing system. The deleterious effects of associated hypoxia during progressive hypercapnia were demonstrated. (Author)

**A68-23703**
DETERMINATION OF CARDIAC OUTPUT IN MAN BY MEANS OF IMPEDANCE PLETHYSMOGRAPHY.
A. Harley and Joseph C. Greenfield, Jr. (Durham Veterans Administration Hospital, Dept. of Medicine, Div. of Cardiology; Duke University, Medical Center, Durham, N.C.).
(AEROSPACE MEDICAL ASSOCIATION, 1967 ANNUAL SCIENTIFIC MEETING, WASHINGTON, D.C., APRIL 10-13, 1967, PREPRINTS OF SCIENTIFIC PROGRAM, p. 70.)
Aerospace Medicine, vol. 39, Mar. 1968, p. 248-252. 5 refs.

**A68-23704**
OXYGEN BALANCE IN THE ORGANISM UNDER PROLONGED ACCELERATION.
A. S. Barer, G. A. Golov, V. B. Subavin, E. I. Sorokina, and E. P. Tikhomirov (Akademiia Nauk SSSR, Moscow, USSR).
Aerospace Medicine, vol. 39, Mar. 1968, p. 253-256. 8 refs.

Analysis of experimental results concerning the effects of prolonged acceleration on both human beings and animals. Alterations in oxygen consumption were observed and studies were made of cranial and peripheral circulation and of certain metabolic functions. The intimate relationship between functional changes and acceleration stress is discussed. The observed parameters are further elucidated. P. v. T.

**A68-23705**
SPECIAL EFFECTS OF BRIEF PERIODS OF VISUAL FIXATION ON NYSTAGMUS AND SENSATIONS OF TURNING.
William E. Collins (Federal Aviation Administration, Aeromedical Service, Civil Aeromedical Research Institute, Psychology Laboratory, Oklahoma City, Okla.).
Aerospace Medicine, vol. 39, Mar. 1968, p. 257-266. 14 refs.

The influence of (1) rotational experience and (2) brief periods of visual still-fixation were examined in exposing figure skaters and ordinary subjects to various rates of angular acceleration. Both nystagmic eye movements and sensations of turning were recorded. Skaters produced significantly less primary slow-phase eye displacement than did nonskaters, but the groups did not differ in number of eye movements nor in duration of nystagmus. Introduction of the visual still-fixation period significantly shortened primary nystagmus and produced an accentuated secondary nystagmus for both groups. The term "habituation" (a "dropping out" of responses), used to define the effects of repeated vestibular stimulation, does

not appear to describe completely the active process of changes evidenced in the nystagmic tracings presented in this and other studies. Durations of turning sensations were shorter for skaters than for nonskaters. For both groups the period of room illumination, allowing subjects actively to fixate on stationary visual objects, significantly shortened or abruptly terminated the subjective reaction. (Author)

**A68-23706** *

EFFECT OF A WATER DISPLACEMENT SYSTEM FOR GRAVITY COUNTERACTION UPON SKELETAL STATUS IN THE DOG.

George P. Vose (Texas Woman's University, Denton, Tex.) and Alvin W. Smith (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).

Aerospace Medicine, vol. 39, Mar. 1968, p. 266-270. 9 refs.
Grant No. NGR-44-013-055.

Four adult beagles were maintained in metabolic cages for 16 days of equilibration prior to a 32-day period in a water-buoyant environment. Radiographic bone densitometry during the water immersion period revealed conspicuous decreases in bone mass in the distal radius and slight decreases in the middle metacarpal. The magnitude of calcium loss in the distal radius was estimated to be approximately 5 mg per day. In the os calcis, however, slight increases occurred in three of the four dogs. After 27 days of the recovery period three of the four dogs had regained their initial bone mass in the distal radius but recovery was still incomplete in the metacarpal. Bone formation rate as determined by tetracycline labeling initially and at the close of the immersion period indicated that bone apposition was at least as rapid in the femur of the experimental dogs as in the nonimmersed control dog. No significant differences in femoral ash or calcium content on a weight-percent basis were noted between the experimental dogs and the control dog. (Author)

**A68-23707** *

GALACTIC RADIATION HAZARD IN LONG-TERM SPACE MISSIONS.

Hermann J. Schaefer (U. S. Naval Aviation Medical Center, Aerospace Medical Institute, Pensacola, Fla.).

(AEROSPACE MEDICAL ASSOCIATION, 1967 ANNUAL SCIENTIFIC MEETING, WASHINGTON, D.C., APRIL 10-13, 1967, PREPRINTS OF SCIENTIFIC PROGRAM, p. 127, 128.)
Aerospace Medicine, vol. 39, Mar. 1968, p. 271-276. 12 refs.
NASA-sponsored research.

**A68-23708** *

AN ATAXIA TEST BATTERY NOT REQUIRING RAILS.

Alfred R. Fregly and Ashton Graybiel (U. S. Naval Aviation Medical Center, Aerospace Medical Institute, Pensacola, Fla.).

Aerospace Medicine, vol. 39, Mar. 1968, p. 277-282. 10 refs.
NASA-sponsored research.

Description of a quantitative ataxia test battery not requiring rails. Individuals with bilateral and unilateral vestibular defects, as well as those referred for testing because of symptoms of vertigo, obtained performance test scores significantly different from the normative standards. The usefulness of individual tests, as well as the entire battery, for clinical and research purposes, is pointed out. P. v. T.

**A68-23709**

EFFECT OF ACCELERATION ON ALVEOLAR SIZE IN THE LUNGS OF DOGS.

Jon B. Glazier and John M. B. Hughes (Royal Postgraduate Medical School, Dept. of Medicine, Clinical Respiratory Physiology Research Group, London, England).

Aerospace Medicine, vol. 39, Mar. 1968, p. 282-292. 11 refs.
Research supported by the Medical Research Council.

Alveolar size has been measured in different regions of the lungs of dogs subjected to 3-g headwards acceleration ($+3G_z$) and 5-g supine acceleration ($+5G_x$). The animals were frozen intact on a human centrifuge thereby fixing the lungs while they were exposed to the increased g forces. The measurements were made using histological morphometric techniques. The normal gradient of alveolar size of 3.7 to 1 from apex to base in the vertical dog at 1 g increased to 11 to 1 at 3 g if the dog wore an abdominal binder as an antigravity suit. There was no significant change in the gradient of size when the abdominal binder was not worn. When exposed to an acceleration of 5 g, the most superior alveoli in the supine dog more than doubled their volume. Most of the alveoli more than 9 cm below the ventral surface of the dog were collapsed by the g forces. (Author)

**A68-23710** #

HASTENING RESPIRATORY ACCLIMATIZATION TO ALTITUDE WITH BENZOLAMIDE (CL 11,366).

Richard S. Kronenberg (Minnesota, University, Hospitals, Minneapolis, Minn.) and Stephen M. Cain (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).

Aerospace Medicine, vol. 39, Mar. 1968, p. 296-300. 10 refs.

A "double-blind" study involving a 72-hr exposure to a pressure altitude of 14,000 ft (447 torr) was carried out on 23 subjects to ascertain whether benzolamide (CL 11,366) hastened respiratory acclimatization to altitude better than did acetazolamide, another carbonic anhydrase inhibitor previously investigated. Samples of arterial blood, plasma, and cerebrospinal fluid (CSF) were taken at 24 and 72 hr at altitude and analyzed for pH, $P_{CO_2}$, $P_{O_2}$, $CO_2$ content, $HCO_3^-$, standard $HCO_3^-$, lactate, $Na^+$, $K^+$, and $Cl^-$. End-tidal $P_{CO_2}$ was measured frequently during waking hours and $CO_2$ response curves were measured daily. Three 24-hr urine collections were analyzed for $Na^+$, $K^+$, $Cl^-$, and 17 hydroxycorticosteroids. Subjects filled out questionnaires to evaluate their subjective responses to altitude and were ranked on their apparent state of well-being by an observer. Changes in physiologic variables were consistent with more rapid respiratory acclimatization, and the subjective data indicated that the drug was helpful in ameliorating acute altitude sickness. Benzolamide was not clearly better in either respect than acetazolamide. (Author)

**A68-23711**

RELATIVE DECOMPRESSION SICKNESS HAZARDS IN RATS OF NEON AND OTHER INERT GASES.

Peter B. Bennett and Anthony J. Hayward (Defence Research Board, Defence Research Telecommunications Establishment, Toronto, Canada).

Aerospace Medicine, vol. 39, Mar. 1968, p. 301, 302. 14 refs.

The comparative incidence of decompression sickness was ascertained in 160 female Wistar rats (210 to 240 g) compressed at 0.9 atmosphere absolute per minute to 9.7 atmospheres absolute for 1 hr followed by decompression at 0.9 atmosphere abolute per minute. Rats were exposed in groups of 20 at a time to one of a number or inert gas mixtures. These consisted of 20% oxygen and 80% inert gas using either helium, neon, nitrogen or argon. The relative decompression sickness incidence as shown by the number of rats either dying or developing spinal bends was 45% for oxygen-helium, 50% for oxygen-neon, 57.5% for oxygen-nitrogen and 100% for oxygen-argon. The relation of these findings to various theoretical predictions is discussed and it is suggested that a mixture of neon, helium and oxygen is likely to be one of the best mixtures for deep diving. (Author)

**A68-23712**

ALCOHOL-HYPOXIA EFFECTS UPON OPERATOR TRACKING, MONITORING, AND REACTION TIME.

Richard G. Pearson (North Carolina, University, North Carolina State, Dept. of Psychology and Dept. of Industrial Engineering, Raleigh, N.C.).

Aerospace Medicine, vol. 39, Mar. 1968, p. 303-307. 7 refs.

Each of four young male subjects was tested in eight 10-hr experiments, serving twice each under control and alcohol conditions both at ground (2500 ft) and simulated altitude (12,000 ft). Periodic (hourly) assessment of psychomotor skill involved (1) four 2-min trials of compensatory tracking with concurrent meter mon-

itoring and (2) choice reaction time. Tracking performance decrement was a function of task load per se plus a superimposed, cumulative effect of hypoxia, although the latter effect was considerably less under the second half of the experiment. Tracking data suggested both a separate effect of alcohol and an alcohol-hypoxia synergism, but these were not supported statistically. Monitoring performance was found to improve significantly with time on task, a finding which contrasts with traditional conceptions of skill fatigue. Transient, adverse effects of alcohol (peak mean level 85 mg %) on monitoring and the decision component of reaction time were demonstrated. (Author)

**A68-23713**
PROLONGED A-V CONDUCTION IN NORMAL INDIVIDUALS - REPORT OF TWO CASES.
Norman L. Berkman (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Internal Medicine Branch, Brooks AFB, Tex.).
Aerospace Medicine, vol. 39, Mar. 1968, p. 308-311. 16 refs.

Discussion of two case reports of first-degree heart block in healthy asymptomatic individuals. These cases suggest that first-degree atroventricular block can occur in individuals who demonstrated no evidence of cardiovascular disease. P. v. T.

**A68-23714**
TWELVE YEAR SURVEY OF AIRLINE PILOTS.
Frank S. Preston (Air Corporations, Joint Medical Service, London, England).
Aerospace Medicine, vol. 39, Mar. 1968, p. 312-314. 6 refs.

The paper covers the histories of 1000 airline pilots employed in UK airlines between the years 1954 and 1965 and discusses those lost from the airlines for varying reasons. The fortunes of the remaining individuals will be followed during the next ten years because the industry is entering a possibly hazardous age-peaking situation, particularly as the main body of pilots enter and proceed through middle age. (Author)

**A68-23772** #
ON THE DYNAMICS OF THE HUMAN BODY IN FREE FALL.
P. G. Smith (Bellcomm, Inc., Washington, D.C.) and T. R. Kane (Stanford University, Div. of Engineering Mechanics, Stanford, Calif.).
ASME, Transactions, Series E - Journal of Applied Mechanics, vol. 35, Mar. 1968, p. 167, 168. 33 refs.

Description of a method for determining the differential equations and boundary conditions governing the human body in free fall. The human body is regarded as a collection of rigid bodies. The relative orientations of the bodies are described by means of a number r of angles, called internal variables, which form the elements of a column matrix A. The orientation of the main body relative to an inertial reference frame is specified in terms of three elements, called external variables, of a column matrix B. The state of the system is thus known when both A and B are known. M.G.

**A68-23814**
BIOLOGICAL EFFECTS OF LASERS - SAFETY RECOMMENDATIONS.
P. A. Cirincione (U.S. Navy, Office of Naval Research, Naval Training Devices Center, Human Factors Laboratory, Communications Psychology Div., Port Washington, N.Y.).
IN: LASER TECHNOLOGY AND APPLICATIONS.
Edited by S. L. Marshall.
New York, McGraw-Hill Book Co., Division of McGraw-Hill, Inc., 1968, p. 251-253.

Discussion of possible damage to the eye and other tissue from damage arising from accidental laser irradiation. Results from the First Annual Conference on the Biological Effects of Laser Radiation are summarized. Suggestions are made for preventing laser radiation damage to laboratory personnel. M.G.

**A68-23935**
MINIMIZING HUMAN ERRORS.
Charles E. Cornell.
Space/Aeronautics, vol. 49, Mar. 1968, p. 72-81.

Analysis of the causes and remedies of human errors with respect to work involving spacecraft manufacturing. The four major causes of human error which are discussed include failure to follow procedures, incorrect diagnosis of particular situations, misinterpretation of communications, and insufficient attention or caution. The problem associated with quantifying human error is also discussed. R. B. S.

**A68-24334**
NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS.
Edited by Joe Poyer, T. B. Weber (Beckman Instruments, Inc., Fullerton, Calif.), and Julia Herrick (Mayo Clinic, Rochester, Minn.).
New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967. 339 p. Members, $11.00; nonmembers, $14.

CONTENTS:



**A68-24335**
PSYCHOPHYSIOLOGICAL INDICES OF STRESS TOLERANCE.
Robert Roessler (Baylor University, College of Medicine; Houston State Psychiatric Institute, Stress Tolerance Section, Houston, Tex.).
IN: NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS. [A68-24334 10-05]
Edited by Joe Poyer, T. B. Weber, and Julia Herrick.
New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967, p. 17-28. 12 refs.

Individual differences in psychological makeup are related to the physiological responses to a variety of environmental inputs. Some of the clinical and experimental evidence for these relationships is presented. Knowledge in this area has advanced to the point where prediction of maladaptive and adaptive responses to stress soon may be possible. Some of the problems associated with the achievement of this goal are reviewed, including the desirable features of instrumentation employed in such research. Potential applications of such predictive abilities are emphasized. (Author)

**A68-24336**

THE GOALS OF MONITORING INSTRUMENTATION IN TERRESTRIAL STRESS ENVIRONS.

Clinton C. Brown (Johns Hopkins University, School of Medicine, Dept. of Psychiatry and Behavioral Science, Baltimore, Md.).

IN: NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS. [A68-24334 10-05]
Edited by Joe Poyer, T. B. Weber, and Julia Herrick.
New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967, p. 91-96. 13 refs.

Proposal of a concept of monitoring instrumentation termed "control conditioning," which deemphasizes the hardware approach and relies instead on recently discovered capacities of biological systems. Experimental evidence is examined for military and space uses, and for the clinical fields of psychosomatics and psychophysiology. Finally, it is proposed that a process of control conditioning be used to control human behavior in remote locations for extended periods in order to augment the adjustive capacity of the individual. B.B.

**A68-24337**

AUTOMATED MONITORING SYSTEMS IN A CLINICAL ENVIRONMENT.

Cesar A. Caceres (U.S. Public Health Service, Bethesda, Md.).

IN: NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS. [A68-24334 10-05]
**Edited by Joe Poyer, T. B. Weber, and Julia Herrick.**
**New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967, p. 97-101.**

**Determination of the capability of a real-time, on-line computer system in aiding the work of a human medical monitor. An attempt is made to ascertain whether such a system can provide rapid and precise data analysis, for the particular case of an electrocardiographic system which serves only as a model of the signal types that are medically available. The objectivity of the methods employed suggests their use as screening techniques to detect disease, to select subjects for in-flight capsule work, to control servomechanisms to start therapeutic measures, and for training and other purposes.** B.B.

**A68-24338 ***

SURVEY OF BIOMEDICAL INSTRUMENTATION DEVELOPMENTS AT AMES RESEARCH CENTER.

Thomas B. Fryer (NASA, Ames Research Center, Moffett Field, Calif.).

IN: NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS. [A68-24334 10-05]
**Edited by Joe Poyer, T. B. Weber, and Julia Herrick.**
**New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967, p. 103-112. 8 refs.**

Investigations of the general characteristics of some miniature electronic systems designed for monitoring physiological parameters in small animals, and indication of how current advances in electronics can be applied to bioinstrumentation problems. Examples of amplifiers and telemetry monitoring systems are given to show the influence of new electronic techniques on biomedical instrumentation. The small size that has been achieved with these devices is emphasized, as well as the fact that they meet the need for accurate and reliable biomedical electronic equipment. B.B.

**A68-24339**

TELEMETRY AND REPRODUCTIVE BIOLOGY.

Howard Balin (Pennsylvania, University, School of Medicine; Pennsylvania Hospital, Dept. of Obstetrics-Gynecology, Gynecic Research Section, Philadelphia, Pa.).

IN: NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS. [A68-24334 10-05]
Edited by Joe Poyer, T. B. Weber, and Julia Herrick.
New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967, p. 113-124. 7 refs.

Discussion of the use of radio telemetry to provide fundamental knowledge of the physical behavior of the ovary during different phases of its cycle. Continuous data obtained directly from the surface of the Macaca rhesus monkey ovary during several menstrual cycles is analyzed, and comment is made on the surface temperature and electropotential patterns of different phases of the ovarian cycle with hormonal bioassays. B.B.

**A68-24340**

CREATING THE SPACE/TERRESTRIAL ANALOG.

Quentin L. Hartwig (George Washington University, Washington, D.C.).

IN: NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS. [A68-24334 10-05]
Edited by Joe Poyer, T. B. Weber, and Julia Herrick.
New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967, p. 125-130.

Consideration of the problem of disseminating information about advanced electronic equipment for monitoring the physiological functions of astronauts while in the space enviroment. **The methods used by the Publications and Applications teams of NASA to distribute advanced space research information to life scientists and eventually to the general public are discussed. A spray-on electrode consisting of Duco household cement, silver powder, and acetone is cited as an example of a practical application of an aerospace technology.** B.B.

**A68-24341**

HEART-PACED ERGOMETRY.

Laurence E. Morehouse (California, University, Los Angeles, Calif.).

IN: NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS. [A68-24334 10-05]
Edited by Joe Poyer, T. B. Weber, and Julia Herrick.
New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967, p. 139-149.

Description of the Physiologically Adjusted Continuous Environment Regulator (PACER), which analyzes the output signals of a cardiotachometer and compares them with the signals representing heart rates desired during a prescribed program of exercise. It then automatically controls the setting of the ergometer to adjust the workload to maintain the heart rate at the desired level. PACER can be used to assess work capacity and to measure the effects of drugs and of various gaseous environments in space cabins. B.B.

**A68-24342**

REMOTE PHYSIOLOGICAL MONITORING USING A MICROWAVE INTERFEROMETER.

## A68-24343

F. A. Giori and A. R. Winterberger (Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.).
IN: NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS. [A68-24334 10-05]
Edited by Joe Poyer, T. B. Weber, and Julia Herrick.
New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967, p. 291-308.

Description of a physiological monitoring technique in which body surface movements are observed by a remote precision ranging device and the resulting signal is processed in real time to yield data about cardiovascular and respiratory parameters. A series of experiments is performed on several human subjects to determine (1) pulse and respiration rate, (2) respiration depth, and (3) a combination of blood pressure and vascular resistance. B.B.

## A68-24343

RECENT BIOMEDICAL APPLICATIONS OF FOUR-ELECTRODE IMPEDANCE MEASURING TECHNIQUES.
Robert D. Allison (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.).
IN: NATIONAL BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM ON CHALLENGES TO MEDICINE AND MEASUREMENT, 4TH, ANAHEIM, CALIF., MAY 16-18, 1966, PROCEEDINGS. [A68-24334 10-05]
Edited by Joe Poyer, T. B. Weber, and Julia Herrick.
New York, Plenum Press, Division of Plenum Publishing Corp. (Biomedical Sciences Instrumentation. Volume 3), 1967, p. 309-327. 23 refs.
PHS Grants No. GR-05537; No. PH-05518-04.

Discussion of recent studies comparing four-electrode electrical impedance pulse volume and blood flow information with an electromagnetic flowmeter, water-filled plethysmograph chambers, and mercury-in-rubber strain-gauge venous occlusion systems. Applications of the principles for determining pulse volume and flow in peripheral segments are applied to the definition of unilateral renal bloodflow. Examples of these studies are described. B.B.

## A68-24529 *

EVOLUTION OF HEURISTICS BY HUMAN OPERATORS IN CONTROL SYSTEMS.
Ralph E. Thomas (Battelle Memorial Institute, Statistical and Mathematical Modeling Div., Columbus, Ohio) and Julius T. Tou (Florida, University, College of Engineering, Dept. of Electrical Engineering, Gainesville, Fla.).
(Institute of Electrical and Electronics Engineers, International Convention and Exhibition, New York, N.Y., Mar. 20-24, 1967.)
IEEE Transactions on Systems Science and Cybernetics, vol. SSC-4, Mar. 1968, p. 60-71.
NASA-supported research.

Description of a mathematical model for decision making in control systems. The model is constructed to perform four modes of control: (1) probing, (2) gradient, (3) heuristic, and (4) terminal. The operation of the model switches from one mode to another by following certain decision logic, which simulates the function of a human operator in a control system and the evolution of heuristics for control. The model can generate, with reasonably high probability, the verbal heuristics of human controllers for first-order control systems of the type investigated. The four modes of control with a switching logic give a highly flexible model for generating data that can be analyzed for invariance using the methods of dimensional analysis. M.G.

## A68-24530

DYNAMICAL CHARACTERISTICS OF THE FUSIONAL VERGENCE EYE-MOVEMENT SYSTEM.
Bert L. Zuber (Illinois, University, Dept. of Information Engineering, Bioengineering Laboratory; Presbyterian-St. Luke's Hospital, Dept. of Biomedical Engineering, Neurophysiology Laboratory, Chicago, Ill.) and Lawrence Stark (Illinois, University, Dept. of Information Engineering, Bioengineering Laboratory; Presbyterian-St. Luke's Hospital, Dept. of Biomedical Engineering, Chicago, Ill.).
IEEE Transactions on Systems Science and Cybernetics, vol. SSC-4, Mar. 1968, p. 72-79. 20 refs.
PHS Grants No. NB-3055-04; No. NB-3090-04; NIH Grant No. MH-06175-02; Contract No. Nonr-184(70); Grant No. AF AFOSR 49-638.

Discussion of experiments performed on the fusional vergence eye-movement mechanism in humans and comparison of results with the established dynamical characteristics of the versional eye-movement system. Transient and frequency response experiments indicate that the fusional vergence system is not characterized by sampled data or refractor operation. When provided with a periodic input, this system may utilize prediction to reduce inherent phase lags. The gain of the system, although apparently unaffected by the predictive mechanism, is subject to input amplitude-dependent nonlinearities. Under conditions of artificially high-loop gain, the system breaks into smooth sustained oscillations at a frequency predicted by frequency response data. The absence of a refractory period in the fusional vergence system is demonstrated by the system response to brief pulsatile stimulation. M.G.

## A68-24604 *

NEUROPHYSIOLOGICAL ASPECTS OF RHYTHMS.
Felix Strumwasser (California Institute of Technology, Div. of Biology, Pasadena, Calif.).
IN: THE NEUROSCIENCES: A STUDY PROGRAM.
Edited by G. C. Quarton, Theodore Melnechuk, and F. O. Schmitt.
New York, Rockefeller University Press, 1967, p. 516-528, 887, 888. 47 refs.
NIH Grant No. NB-07071; Contract No. AF 49(638)-1447; Grant No. NGR-05-002-031.

Study of the neurophysiological aspects of rhythms, proceeding downward in level from work with whole organisms to the isolated parts of the central nervous system and finally to cell-free fractions. A brief review of the laws and current models controlling daily activity cycles in vertebrates is given, followed by a demonstration of a circadian rhythm in the mammalian EEG and a review of the present knowledge and understanding of circadian and higher-frequency rhythms at the level of single neurons in the marine gastropod, Aplysia californica. R.B.S.

## A68-24607 *

INTERFACIAL PHENOMENA GOVERNING ADHESION OF CHLORELLA TO GLASS SURFACES.
John S. Nordin, H. M. Tsuchiya, and A. G. Fredrickson (Minnesota, University, Chemical Engineering Dept., Minneapolis, Minn.).
Biotechnology and Bioengineering, vol. 9, no. 4, 1967, p. 545-558. 8 refs.
Grants No. NGR-24-005-056; No. NsG-79-60; No. NsG-24-005-001.

Discussion of interfacial phenomena directly involved in the adhesion of a strain of Chlorella, a unicellular alga, to glass surfaces in simple ionic solutions. The principal mechanisms governing the adhesion appear to be electrostatic interaction between electrical double layers and various specific surface interactions resulting from surface heterogeneity and ion adsorption. Under most conditions the algal cells and glass surfaces have negative zeta potentials, and adhesion to glass will not occur; but if, for example, $FeCl_3$ is added to an algal - glass system immersed in 0.05M NaCl, the algal and glass surfaces will possess very different zeta potentials, and adhesion will be strongest under those conditions which produce the greatest difference in zeta potentials. Prior pretreatment and usage of glass apparatus greatly affect the glass zeta potentials and the adhesion of algal cells to glass. An apparatus for measuring a relative set of numbers representing the force of adhesion of algal cells is described. M.M.

## A68-24609 *

MEASUREMENT OF NONLINEARITY IN THE ARTERIAL SYSTEM OF THE DOG BY A NEW METHOD.
J. E. Kendrick, G. L. Matson, V. C. Rideout (Wisconsin, University, Dept. of Electrical Engineering and Dept. of Physiology, Madison, Wis.), and D. E. Dick.

Circulation Research, vol. 22, Feb. 1968, p. 101-111. 16 refs.
NSF-supported research; PHS Grant No. HE-04098; Grant No. NGR-50-002-083.

Description of a method of measurement of the nonlinearity of the canine arterial system by simultaneously using two fixed-flow pumps in parallel to perfuse the system at two incommensurate frequencies, thus leading to the appearance of intermodulation frequencies which provide a sensitive measurement of nonlinearity. This scheme has been used, and the recorded measurements have been reduced to power-spectral-density form with the aid of a hybrid computer. The most important result of these studies is that the intermodulation scheme is shown to be a very sensitive method for detecting the presence of nonlinear characteristics in the arterial system of the dog, even though the system was found to be nearly linear. This scheme also proved useful in detecting changes in nonlinearity, since, when injection of norepinephrine considerably increased the mean pressure, the nonlinearity was significantly less. M.M.

**A68-24611** *

LONG-RANGE INTERATOMIC FORCES.

Tai Yup Chang (Wisconsin, University, Chemistry Dept., Theoretical Chemistry Institute, Madison, Wis.).

Molecular Physics, vol. 13, no. 5, 1967, p. 487, 488. 5 refs.
Grants No. NsG-275-62; No. NsG-50-002-001.

Demonstration that the theoretical value of the quadrupole-quadrupole interaction constant of $Se_2$ agrees with the experimental value, and a discussion of the long-range interatomic forces of the halogen molecules. For the $^3\Pi_u^+$ state of the halogen molecule dissociated to $X(^2P_{3/2}) + X(^2P_{1/2})$, a quadrupole-quadrupole interaction value is obtained which contradicts the result of Byrne et al. (1967). R.B.S.

**A68-24664** *

SHAPES OF TUNING CURVES FOR SINGLE AUDITORY-NERVE FIBERS.

N. Y. S. Kiang, M. B. Sachs, and W. T. Peake (Massachusetts Institute of Technology, Research Laboratory of Electronics, Cambridge; Massachusetts Eye and Ear Infirmary, Eaton-Peabody Laboratory, Boston, Mass.).

Acoustical Society of America, Journal, vol. 42, Dec. 1967, p. 1341, 1342. 10 refs.
Research supported by the Joint Services Electronics Program and NIH; Grants No. NsG-496; No. NsG-22-009-019.

Results of measurements of the shapes of tuning curves for single fibers in the auditory nerve of anesthetized cats. The threshold for single auditory-nerve fibers are plotted in terms of stapes displacement, and the tuning curves are found to rise monotonically on both sides of the characteristic frequency. B.B.

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# LC ENTRIES

**A68-80789**
**THE IDENTIFICATION OF TOXIC COMPOUNDS IN THE PYROLYSIS PRODUCTS OF POLYTETRAFLUOROETHYLENE (PTFE).**
W. Emile Coleman, Lester D. Scheel, Richard E. Kupel, and Robert L. Larkin (PHS, Natl. Center for Urban and Ind. Health, Occupational Health Program, Cincinnati, Ohio).
*American Industrial Hygiene Association Journal*, vol. 29, Jan.–Feb. 1968, p. 33–40. 10 refs.

When polytetrafluoroethylene (PTFE) was pyrolyzed in air in the temperature range of 500° to 650°C., the predominant product was $COF_2$. Above 650°C. the major products were $CF_4$ and $CO_2$. Other fluorocarbons were produced in lesser amounts. PTFE pyrolyzed in the presence of $SiO_2$ also formed $SiF_4$. Between 550° and 600°C. production of $COF_2$ was as high as 63%. Experimental exposure of rats showed $COF_2$ to be the most toxic component of the pyrolysis gases.

**A68-80790**
**EVOKED RESPONSE (EEG) AUDIOMETRY IN NONORGANIC HEARING LOSS.**
Geary A. McCandless and William E. Lentz (Colo., U., Med. Center, Dept. of Audiol. and Speech Pathol., Denver).
*Archives of Otolaryngology*, vol. 87, Feb. 1968, p. 123–128. 7 refs.

The present study was undertaken to assess the usefulness of evoked response audiometry in the threshold determination of patients with nonorganic hearing loss. Evoked response measures from 12 normal subjects agreed within five db. of their voluntary thresholds. Three distinct clinical groups emerged from this study. Group 1 consisted of subjects having real ear pathology but who gave slightly variable voluntary responses. They were referred for evoked response audiometry for validation purposes only. Of the 15 subjects in this group, 14 had evoked response thresholds within five db. of voluntary values. Subjects in group 2 gave obviously inaccurate responses on initial examination, but with repeated testing their voluntary thresholds improved and stabilized. A comparison of the improved voluntary thresholds with evoked response audiometry showed agreement with five db. for all seven subjects. Group 3 consisted of ten subjects who with repeated audiometric testing failed to give accurate subjective responses. Evoked response audiometric thresholds averaged about 50 db. better than voluntary results. The evoked response technique appears to be a valid objective measure for threshold determination in patients who are unwilling to give accurate behavioral thresholds.

**A68-80791**
**RESPIRATORY FUNCTION IN NORMAL YOUNG ADULTS AT SEA LEVEL AND 4300 METERS.**
C. Frank Consolazio, Herman L. Johnson, LeRoy O. Matoush, Richard A. Nelson, and Gerhard J. Isaac (Fitzsimons Gen. Hosp., U.S. Army Med. Res. and Nutr. Lab., Denver, Colo.)
*Military Medicine*, vol. 133, Feb. 1968, p. 96–105. 23 refs.

Respiratory function of two groups of normal young adults was studied at sea level and at an altitude of 4,300 m. for 28 days. Physical conditioning in one half of the subjects proved to be beneficial since it resulted in an additional increase in maximal breathing capacity (MBC) during high altitude exposure. Maximal breath holding time, in seconds, for all groups at altitude, was significantly decreased, and again the physical conditioned group had significantly higher values than the nonexercisers during altitude exposure. These decreases may be related to the oxygen tension of the inspired air and the decreased gas volume in the lungs. It is suggested that the great changes one observes at altitude in MBC and maximal breath holding time could be used as an index of adaptation to high altitude. There is a marked improvement in these parameters with physical conditioning. Resting and maximal work $\dot{V}_E$ (BTPS) were significantly increased at the 4,300 m. altitude. This, in conjunction with the increased MBC values at altitude, strongly suggests that ventilation during maximal work is not limited by the strength of the respiratory muscles, but is regulated through the central nervous system.

**A68-80792**
**PERMANENTLY ATTACHED ELECTRODES FOR HIGH ALTITUDE ELECTROCARDIOGRAMS.**
R. H. T. Edwards, P. A. Burgess (Roy. Postgraduate Med. School, London, Great Britain), D. C. Fluck (Guy's Hosp., Cardiol. Dept., London, Great Britain), and E. S. Williams (Middlesex Hosp., Inst. of Nucl. Med., London, Great Britain).
*Bio-medical Engineering*, vol. 2, Dec. 1967, p. 544–546. 9 refs. Astor Found. and Wellcome Trust supported research.

A method to obtain electrocardiograms (ECG) under adverse environmental conditions on a high altitude physiological expedition was described. Six healthy males aged 26–42 were studied. They wore the electrodes attached to the skin, on each of the four extremities and on the chest, allowing the ECG to be obtained at frequent intervals. The ECG was recorded in the supine position after ten min. rest. Following control studies at 1,600 ft. the subjects were transferred to high altitude, 11,500 ft. by helicopter where the studies were conducted for six days. Apart from some skin irritation, the method was found convenient and gave satisfactory ECG recordings. No change was observed in the wave configuration, in the direction of the mean frontal P or QRS axes, or in the position of the "transition zone" in the chest leads following ascent and during the six day stay.

**A68-80793**
**PANCREATIC ADAPTATION TO CHANGE IN DIETARY PROTEIN SOURCE IN RATS FED AT DIFFERENT FREQUENCIES.**
Jean Twombly Snook (Cornell U., N. Y. State Coll. of Home Econ., Dept. of Food and Nutr., Ithaca, N. Y.)
*Journal of Nutrition*, vol. 94, Mar. 1968, p. 351–360. 12 refs.
Grants PHS HD-02207.

The rates at which the pancreatic concentrations of chymotrypsinogen, trypsinogen, amylase, and nucleic acid adapt to the substitution of whole-egg protein for casein at the 15% level of the diet were determined over a two-wk. period using rats fed (1) ad libitum, and (2) for one-hr. intervals spaced 12 hr. apart (space-fed). Chymotrypsinogen and trypsinogen increased almost immediately, with maximal adaptation occurring within two to four days. Four to seven days were required for amylase to adjust, by increasing, to the change in protein source. There was some evidence to indicate that the mechanisms mediating amylase and protease induction were not identical although the direction of adaptation was the same for all three enzymes. Enzyme and RNA levels in rats fed the same diet did not differ significantly regardless of feeding frequency on any specific day of the experiment although, on the average, more chymotrypsinogen and trypsinogen, but not amylase, were found throughout the experimental period in rats fed the egg protein diet at intervals. The introduction of whole-egg protein into the diet caused pancreatic RNA but not DNA to increase as much as 66% within two to three days.

**A68-80794**
**SPLANCHNIC BLOOD FLOW AND METABOLISM IN HEAT-STRESSED MAN.**

A68-80795

Loring B. Rowell, George L. Brengelmann, John R. Blackmon, Richard D. Twiss, and Fusako Kusumi (Wash., U., School of Med. and School of Nursing, Depts. of Med. and Physiol. and Biophys., Seattle).
*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 475–484. 37 refs.
Grants PHS HE-09773, PHS FR 37, and PHS HE 05281; Wash. State Heart Assn. supported research.

To determine whether normal splanchnic metabolism could be maintained during prolonged thermal and exercise stresses which reduced hepatic blood flow (HBF), HBF was estimated in 11 men who worked to exhaustion at 42–56% of maximal $\dot{V}O_2$ at 48.9°C. HBF was low (average 667 ml./min.) but quite stable throughout exercise despite falling peripheral pulse pressure. Temperatures rose to 40.2°C. in the rectum and 41.7°C. in hepatic veins at exhaustion. Total $\dot{V}O_2$ rose slightly during work while splanchnic $\dot{V}O_2$ rose 1.4 times. Hepatic venous oxygen content fell to 0.6 ml./100 ml. Hepatic glucose release increased from 351 mg./min. at ten min. to 749 mg./min. at exhaustion. Uptake of free fatty acids was normal at 0.13 mEq/min. Arterial lactate rose abnormally high; hepatic extraction percentage was 58% of normal with net release in two men at exhaustion. Glucose outpouring and elevated hepatic venous lactate concentrations suggest developing hepatic-splanchnic hypoxia.

**A68-80795**
**EFFECTS OF EXERCISE AT ITS CESSATION ON THE HEART AND ITS BLOOD SUPPLY.**
Arthur S. Leon and Colin M. Bloor (Walter Reed Army Med. Center, Walter Reed Army Inst. of Res., Dept. of Cardiorespirat. Diseases, Washington, D. C.)
*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 485–490. 37 refs.

Studies were carried out in rats on effects of daily and intermittent exercise and its cessation on heart size and on cross-sectional luminal areas of extracoronary collateral (ECA) and coronary arteries (CA) and on capillary-ventricular muscle fiber ratios (CFR). For ten wk. young male rats swam for one-hr. periods daily (I) or twice weekly (II). These animals and unexercised controls were sacrificed at the end of ten wk. exercise or 14–42 days following cessation of exercise. Ventricular dry weights were determined, ventricular-body weight ratios calculated, and histological sections prepared. At the end of the exercise period, body weights in both I and II were below controls. Cardiac hypertrophy with an associated increase in CA area was observed only in I. ECA areas and CFR were significantly increased over control levels in both groups. After cessation of exercise, ventricular weights regressed rapidly, dipping transiently below control levels at 14–28 days, while body weights increased markedly. Following this initial drop, ventricular weight increased along with body weight. Although CA area regressed at about the same rate as ventricular weight, ECA area and CFR remained significantly greater than controls in I at 42 days postexercise.

**A68-80796**
**BIOCHEMICAL CHANGES ASSOCIATED WITH TOXIC EXPOSURES TO POLYTETRAFLUOROETHYLENE PYROLYSIS PRODUCTS.**
Lester D. Scheel, Lofton McMillan, and Frederick C. Phipps (PHS, Natl. Center for Urban and Ind. Health, Occupational Health Program, Cincinnati, Ohio).
*American Industrial Hygiene Association Journal*, vol. 29, Jan.–Feb. 1968, p. 49–53. 9 refs.

Rats were exposed to the products of pyrolysis of polytetrafluoroethylene (PTFE) containing hydrolyzable fluoride equivalent to 50 p.p.m. $COF_2$ for one hr. daily. After one exposure, urinary excretion of fluoride was four times normal. Weight loss of exposed animals indicated inhibition of metabolism. Changes in succinic dehydrogenase activity *in vivo* correlated with exposure to pyrolysis products of PTFE and with urinary fluoride concentrations. Toxic effects of daily sublethal exposures were found to be cumulative. The metabolic inhibition observed was reversible. The toxic syndrome of daily inhalation of pyrolysis products of PTFE is compatible with descriptions of fluoride poisoning.

**A68-80797**
**EFFECT OF PULMONARY VASOCONSTRICTION ON BALANCE BETWEEN ALVEOLAR VENTILATION AND PERFUSION.**
F. Haas and E. H. Bergofsky (N. Y. U., School of Med., Depts. of Rehabil. Med. and Physiol., New York City).
*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 491–497. 21 refs.
Grant VRA RT-1 and N. Y. Heart Assn. supported research.

Rises in arterial $O_2$ tension were observed in anesthetized dogs with controlled ventilation during generalized pulmonary vasoconstriction induced by (1) respiratory acidosis, (2) metabolic acidosis, (3) serotonin, and (4) elevations of extracellular potassium concentrations. Analysis of concomitant changes in cardiac out-put, dead space, venous admixture, and alveoloarterial $O_2$ tension differences suggests that the rises in arterial $O_2$ tension are attributable to the occurrence of more homogeneous ratios of ventilation-perfusion during the vasoconstriction. These, in turn, may depend on the associated increases in pulmonary arterial pressure which can be expected to divert pulmonary blood flow from over-perfused to poorly perfused regions of the lung.

**A68-80798**
**MYOCARDIAL POTASSIUM UPTAKE WITH CONSTANT ARTERIAL POTASSIUM CONCENTRATION.**
Norberto C. Gonzalez, Takuma Hojo, and E. B. Brown, Jr. (Kan., U., Med. Center, Dept. of Physiol., Kansas City).
*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 498–502. 20 refs.
Grant PHS 5T1 HE5670.

The role of elevated arterial plasma potassium concentration upon myocardial potassium uptake during hypercapnia was studied. Carbon dioxide tension was increased before and after the infusion of phenoxybenzamine, and myocardial potassium flux was estimated by multiplying the arteriovenous potassium difference across the myocardium and the flow in the left anterior descending coronary artery. It was found that (1) phenoxybenzamine temporarily suppressed the typical increase in plasma potassium concentration during hypercapnia, (2) hypercapnia was associated with a myocardial potassium uptake both when arterial plasma potassium increased and when it remained unchanged, and (3) the cardiac uptake of potassium observed when arterial potassium concentration reached its highest level was higher than that seen when arterial potassium remained at control level. It is concluded that the elevated plasma potassium concentration of hypercapnia is not the only cause of myocardial potassium uptake seen in that situation.

**A68-80799**
**THE PARTICLES RESULTING FROM POLYTETRAFLUOROETHYLENE (PTFE) PYROLYSIS IN AIR.**
W. Emile Coleman, Lester D. Scheel, and Charles H. Gorski (PHS, Natl. Center for Urban and Ind. Health, Occupational Health Program, Cincinnati, Ohio).
*American Industrial Hygiene Association Journal*, vol. 29, Jan.–Feb. 1968, p. 54–60. 14 refs.

Particulate products from the pyrolysis of polytetrafluoroethylene (PTFE) in air were collected on membrane filters, then examined by electron microscopy, infrared, mass spectrography, chromatography, and chemical analysis. The residue differed from the composition of PTFE. Evidence indicated that the

pyrolysis products were composed of a complex mixture of fluorinated acids and olefins. Humidity in the pyrolysis chamber greatly influenced the composition of the mixture of products.

**A68-80800**
**AN ACOUSTIC BRIDGE FOR MEASURING THE STATIC AND DYNAMIC IMPEDANCE OF THE EARDRUM.**
Lawrence H. Pinto and Peter J. Dallos (Northwestern U., Bio-Med. Eng. Res. Center and Auditory Res. Lab., Evanston, Ill.)
*IEEE Transactions on Bio-Medical Engineering*, vol. BME-15, Jan. 1968, p. 10–16. 14 refs.
Grants NIH GM874, NIH FR00018, and NIH NB1310.

An acoustic impedance bridge is described that is capable of measuring the input impedance of the human ear in the frequency range of 250 to 1,250 c.p.s., with an accuracy of three degrees and five percent in phase and magnitude, respectively. In addition to static impedance, the bridge measures and records both in-phase and quadrature components (re an arbitrary reference) of changes in the ear's impedance due to the acoustic reflex. Assumptions upon which the use of the bridge is based are stated, the calibration procedure is described, and an example of the use of the bridge is given.

**A68-80801**
**DECOMPRESSION SICKNESS: A REVIEW.**
R. I. McCallum (Newcastle upon Tyne, U., Nuffield Dept. of Ind. Health, Great Britain).
*British Journal of Industrial Medicine*, vol. 25, Jan. 1968, p. 4–21. 60 refs.

A review of studies concerning decompression sickness in the field of civil engineering and problems associated with tables and procedures for work under high pressures was presented. Topics discussed included: (1) causes of decompression sickness, (2) decompression procedures; (3) regulations and requirements for work done in compressed air; (4) evaluation of decompression tables; (5) acclimatization; (6) therapeutic use of oxygen; (7) respirators in compressed air; (8) effects of pressure on response to gas-detecting instruments; (9) the bends rate; (10) asceptic necrosis of bone in compressed air workers and its causes; (11) effects on lungs; (12) neurological complications of decompression; (13) effects on cerebral function; (14) cardiac effects; (15) blood changes; (16) treatment of decompression sickness; (17) post-mortem examination of fatalities; and (18) procedures and plans for control of the problem in civil engineering.

**A68-80802**
**A STUDY OF POWER SPECTRA ANALYSIS OF NORMAL FINGER TREMORS.**
Robert H. Wyatt, Jr. (Duke U., School of Elec. Eng., Durham, N. C.)
*IEEE Transactions on Bio-Medical Engineering*, vol. BME-15, Jan. 1968, p. 33–45. 31 refs. Mary Duke Biddle Found. supported research.

Measurements of "normal," neuromuscular finger tremor acceleration in healthy adults were made and then analyzed by power spectra and correlation techniques. These techniques from random-signal analysis offer objective methods by which tremors may be described and compared quantitatively. Measurements of this type may provide useful information in evaluating surgical and medical treatments of Parkinson's disease; furthermore, if relations between tremor phenomena and certain physiological and pathological states are established, these techniques will have a diagnostic value. Some interesting and useful results evolved from this study; the power density spectra, autocorrelograms, and cumulative power spectra of the tremor measurements are presented and discussed.

**A68-80803**
**HUMAN POWER OUTPUT.**
C. T. M. Davies and R. Rennie (Med. Res. Council, Environ. Physiol. Res. Unit and Biomed. Eng. Labs., London, Great Britain).
*Nature*, vol. 217, Feb. 24, 1968, p. 770–771.

The peak power output (in horsepower) in 47 men and eight young women during the performance of a standing vertical jump from a force platform was investigated. The best of three experimental jumps was recorded and analyzed. The mean peak power output for men was $5.221 \pm 1.56$ h.p., for women $3.15 \pm 0.48$ h.p. These figures were among the highest ever recorded, fifteen times greater than corresponding values for maximum aerobic power achieved during sustained exercise on a bicycle ergometer and very close to the theoretical maximum.

**A68-80804**
**AMMONIA–OXYGEN FUEL CELL.**
E. J. Cairns, E. L. Simons, and A. D. Tevebaugh (Gen. Elec. Co., Res. and Develop. Center, Schenectady, N. Y.)
*Nature*, vol. 217, Feb. 24, 1968, p. 780–781. 10 refs.

Presented are the initial results obtained using Teflon bonded platinum black electrodes in a fuel cell operating with gaseous ammonia and oxygen and using 54 weight per cent aqueous potassium hydroxide as electrolyte. The performance levels achieved in these ammonia–oxygen cells exceed those attained with any fuels other than hydrogen or hydrazine. Current densities of 120–130 mA./cm.$^2$ were only generated above 200°C.

**A68-80805**
**TOXICITY OF FLUORINE SHORT-TERM INHALATION.**
M. L. Keplinger and L. W. Suissa (Miami U., School of Med., Res. and Teaching Center of Toxicol., Coral Gables, Fla.)
*American Industrial Hygiene Association Journal*, vol. 29, Jan.–Feb. 1968, p. 10–18. 10 refs.
NASA Grant NGR 10-007-012.

Rats, mice, guinea pigs, rabbits and dogs were exposed to fluorine for five, 15, 30 or 60 min. The $LC_{50}$'s and effect at lower concentrations were determined. High concentrations of fluorine caused marked irritation of the eyes and respiratory tract, and damage to the lungs, liver and kidneys. Exposure at or below 100 p.p.m. for five min., 70 p.p.m for 15 min., 55 p.p.m. for 30 min. or 45 p.p.m. for 60 min. caused no apparent effects in the animals. Exposure of volunteer human subjects revealed very little irritation at concentrations up to 25 p.p.m. There was marked irritation of the eyes and nose at 100 p.p.m.

**A68-80806**
**THE INHALATION TOXICITY OF PYROLYSIS PRODUCTS OF POLYTETRAFLUOROETHYLENE HEATED BELOW 500 DEGREES CENTIGRADE.**
R. S. Waritz and B. K. Kwon (E. I. du Pont de Nemours and Co., Haskell Lab. for Toxicol. and Ind. Med., Wilmington, Del.)
*American Industrial Hygiene Association Journal*, vol. 29, Jan.–Feb. 1968, p. 19–26. 16 refs.

Quantitative evidence was obtained which indicates that the principal toxic component in the pyrolysate from polytetrafluoroethylene at the first temperature at which rat mortality is observed (Approximate Lethal Temperature, ALT), is a particulate material which may have other toxicants adsorbed on it. The toxicity of this particulate varies, depending upon the conditions under which it is generated. At 30°C. above the ALT, perfluoroisobutylene could be the principal toxic agent. The data correlate well with known chemical reactions as well as observations and hypotheses of other investigators.

**A68-80807**
**EXPERIMENTAL METHOD FOR EVALUATING THE DECOMPOSITION OF FLUOROCARBON PLASTICS BY HEAT.**

A68-80808

Richard E. Kupel and Lester D. Scheel (PHS, Natl. Center for Urban and Ind. Health, Occupational Health Program, Cincinnati, Ohio). *American Industrial Hygiene Association Journal,* vol. 29, Jan.–Feb. 1968, p. 27–32.

In studying the toxicity of pyrolysis products of fluorocarbons, a time-of-flight mass spectrometer was selected for identification of decomposition fragments. Quantitative measurements were made by gas chromatography except for $COF_2$ which was collected in 0.5 N NaOH followed by determination of the fluoride. Monel metal tubes were used in the pyrolysis furnaces and temperatures were measured by thermocouples shielded with stainless steel. A cubical chamber (aluminum) of 1245-liter capacity and equipped with an airlock was used for exposure of animals to the pyrolysis products.

**A68-80808**
**DEVELOPMENT OF A SEMIPURIFIED DIET FOR THE ADULT POCKET MOUSE (PEROGNATHUS).**

Gene A. Spiller and Rosemarie Ostwald (Calif., U., Dept. of Nutr. Sci., Berkeley).

*Journal of Nutrition,* vol. 94, Mar. 1968, p. 297–301. 6 refs.

NASA Grant NGE 05-003-118.

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

**A68-80809**
**HABITUATION OF EVOKED POTENTIALS IN THE RAT UNDER CONDITIONS OF BEHAVIORAL CONTROL.**

Robert D. Hall (Mass. Inst. of Technol., Res. Lab. of Electron., Center for Commun. Sci., Cambridge).

*Electroencephalography and Clinical Neurophysiology,* vol. 24, Feb. 1968, p. 155–165. 55 refs.

NASA Grant NsG-496, Contract DA 28-043-AMC-02536(E), and Grant NIH 1 PO1 GM-14940-01.

Three experiments are reported in which potentials evoked by sensory stimuli were recorded from rats during habituation procedures. In all three, behavior was controlled through the use of appetitive operant conditioning procedures. In one experiment rats were exposed to repetitive photic stimuli, and evoked potentials were recorded from primary visual cortex. In two experiments rats were exposed to repetitive click stimulation, and evoked potentials were recorded from auditory cortex and, in various subjects, from medial geniculate body, inferior colliculus, ventral cochlear nucleus, and mesencephalic reticular formation. Constant rates of behavioral responding provided a control against fluctuations in the level of arousal, and the nature of the behavioral responses insured a relatively constant orientation of the subjects with respect to the stimuli. The photic and acoustic stimuli were irrelevant to the behavioral tasks. Average evoked responses revealed the following: (1) Photically evoked potentials recorded from visual cortex exhibited habituation, and the amplitude reductions were confined to late components of the evoked response. (2) Click-evoked potentials recorded from auditory cortex and medial geniculate body also showed reductions in amplitude during repetitive stimulation. At the cortical level the amplitude changes involved only late components of the evoked response. (3) Click-evoked potentials recorded from the inferior colliculus, ventral cochlear nucleus (both VIIIth nerve and cochlear nucleus components), and reticular formation did not show consistent evidence of habituation. (4) The data appear to justify the conclusion that habituation of evoked potentials occurs in the classical sensory pathways, but is probably restricted to cortical and thalamic levels of the sensory systems. These changes cannot be attributed to changes in the level of arousal, uncontrolled fluctuations in stimulus intensity, or "pre-receptor" mechanisms.

**A68-80810**
**BROAD-BEAM GAMMA ATTENUATION IN THIN ABSORBERS.**

Elmon Bill Stewart and Joe O. Ledbetter (Tex. State Dept. of Health, Radiation Control Program and Tex., U., Civil Eng. Dept., Austin).

*(Am. Ind. Hyg., Conf., Pittsburgh, May 16–20, 1966).*

*American Industrial Hygiene Association Journal,* vol. 29, Jan.–Feb. 1968, p. 94–100. 15 refs.

The investigation of broad-beam gamma attenuation by thin sections of steel, aluminum, and glass was undertaken because of a dearth of such data on these important structural materials. Evaluating the shielding capabilities of automobiles and modern buildings requires knowledge about the broad-beam attenuation of gamma radiation under the conditions of these experiments. For calculations of broad-beam gamma attenuation by thin sections of steel assuming exponential attenuation ($B_n=1.0$) will not cause serious error (<10%). The buildup factors for the thin sections of aluminum and glass varied exponentially with the thickness; i.e., $B_n=e^{kx}$, where k was constant over the range of experiments ($\approx 0.317$ for the aluminum and glass).

**A68-80811**
**AORTIC BLOOD PRESSURE AND VELOCITY AS A FUNCTION OF TIME AND POSITION.**

Robert M. Olson (USAF School of Aerospace Med., Aerospace Med. Div., Brooks AFB, Tex.)

*Journal of Applied Physiology,* vol. 24, Apr. 1968, p. 563–569. 6 refs.

A method is presented whereby aortic blood pressure and velocity can be estimated as a function of time during the cardiac cycle and position along the aorta. Pressures are measured simultaneously at multiple sites in the aorta. Three-dimensional models are then constructed in which pressure is plotted along the vertical axis and time and position are plotted along mutually perpendicular horizontal axes. The basic equations of the pressure gradient technique are then used to transform this pressure mapping into a velocity mapping. Besides providing the most complete description possible of aortic blood pressure and velocity, the technique is important for several reasons. First, it should improve the accuracy of pressure-derived blood velocity estimates; next, it allows one to estimate aortic side branch flow by a surgically simple technique; finally, it provides data from which other important and new data can be derived.

**A68-80812**
**AN INSTANT HEART RATE MONITOR.**

L. L. Hamilton (Highland View Hosp., Metab. Ward, Cleveland, Ohio).

*Journal of Applied Physiology,* vol. 24, Apr. 1968, p. 585–587. 7 refs.

Grants VRA RD-1144-M and VRA RD-2376-M.

A low-cost transistorized device is presented which provides an output voltage proportional to the instantaneous frequency of electrical pulses applied to its input. Linearity is within 5% over the range 30–150 pulses/response. Excellent heart rate resolution is provided at slow chart speeds.

**A68-80813**

**METABOLIC DEPRESSION AND OXYGEN DEPLETION IN THE DIVING TURTLE.**

Donald C. Jackson (Pa., U., School of Med., Dept. of Physiol., Philadelphia).

*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 503–509. 26 refs.

Grant PHS GM 14562.

Heat loss from the turtle, *Pseudemys scripta elegans*, was measured by direct calorimetry during experimental dives lasting four hr. at 24°C. and was correlated with the depletion rate of blood and lung oxygen. On the basis of this correlation the diving period was subdivided into three metabolic phases: I, heat loss at the predive rate persisted 20–25 min. while oxygen concentrations were rapidly falling; II, the rate of heat loss rapidly declined to 40% of the initial rate from 25–45 min. while available oxygen reserves were exhausted; III, for the remainder of the dive the rate of heat loss gradually declined to 15% of the predive rate while oxygen reserves remained low and constant. Central body temperature and muscle electrical activity decreased in parallel fashion to heat loss when measured simultaneously during diving. These results provide evidence for the hypothesis that metabolic rate falls during diving due to reduction in tissue oxygen supply.

**A68-80814**

**EFFECT OF TRAINING ON CIRCULATORY RESPONSE TO EXERCISE.**

Björn Ekblom, Per-Olof Åstrand, Bengt Saltin, Jesper Stenberg, and Brittmari Wallström (Gymnastik-och Idrottshögskolan, Dept. of Physiol., Stockholm, Sweden).

*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 518–528. 24 refs. Swed. Natl. Assn. against Heart and Chest Diseases, Swed. Sports Federation, and Swed. Med. Res. Council supported research.

Submaximal and maximal work was performed by eight male students, aged 19–27 yr., on a bicycle ergometer before and after 16 wk. of physical training. Oxygen uptake, heart rate, cardiac output (dye-dilution technique), and blood pressure were determined. **The maximal oxygen uptake increased from 3.15 to 3.68 liters/min., partly due to an increased arteriovenous oxygen difference (from 138 to 143 ml./liter) and partly due to an increased cardiac output (from 22.4 to 24.2 liters/min.). Since the maximal heart rate was unchanged, the main cause for the increased cardiac output was the stroke volume (from 112 to 127 ml.). The mean blood pressure** during and the peak blood lactate concentration after the maximal work were significantly higher after the training. The mechanical efficiency during submaximal work was improved. At a given submaximal oxygen uptake heart rate, cardiac output, and blood lactate concentration was lower, the stroke volume unchanged, and the arteriovenous oxygen difference higher after the training.

**A68-80815**

**EFFECT OF OXYGEN AT 2 ATMOSPHERES ON THE PULMONARY MECHANICS OF NORMAL MAN.**

Aron B. Fisher, Richard W. Hyde, Ricardo J. M. Puy, James M. Clark, and C. J. Lambertsen (Pa., U., School of Med., Depts. of Pharmacol., Physiol. (Div. of Graduate Med.), and Med., Philadelphia).

*Journal of Applied Physiology*, vol. 24, Apr. 1968 p. 529–536. 35 refs.

Contract Nonr 551(58), Grants NIH HE-08184, NIH HE-08899, and NIH 2T1-GM-957-05.

**Six normal subjects who inspired pure oxygen at an ambient pressure of two Ata for 6–11 hr. developed symptoms of pulmonary** irritation and statistically significant changes in vital capacity and dynamic pulmonary compliance. Changes in functional residual capacity, residual volume, airway resistance, total pulmonary resistance, and chest roentgenograms were not significant. Transpulmonary pressure gradients in two subjects were found after oxygen exposure to be less during forceful inspiration. Measurement of lung volumes and pulmonary mechanics made 14–22 hr. after discontinuing the oxygen exposure were not significantly different from control. The findings suggest that with this degree of oxygen exposure (1) long-lasting alterations of the mechanical properties of the lung did not occur, (2) the progressive decrease in vital capacity may have resulted from factors which limited inspiratory effort, (3) obstruction of large airways was not a major manifestation, and (4) decreased lung compliance could not be attributed to atelectasis or pulmonary edema but may have resulted from a number of factors including alterations of lung surfactant or pulmonary tissue elastic elements.

**A68-80816**

**ALTERATIONS IN THE PULMONARY CAPILLARY BED DURING EARLY $O_2$ TOXICITY IN MAN.**

Ricardo J. M. Puy, Richard W. Hyde, Aron B. Fisher, James M. Clark, J. Dickson, and C. J. Lambertsen (Pa., U., School of Med., Depts. of Physiol. (Div. of Graduate Med.), Pharmacol., and Med., Philadelphia).

*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 537–543. 36 refs.

Contract Nonr 551(58), Grants NIH HE-08184, NIH HE-08899, and NIH HE-10324; Consejo Nacl. de Invest. Cient. y Téc., Argentina supported research.

The effect of oxygen toxicity on the pulmonary capillary bed of humans was evaluated in six normal subjects who breathed 99.8% $O_2$ at 1,500 mm. Hg for 6–11 hr. in a pressure chamber. The diffusing capacity ($DL_{CO}$), pulmonary capillary blood volume (Vc), diffusing capacity of the alveolar membrane (Dm), capillary blood flow (Qc), and pulmonary parenchymal tissue volume (Vt) were measured with single-breath techniques before and after $O_2$ exposure. Following oxygen at high pressure (OHP) measurements were made 0.5–4 hr. after return to sea level (post-$O_2$ measurements) and again 12–20 hr. after the termination of OHP (follow-up measurements). Of the above findings, only changes in $DL_{CO}$ and Vc were statistically significant either at post-$O_2$ or follow-up measurements. The lack **of significant changes in Vt associated with a modest decrease in Vc suggests that marked alterations in pulmonary structure, such as seen in animals during severe $O_2$ poisoning, was not present in these subjects. Most likely, the fall in Vc and $DL_{CO}$ was secondary to a toxic effect of $O_2$ on the pulmonary capillaries.**

**A68-80817**

**STATIC VOLUME-PRESSURE CHARACTERISTICS OF THE RIB CAGE AND ABDOMEN.**

Kimio Konno and Jere Mead (Harvard School of Public Health, Dept. of Physiol., Boston, Mass.).

*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 544–548. 6 refs.

Grants PHS AP-00229 and PHS 5-R01-GM-12564.

The separate static volume-pressure characteristics of the rib cage and abdomen in six human subjects were measured by combining estimates of relaxation volumes, based on an analysis of changes in anteroposterior diameters of the rib cage and abdomen, with relaxation pressures measured between the esophagus and atmosphere for the rib cage and between the stomach and atmosphere for the abdomen. The abdomen to be less compliant than the rib cage for large volume changes was found. In the **volume range of quiet breathing, however, it is nearly as compliant as the rib cage in standing, and somewhat more compliant in supine** subjects. These findings are related to the relative contributions of rib cage and abdomen during quiet breathing and during vital capacity maneuvers and the problem of estimating the work of chest wall distortion is discussed.

A68-81818

A68-80818
**A NEW, MINIATURIZED, MULTICHANNEL, PERSONAL RADIOTELEMETRY SYSTEM.**
R. H. Murray, A. Marko, A. T. Kissen, and D. W. McGuire (Ind. U., Cardiopulmonary Lab. and Environ. Med. Div., Wright-Patterson AFB and Dayton, U., Res. Inst., Ohio).
*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 588–592. 8 refs.
Contracts AF 33(615) 2922 and AF 33(625) 2182.

A miniaturized, multichannel, pulse-duration modulated and multiplexed, personal radiotelemetry unit has been described for the simultaneous transmission of three electrocardiographic signals, environmental or body temperature, expired air flow, and oxygen tension, permitting the on-line determination of oxygen consumption. The system has been devised and constructed for the monitoring of subjects during work (including vigorous exercise) and exposures to environmental stresses.

A68-80819
**THE TOXICITY OF POLYTETRAFLUOROETHYLENE PYROLYSIS PRODUCTS—INCLUDING CARBONYL FLUORIDE AND A REACTION PRODUCT, SILICON TETRAFLUORIDE.**
Lester D. Scheel, William C. Lane, and W. Emile Coleman (PHS, Natl. Center for Urban and Ind. Health, Occupational Health Program, Cincinnati, Ohio).
*American Industrial Hygiene Association Journal*, vol. 29, Jan.–Feb. 1968, p. 41–48. 11 refs.

The toxicity of pyrolysis products (550° C.) of polytetrafluoroethylene (PTFE) was evaluated by exposure of dogs, rabbits, guinea pigs, rats and mice. Carbonyl fluoride ($COF_2$) was identified as the principal toxic component. One-hr. exposures of rats showed a 24-hr. $LC_{50}$ of 370 p.p.m. for the pyrolysis products and an $LC_{50}$ of 360 p.p.m. for $COF_2$. When PTFE is pyrolyzed in the absence of silica, the products are less toxic to a slight degree. Pathology revealed changes in the lungs and livers of exposed animals. Irritation of the lungs may persist for some days.

A68-80820
**EFFECTS OF I.C.I. 50172 IN MAN DURING ERECT EXERCISE.**
Derek Gibson and Edgar Sowton (Inst. of Cardiol. and Natl. Heart Hosp., London, Great Britain).
*British Medical Journal*, vol. 1, Jan. 27, 1968, p. 213–215. 10 refs.

The intravenous injection of five mg. of (4-2-hydroxy-3-isopropylamino-propoxy acetanilide) during erect submaximal exercise in subjects with good cardiac function resulted in the following changes: heart rate fell by 16%, but stroke volume increased so that cardiac output remained constant; and left ventricular ejection time increased but left ventricular systolic ejection rate, left ventricular work, aortic pressure, pulmonary artery pressure, and pulmonary capillary wedge pressure did not change significantly.

A68-80821
**CONTINUOUS INTRAVENOUS DRIP OF PENTATHOL SODIUM FOR CONTROL OF VIOLENT PATIENT DURING 41-HOUR FLIGHT.**
Robert D. Chaney (Ind. U., Med. Center, Dept. of Anesthesiol., Indianapolis).
*Anesthesia and Analgesia*, vol. 47, Jan.–Feb. 1968, p. 84–86.

A case report of a psychiatric patient who required sedation for safe transportation by commercial airlines was presented. Patient preparations necessary before and during the flight were given, and the methods of restraint and administration of sodium thiopental were described.

A68-80822
**STANDARDIZATION OF E. COLI STRAINS IN FECES OF CHILDREN IN THE FIRST HALF OF YEAR AND THE FORMATION OF ANTIBODIES AGAINST THE FOUND TYPES [TYPIZACE KMENU E. COLI VE STOLICI DETI V PRVNIM PULROCE ZIVOTA A TVORBA PROTILATEK PROTI NALEZENYM TYPUM].**
Z. Nejedlá, E. Srajbr, and A. Lanc.
*Ceskoslovenská Pediatrie*, vol. 22, Oct. 1967, p. 907–912. 10 refs. In Czech.

The partial standardization (according to O-antigens) of *E. coli*, isolated from the feces of four subjects observed from birth to the age of six mo. was performed. The samples of feces was taken in 14 to 28 day intervals. The titers of antibodies against all types found in the feces, those found in the mothers and the types 026, 055, 079, were determined every two wk. The same types of *E. coli* was found in two children as in their mothers. The children transfered the types of *E. coli* to each other. The types of *E. coli* in feces changed not only in relation to food or quality of the feces, but also without any clinical symptoms of the child. The strain that was overpassed by another appeared again after some time.

A68-80823
**THE CSF LACTATE/PYRUVATE RATIO IN CEREBRAL HYPOXIA.**
B. K. Siesjö, Å. Kjällquist, and N. Zwetnow (Lund, U., Dept. of Neurosurg.; Lasarettet, E-blocket, Neurosurg. Res. Lab., Lund; and Gothenburg, U., Sweden).
*Life Sciences*, vol. 7, Jan. 15, 1968, p. 45–52. 18 refs.
Contract ONR F6 1052 67C 0052 and Swed. Med. Res. Council supported research.

The lactate/pyruvate ratio of cisternal cerebrospinal fluid (CSF) was measured in anesthetized and artificially ventilated dogs during experimental reductions of the cerebral perfusion pressure. The lactate/pyruvate ratio was found to increase even after such slight reductions in cerebral perfusion pressure which did not significantly lower the cerebral blood flow. Since also a moderate traumatization of the brain, as that caused by ventricular puncture, could lead to an increased CSF lactate/pyruvate ratio it is concluded that this parameter is a sensitive indicator of cerebral hypoxia.

A68-80824
**SOME TYPES OF OCULAR NYSTAGMUS AND THEIR NEUROLOGICAL MECHANISMS.**
C. S. Hallpike (Middlesex Hosp., Ferens Inst. of Otolaryngol., London, Great Britain).
*Proceedings of the Royal Society of Medicine*, vol. 60, Oct. 1967, p. 1043–1054. 33 refs.

Various types of ocular nystagmus and their neurological mechanisms were discussed. The literature concerning nystagmus was reviewed. Included were discussions involving canal nystagmus, central or deviation-maintenance nystagmus and positional nystagmus of the central or direction-changing type.

A68-80825
**RESPONSES OF THE OCULOMOTOR UNITS TO THE LABYRINTH STIMULATION UNDER HYPOTHERMIA.**
C. Desole and E. A. Pallestrini (Sassari, U., Ist. di Fisiol. Umana, Sardegna, Italy).
*Experientia*, vol. 23, Oct. 15, 1967, p. 823–824. 9 refs.

The behavior of the oculomotor unit responses to the stimulation of the labyrinth in curarized guinea pigs during progressive body cooling and rewarming was analyzed. Rhythmic responses of the action potentials were recorded. The quick responses increased in frequency at a body temperature of 28°C. and were replaced by a tonic activation below 24°C. During rewarming, no quick

responses were recorded at a body temperature of 24°C., but they reappeared at higher temperatures. These results showed for the first time that the rhythmic responses of the oculomotor units to the stimulation of one semi-circular canal were abolished by cooling the guinea pigs below a colonic temperature of 24 to 26°C.

**A68-80826**

**RELATIONS BETWEEN THE INFLUENCES OF SHORT IRRADIATION UPON RESTING POTENTIAL, THRESHOLD OF ELECTRICAL STIMULATION AND RESISTANCE OF CELL MEMBRANE OF NITELLA FLEXILIS [ZUSAMMENHANGE ZWISCHEN DEN STRAHLENBEEINFLUSSUNGEN DER MEMBRANSPANNUNG, DER ELEKTRISCHEN REIZSCHWELLE UND DES OHMSCHEN WIDERSTANDES DER ZELLMEMBRAN VON NITELLA FLEXILIS].**

U.-P. Hansen (Inst. für Angew. Physik., Kiel, West Germany).

*Atomkernenergie,* vol. 12, Nov./Dec. 1967, p. 447–462. 61 refs. In German.

Short irradiation of cell membranes caused diminution of resting potential, threshold and resistance. Investigations made on cells of the alga, *Nitella flexilis,* verified the fact that these phenomenon are related and can be reduced to an enhancement of the passive permeabilities of the plasmalemma. The opinion that irradiation interferes with the mechanism of the Hodgkin and Huxley theory was discussed. This would mean that only the permeability of chloride ions is increased (below 30 mv.). The results of the investigations were used to test the hypothesis of Vanselow. Some peculiarities were demonstrated, such as the very slow oscillations of the resting potential lasting for several hours.

**A68-80827**

**THE SUPPLY OF THE MUSCLES WITH ENERGY AFTER CONTINUOUS HYPOFUNCTION.**

E. Russanov (Bulg. Acad. of Sci., Inst. of Physiol., Sofia).

*Comptes Rendus de l'Academie Bulgare des Sciences,* vol. 20, no. 4, 1967, p. 389–392. 9 refs.

Rabbits kept under conditions of motor restriction for six mo. were used to examine the metabolic changes characteristic of the energy supply to muscles subjected to continuous hypofunction. The test animals showed no change in appearance, behavior or weight. These was a considerable reduction in glycogen concentration and a lesser decrease of creatine phosphate. Continuous muscular hypofunction caused no essential changes in the adeninenucleotide content. Since energy expenditure was reduced during continuous hypofunction, it was assumed that the energy supply of the muscles was adapted to the level of physiological function.

**A68-80828**

**CRITICAL-FLICKER-FUSION THRESHOLDS AS A FUNCTION OF VERY SMALL PULSE-TO-CYCLE FRACTIONS.**

Robert W. Powell and James C. Smith (Fla. State U., Tallahassee).

*Psychological Record,* vol. 18, Jan. 1968, p. 35–40. 16 refs.

Contracts AEC AT-(40-1)-2903 and AEC AT-(40-1)-2690.

As a follow-up to an earlier study, critical-flicker-fusion thresholds were determined as a function of two additional pulse-to-cycle fractions (.025, .05). The subjects were the same four white Carneaux pigeons used in the earlier study. The Estes–Skinner conditioned-suppression paradigm was used to assess the thresholds. Threshold determinations were made at three levels of illumination (30, 300, 30.30 and .0303 millilamberts). All subjects showed a uniform and approximately linear drop in thresholds from the peak that had been achieved with a pulse-to-cycle fraction of .10. While the break was most pronounced at the high and medium level of illumination, some drop-off also occurred at the low stimulus intensity. The relationship of these findings to Bartley's model is discussed.

**A68-80829**

**THE EFFECT OF FLICKER ON EYE MOVEMENTS.**

D. C. West and P. R. Boyce (Reading, U., J. J. Thomson Phys. Lab., Great Britain).

*Vision Research,* vol. 8, Feb. 1968, p. 171–192. 15 refs.

Grant PHS B.1233 and D.S.I.R. supported research.

Recordings of fixation eye movements were made in the presence of flickered illumination using both the optical level and strain gauge techniques. It was found that for low frequency flicker (3 c.p.s.) the saccade rate increased significantly and that there existed a definite time relationship between the onset of the light phase of the flicker and the occurrence of a saccade. Further experiments revealed that this effect only occurred when the information available concerning the position of the fixation target was intermittent. The results are discussed in terms of the control of drift rate to optimise the operation of the fixation control system.

**A68-80830**

**EFFECTS OF HIGH ELECTRIC FIELDS ON MICROORGANISMS. II. MECHANISM OF ACTION OF THE LETHAL EFFECT.**

W. A. Hamilton and A. J. H. Sale (Unilever Res. Lab., Bedford, Great Britain).

*Biochimica et Biophysica Acta,* vol. 148, Dec. 27, 1967, p. 789–800. 26 refs.

The mechanism by which high electric field strengths, delivered as a series of pulses of direct current, kill vegetative bacterial cells in suspension was studied. Membrane damage was demonstrated by the lysis of erythrocytes and protoplasts, the leakage of intracellular contents, the loss of the ability of *Escherichia coli* to plasmolyze in a hypertonic medium and the release of -galactosidase activity in a permease-negative mutant of *E. coli.* In a suspension of *Staphylococcus aureus* the number of cells killed by an electric field correlated with the number that could not be converted to spherosplasts. Spores of *Bacillus cerus* and Bacillus polymyxa were resistant to electric field strengths up to 30 kv./cm. The development of sensitivity during germination and outgrowth was due to the emergence of the vegetative cell from the protection afforded by the spore coat and cortex layers. The d.c.-pulse treatment caused loss of motility and synthesis of the induced enzyme -galactosidase in vegetative bacteria, but no inhibitions were demonstrated with a number of isolated enzyme activities. It was proposed that the electric field caused an irreversible loss of the membrane's function as the semipermeable barrier between the bacterial cell and its environment, and that this was the cause of cell death.

**A68-80831**

**EFFECTS OF HIGH ELECTRIC FIELDS ON MICROORGANISMS. I. KILLING OF BACTERIA AND YEASTS.**

A. J. H. Sale and W. A. Hamilton (Unilever Res. Lab., Bedford, Great Britain).

*Biochimica et Biophysica Acta,* vol. 148, Dec. 27, 1967, p. 781–788. 5 refs.

A lethal effect of high electric fields on a number of species of vegetative bacteria and yeasts was demonstrated. Fields up to 25 kv./cm. were applied as a series of direct current pulses to suspensions of the organisms. Death of the organisms was not due to the products of electrolysis; the temperature rise of the suspension was small and did not cause the lethal effect. The degree of kill of a population was determined by the product of the pulse length and number of pulses, and by the field strength in the suspension. The various species differed in their sensitivity to the electric field, the yeasts being more sensitive than the vegetative bacteria.

**A68-80832**
**BEHAVIORAL AND ANATOMICAL ANALYSIS OF VIBRATION SENSIBILITY.**
Robert J. Schwartzmann and Morton D. Bogdonoff (Duke U., Med. Center, Dept. of Med., Durham, N. C.).
*Experimental Neurology*, vol. 20, Jan. 1968, p. 43–51. 29 refs.
Grants PHS TO1 GM 01238 and PHS 5 RO1 MH10896.

The essential role of the dorsal funiculus for the discrimination of vibration sensibility has been studied in four monkeys. Animals were trained to respond positively only to vibratory stimuli. Dorsal column section was then performed. All animals retained the ability to respond positively to vibratory stimulation and relearning did not appear to be necessary. The ability to inhibit responses to negative cues was diminished following surgery and never fully restored. A change developed in the animals' behavior characterized by wandering of interest and sudden inattentiveness. It is concluded that vibration sensibility can be discriminated in the absence of the dorsal funiculus.

**A68-80833**
**RESPONSE OF CELLS TO RESTRICTED VISUAL STIMULI IN AN ASSOCIATION AREA OF CAT CEREBRAL CORTEX.**
R. Dubner and F. J. Brown (NIH, Natl. Inst. of Dental Res., Bethesda, Md.).
*Experimental Neurology*, vol. 20, Jan. 1968, p. 70–86. 39 refs.

Cellular responses to restricted light patterns (circular spots or vertical slits, 0.5–3.0 degrees in diameter) were studied in the anterior part of middle suprasylvian gyrus of cats anesthetized with chloralose. "On," "off," or "on-off," phasic responses were observed over almost the entire visual field when stimulus intensities were two or more log units brigher than the background. When near-threshold stimuli were employed, restricted receptive fields (3–30 degrees in diameter) were located near the center of the visual field. The most extensive receptive field mapping was done near the horizontal meridian and the type of response often changed as the stimulus was moved to different parts of the field. Cells were influenced by both eyes and summation was observed during binocular stimulation. Many of the cells also responded to auditory click stimuli. After surgical ablation or undercutting of ipsilateral visual cortical areas and section of the corpus callosum, cells rarely responded to restricted light stimuli although diffuse light stimuli were still effective. Transient depression of visual cortex by the application of KCl also eliminated cell responses to restricted spots of light; responses returned with recovery of the depressed cortical areas. The present data indicate that neurons in this association area respond to restricted visual stimuli in a specific manner, and this sensory-specific visual input is dependent upon participation of visual cortex. It is suggested that this cortical locus plays a role in complex sensory mechanisms involving intermodality, sensory-specific interactions.

**A68-80834**
**EFFECT OF DIET AND IN VIVO HYPEROXIA ON PLASMA TOCOPHEROL LEVELS.**
S. J. Szabo and C. E. Mengel (Ohio State U., Div. of Hematol. and Oncol., Dept. of Med., Columbus).
*American Journal of the Medical Sciences*, vol. 255, Feb. 1968, p. 132–136. 9 refs.
NASA Contract NAS 9-6910, Contract Nonr-495(30), Grants PHS CA-08702-01, and PHS I TOI CA-5192-01.

The tocopherol status of animals and humans had been shown previously to be critical with respect to susceptibility to oxygen toxicity, i.e. tocopherol deficiency increased the susceptibility to $O_2$ toxicity. In the present studies it was shown that: (1) short durations of fast or tocopherol-free diet are associated with decreases of plasma tocopherol (.59±.12 to 0.35±0.06 mg.%); and (2) rats exposed to 100% $O_2$ for five days at five psia had additional significant decreases of plasma tocopherol levels (from 0.36±0.09 to 0.28±0.06 mg.%). *In vitro* bubbling of $O_2$ through plasma for up to 15 hr. did not influence tocopherol levels. In contrast, plasma levels of tocopherol decreased to zero within three hr. during exposure to $H_2O$ vapor. The data suggest: (1) *in vivo* consumption of tocopherol by hyperoxia; (2) that this effect is due to $H_2O$ formation rather than $O_2$ *per se*; and (3) that changes of diet and/or sustained hyperoxia could render an initially normal animal more susceptible to oxygen toxicity.

**A68-80835**
**EXERCISE IN MEDICINE: A REVIEW.**
Peter V. Karpovich (Springfield Coll., Physiol. Res. Lab., Mass.).
*Archives of Physical Medicine and Rehabilitation*, vol. 49, Feb. 1968, p. 66–76. 36 refs.

This brief review deals with the use of various types of exercise and physical activities in medical practice. Isotonic and isometric exercises and their advantages and disadvantages are discussed. A new method of testing isotonically maximum muscle strength is presented. The effects of exercise on bones and muscles, body weight control, posture, heart, lungs, in surgery, mental disorders and geriatrics are mentioned. Because warming-up has certain medical aspects, a new point-of-view regarding warming-up is presented.

**A68-80836**
**VISUAL DISINHIBITION WITH BINOCULAR AND INTEROCULAR PRESENTATIONS.**
Daniel N. Robinson (Columbia U., Electron. Res. Labs., New York, N. Y.).
*Journal of the Optical Society of America*, vol. 58, Feb. 1968, p. 254–257. 22 refs.

Subjects were given combinations of two and three brief concentric flashes of equal luminance under backward masking conditions. Intervals between the first (TF) and second (CF) flashes were 10, 20, 50, 75, 100, and 200 msec. When third flashes (DF) were present, they were separated from CF by the same intervals. Two modes of presentation were employed: binocular presentations in which all flashes were presented to both eyes and interocular presentations in which TF and CF were presented to the left eye and DF to the right. With binocular view, the backward masking of CF by DF resulted in the disinhibition of TF, otherwise masked by CF under two-flash conditions. Disinhibition was not obtained under interocular presentations. A major conclusion is that recurrent influences within the human retina are not preserved more centrally (retrochiasmally) in the visual system.

**A68-80837**
**LUMINANCE REQUIREMENTS FOR HUE PERCEPTION IN SMALL TARGETS.**
Mary M. Connors (NASA, Ames Res. Center, Moffett Field, Calif.).
*Journal of the Optical Society of America*, vol. 58, Feb. 1968, p. 258–263. 28 refs.

This study investigated the luminances necessary to perceive red (642 nm.), green (521 nm.), and blue (468 nm.) at nine visual angles ranging from over 1° to 21 sec of arc diam. Monocular, foveal measurements were made by the method of constant stimuli at exposures of 44 and 700 msec. duration. Three color-normals served as observers. The results show that, with sufficient luminance, these hues can be seen even for stimuli as small as 0.35 min. of arc diam. Red is generally perceived at lower luminances than blue or green. There is an inverse relationship between stimulus size and luminance necessary for hue perception which can be represented as two linear functions. At small angles, the area-luminance slopes bracket, but tend to be somewhat larger than the slope predicted by Ricco's law; at larger angles, the function resembles that predicted by Piper's law. The change of function from approximately $A \cdot I = C$ to approximately $A^{0.5} \cdot I = C$ occurs at higher visual angles for shorter exposures.

**A68-80838**

**OCULOMETER FOR 'HANDS-OFF' POINTING AND TRACKING.**

John Merchant.

*Space/Aeronautics,* vol. 49, Feb. 1968, p. 92–95.

NASA-Cambridge supported research.

A tracking system designed to sense, and respond to the motion of the operator's eyes rather than the forces exerted by his hand during the tracking of moving objects was presented. The oculometer consisted of an optical system, the electro-optical sensor and an electronic system. The laboratory model of the oculometer had a simple direct-viewing configuration. It is applicable to control functions and target designations.

**A68-80839**

**RESPONSE OF GERMFREE, CONVENTIONAL, CONVENTIONALIZED AND E. COLI MONOCONTAMINATED MICE TO STARVATION.**

Bud Tennant, Ole J. Malm, Richard E. Horowitz, and Stanley M. Levenson (Walter Reed Army Med. Center, Walter Reed Army Inst. of Res., Div. of Basic Surg. Res., Dept. of Germfree Res., Washington, D. C. and Yeshiva U., Albert Einstein Coll. of Med., Dept. of Surg., New York, N. Y.).

*(Federation of Am. Soc. for Exptl. Biol., Ann. Meeting, Atlantic City, Apr. 1962).*

*Journal of Nutrition,* vol. 94, Feb. 1968, p. 151–160. 18 refs.

Grants DA-49-193-61-G2/MD, DA A-5664, and NIH K6-GM-14,208.

The response of germfree, conventional, conventionalized and *Escherichia coli* monocontaminated mice to starvation was studied. This was undertaken as an extension of some investigations of the effect of microorganisms on the reactions of mice and rats to shock and radiation injury because acute deprivation of food is a common feature of such experiments. Since fasting markedly influences the physiologic and biochemical responses of mice and rats to injury, the results of such experiments reflect the combined effects of injury and food deprivation. Clearly, those factors which condition the animal's response to starvation are of prime importance in evaluating the response of the injury. Conventional and conventionalized mice survived significantly longer than germfree mice when starved. This difference in survival was not due to differences in the rates of loss of body weight by these groups, since the rates of weight loss were the same. The germfree mice died weighing significantly more than the conventional and conventionalized mice. Mice purposefully monocontaminated with a single strain of *E. coli* (sero-group 024) survived longer than germfree mice in one experiment, but this effect was not constant. Again, the rates of weight loss were the same for these groups of mice. The response to starvation of germfree *E. coli* monocontaminated mice was not altered by parenteral administration of thiamine.

**A68-80840**

**THE EFFECT OF ENVIRONMENTAL TEMPERATURE ON SUCCINIC DEHYDROGENASE ACTIVITY IN THE EAR SKIN OF THE RABBIT.**

Cecily M. Joyce (Trinity Coll., Dept. of Zool., Dublin, Ireland).

*Proceedings of the Royal Irish Academy,* vol. 65, Oct. 1967, p. 425–435. 24 refs. U.S. Army supported research.

Mean ear skin temperatures of rabbits kept at environmental temperatures of 20°C. and 6°C. were 32.4° and 13.5° respectively. Individual rabbits kept at 6° with a heater over one ear showed a mean difference of 12.5° in skin temperature between the two ears. There was no significant difference in the rate of oxygen consumption of isolated ear skin measured at 30° between rabbits adapted to 20° and those adapted to 6°. The nitrogen content of ear skin from 6°-adapted rabbits was significantly higher than from 20°-adapted animals. Succinic dehydrogenase activity measured at a standard temperature is significantly higher in ear skin from 6°-adapted as compared with 20°-adapted rabbits. There is a significant rise in the activity of this enzyme in the cold ear of 20°-adapted rabbits placed at 6° for two days with one ear heated. The warm ear of these rabbits showed an activity similar to that of 20°-adapted animals. This shows that local application of heat or cold produces changes in the activity of this enzyme similar to those found in warm- or cold-adapted animals. Culture experiments in which the ear skin was maintained for two days under aseptic conditions in organ culture at 33° and 12° gave the opposite results. Namely, succinic dehydrogenase activity was significantly lower in the skin cultured at 12° as compared with that cultured at 33°. Reversal experiments showed that this difference was not due to depletion of reserves or ageing. It is concluded that ear skin succinic dehydrogenase activity is controlled by some central agent, possibly a hormone, the effect of which differs according to the temperature of the target organ (the synthetic systems in the ear skin).

**A68-80841**

**INCREMENT-THRESHOLD SPECTRAL SENSITIVITY OF THE RHESUS MONKEY AS A FUNCTION OF THE SPECTRAL COMPOSITION OF THE BACKGROUND FIELD.**

H. G. Sperling, N. A. Sidley, W. S. Dockens, and C. L. Jolliffe (Honeywell, Inc., Systems and Res. Div., St. Paul, Minn.).

*Journal of the Optical Society of America,* vol. 58, Feb. 1968, p. 263–268. 8 refs.

Contract DA-49-193-MD2457.

Increment-threshold spectral sensitivity was measured on rhesus monkeys. Homogeneous 20° backgrounds were used, illuminated by a planckian radiator (2,854°K. white) producing 3,000 trolands retinal illuminance and also that white plus an intense spectral-line field of 10,000 td. The white background produced sensitivity functions with pronounced peaks at approximately 450 nm., 535 nm., and 610 nm. Adding intense red, green, or blue light to the background served to eliminate or nearly eliminate the peak in the spectral region nearest the spectral-background component. For the red and green lines, the peaks in the other parts of the spectrum were only slightly reduced. For the blue line, the entire function was altered, with greater reduction of sensitivity through the entire visible spectrum, resulting in a function with a single broad peak in the 570–90 nm. region. The results are discussed in terms of the summation of component receptor mechanism to account for the blue adaptation results and a comparison is made with results from electrophysiological studies.

**A68-80842**

**EFFECT OF DIFFERENT FREQUENCIES OF VIBRATION ON PAIN-THRESHOLD DETECTION.**

Richard Sullivan (New York City, Coll. and Bellevue Hosp., Second (Cornell) Neurol. Serv., New York City, N. Y.).

*Experimental Neurology,* vol. 20, Jan. 1968, p. 135–142. 12 refs.

Radiant-heat pain threshold judgments were obtained from human subjects while the stimulated region was simultaneously vibrated with one of three vibration frequencies. Threshold detection of pain was found to be a function of the frequency of applied vibration. The results are interpreted in terms of a current theory of pain reception.

**A68-80843**

**CONDUCTION VELOCITIES IN THE ABDUCENS NERVE CORRELATED WITH VESTIBULAR NYSTAGMUS IN CATS.**

Yasuteru Yamanaka and Paul Bach-y-Rita (Pacific Med. Center, Smith-Kettlewell Inst. of Visual Sci., San Francisco, Calif.).

*Experimental Neurology,* vol. 20, Jan. 1968, p. 143–155. 13 refs.

Grants PHS NB-06038 and PHS K3-NB-14,094.

In encéphale isolé cat preparations the conduction velocities of nerve fibers teased from the central stump of the abducens

nerve emerging from the pons were measured by determining the time necessary for the nerve spike to travel from the first to the second pair of electrodes over which the nerve bundle had been placed. Lateral rectus muscle contraction was recorded simultaneously with nerve activity. Conduction velocities were distributed in two groups: slow, 6–40 m./sec., and fast, 41–83 m./sec. Slow fibers were active in the absence of movement, in both phases of nystagmus and during slow spontaneous eye deviations. Fast fibers were active during the fast phase and towards the latter portion of the slow phase of nystagmus. Fast fibers were never seen to discharge in the absence of movement. Thus it appears that the slow fibers are active principally during tonic movements and the fast fibers principally during phasic movements, although each type of fiber contributes to some portion of each type of movement.

**A68-80844**
**INTERACTIONS BETWEEN EXTRAOCULAR MYOTATIC AND ASCENDING VESTIBULAR ACTIVITIES.**

Bo E. Gernandt (Naval Aerospace Med. Center, Naval Aerospace Med. Inst., Pensacola, Fla.).

*Experimental Neurology*, vol. 20, Jan. 1968, p. 120–134. 30 refs.

The effect of bisensory convergence and interaction between extraocular myotatic and ascending vestibular activities, as reflected by recording from oculomotor nerves, the brain-stem reticular formation, or from single cells within that structure was studied in cats. As revealed by extraocular stretch receptor and vestibular nerve stimulation in a controlled temporal sequence, the vestibular responses were markedly inhibited by conditioning stretch-receptor volleys, but interference with extraocular stretch response by preceding vestibular activity was weak or absent at the same recording site. In the competition for access to the cells within the reticular formation the impulses evoked by extraocular muscle stretch-receptor activation dominated. Only the vestibulo-ocular impulses funneled through neurons within the brain-stem reticular formation are under the inhibitory control of extraocular muscle stretch activation. The vestibular activity conducted through the vestibular nuclei and along the medial longitudinal fasciculus to the oculomotor nuclei was uninfluenced by this inhibitory control, and no modification of the spontaneous activity in the oculomotor nuclei in response to passive stretch applied to the extrinsic ocular muscles could be observed.

**A68-80845**
**AN ON-LINE DIGITAL INTEGRATOR FOR PHYSIOLOGICAL DATA.**

James A. Freeman and Robert E. Smith (Ky., U., Dept. of Physiol. and Biophys., Lexington).

*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 593–597.
NASA Grant NGR 18-001-008.

Long-term on-line integration of physiological data utilizing conventional analog integrator circuitry is of limited feasibility due to both theoretical and economic considerations of integrating coefficients, noise, and drift. In order to meet a requirement for integration periods of 20-min. duration, a digital circuit has been developed which permits decreasing the integration coefficient by multiplying it by the ratio of two additional capacitors in the circuit. Digital integration occurs as input signals are transformed by a linear voltage to pulse frequency conversion into a series of pulses which are, in turn, collected through a linear transistor pump. Several advantages have been obtained by this approach to on-line integration, including much longer integration times than normally feasible, excellent signal to noise/drift characteristics, and linearity and repeatability as well as stability and low cost.

**A68-80846**
**INFLUENCE OF MOTIVATION ON PHYSICAL WORK CAPACITY AND PERFORMANCE.**

Jack H. Wilmore (Calif., U., Dept. of Phys. Educ., Berkeley).

*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 459–463. 22 refs. Calif., U. supported research.

The physical work capacities of 22 college-age males were assessed on a bicycle ergometer under two control conditions ($C_1$ and $C_2$) and one experimental condition (E) in which each subject was motivated through a competitive situation. The experimental condition (E) was established by having each subject compete against himself (attempting to surpass his work output in $C_1$) and simultaneously against a partner; the two being matched by their respective work outputs in $C_1$. The mean work output and riding time for condition E were significantly greater than for either of the control conditions. However, there were no statisticaly significant differences in the maximal physiological responses; i.e., heart rate, V, $VO_2$, or oxygen pulse, between the three conditions. It was concluded that the maximal values for these physiological variables are essentially fixed or absolute for any one individual on any particular exercise apparatus. It was further suggested that these supramaximal performances elicited under condition E result from an increased anaerobic rather than aerobic capacity, which is possibly due to reduced psychological inhibitions and a concomitant tolerance to increased levels of anaerobic metabolites.

**A68-80847**
**FAILURE OF PRECORDIAL-TO-ARTERIAL CLEARANCE RATIOS TO PREDICT A CORONARY FLOW INDEX.**

William J. MacIntyre and Walter H. Pritchard (Western Reserve U., School of Med., Dept. of Med., Cleveland, Ohio).

*Journal of Applied Physiology*, vol. 24, Apr. 1968, p. 464–467. 11 refs.
Grant NHI HE-06304.

The half-times of clearance of the trailing edge of dye-dilution curves recorded precordially for cardiac output determinations have been compared to the half-times measured from arterial sampling. This ratio has been found to be close to unity (1.01) which is in contradistinction to the results of other investigators who have measured a significant prolongation of the half-time of the precordial curve. The previous investigators had suggested that this prolongation is due to activity in the coronary vascular bed and had proposed that this ratio be used as an index of coronary flow. Although it is recognized that the collimation used in the present study differs from that used by the previous investigators, it is felt that the wide discrepancy in results suggests that use of this ratio as an index of coronary flow should not be accepted until the parameters of this type of measurement are more fully established and confirmed.

**A68-80848**
**THE EXISTENCE OF INCONVENIENCE THROUGH NOISE IN SOCIETY [FOREKOMSTEN AV BULLERSTORNINGAR I SAMHALLET].**

Erland Jonsson and Stefan Sörensen (Stockholm, U., Dept. of Sociol.; Natl. Inst. of Public Health, Dept. of Environ. Hyg.; and Karolinska Inst., Dept. of Hyg., Stockholm, Sweden).

*Nordisk Hygienisk Tidskrift*, vol. 48, no. 2, 1967, p. 21–34. 7 refs. In Swedish.

The results of two surveys involving noise hazards in society were presented. Data were compiled from local health authorities and from a postal survey comprising a representative sample of 2,000 adults. The local health authorities provided the number of cases of noise distrubances during the last five-yr. period. Almost one half the total number of cases involved noise within private homes. Industrial enterprises were also a major source of noise. Traffic noise was primarily stated as a source of inconvenience. The results of the postal investigation indicated that traffic noise, especially that caused by motor cycles and motorbicycles, disturbed the most people. Aircraft noise and noise in housing units were also mentioned frequently. In all 81% of the population stated that

they noticed some kind of noise stimuli, while 51% stated that they were disturbed by one or more noises. Urban areas show a higher frequency of disturbed individuals than rural areas. The city of Stockholm had a higher frequency of disturbed individuals than other parts of the country. The variables of sex, civil status and social status in connection with the two investigated variables "notices" and "is disturbed" by noise were studied. On the whole, however, the interdependence appeared to be comparatively sparse. Inconvenience caused by air pollution and littering were also reported. The results indicated that noise in society is a problem of great hygienic importance.

**A68-80849**
**RELATIONSHIP OF THE DURATION OF SUSTAINED VOLUNTARY ISOMETRIC CONTRACTION TO CHANGES IN ENDURANCE AND STRENGTH.**
Doyice Cotten (Ga. Southern Coll., Statesboro).
*Research Quarterly*, vol. 38, Oct. 1967, p. 366–374. 17 refs.
Natl. Assn. of Coll. Gymnastic Coaches supported research.

The research was undertaken to determine if an increase in the duration of a sustained voluntary isometric contraction is more closely related to changes in cardiovascular endurance or changes in strength. Twenty-four subjects were tested before and after a training program to determine their endurance (oxygen consumption) and strength. The training program consisted of one daily sustained voluntary isometric contraction of the left forearm flexors at a prescribed percentage of the subject's maximum isometric strength. When the mean duration of contractions for each group showed a significant increase, training ceased. The groups which trained with contractions of 50, 75, and 100% of a maximum voluntary contraction showed significant increases in strength, but not endurance. The group which trained with a 25% contraction increased significantly in endurance, but not in strength. The increased duration of contractions at percentages greater than or equal to 50% of a maximum voluntary contraction appeared to be due to increased strength. Hence, measuring cardiovascular endurance by the duration of a sustained voluntary isometric contraction at percentages greater than 25% seems unjustified.

**A68-80850**
**INTERINDIVIDUAL DIFFERENCES IN HEART RATE RESPONSE TO BICYCLE ERGOMETER WORK.**
Richard B. Alderman (Alberta, U., Fitness Res. Unit, Edmonton, Canada).
*Research Quarterly*, vol. 38, Oct. 1967, p. 323–329. 11 refs.

Forty subjects were given four separate bouts of exercise on a bycycle ergometer, two at 45.45 r.p.m. and two at 54.54 r.p.m. In each bout, resistance was progressively increased each successive minute by the addition of 0.5 kg. Exercise was terminated when the subject's heart rate reached 180 beats/min. Data were in terms of the amount of time required to reach particular levels of heart rate. Each of the test-retests were averaged to give a representative performance for each work load. The intercorrelation between the exercise times to 180 beats/min. for the two work loads was $r = 0.933$ after correction for attenuation. Therefore, 87% of the individual difference variance in heart rate response was common to the two work loads, while only 13% was specific to a particular work load.

**A68-80851**
**LIGHT INDUCED UPTAKE OF POTASSIUM AND CHLORIDE BY CHLORELLA PYRENOIDOSA.**
J. Barber (East Anglia, U., School of Biol. Sci., Norwich, Great Britain).
*Nature*, vol. 217, Mar. 2, 1968, p. 876–878. 9 refs.

The unidirectional fluxes of chloride and potassium ions were measured using K-42 and Cl-36 in order to determine if the light promoted uptake of those ions into *Chlorella pyrenoidosa* cells is driven by two different energy sources. It was suggested from the results that the light stimulated uptake of potassium and uptake of chloride by *Chlorella* are active processes. There was no clear evidence that the two fluxes are dependent on different sources of energy. It also seemed unlikely that they obtain the necessary energy directly from electron transport but possibly utilize ATP derived from cyclic and non-cyclic photophosphorylation. The close association of active chloride influxes with oxygen evolution may be a feature found only with vacuolated cells.

**A68-80852**
**STORAGE OF CARBON DIOXIDE IN MUSCLE.**
Mark Heymann and Neil Cherniack (Ill., U., Michael Reese Hosp. and Med. Center, Dept. of Med., Chicago).
*Nature*, vol. 217, Mar. 2, 1968, p. 865.

The carbon dioxide and oxygen tensions, the hydrogen ion concentration and the hematocrit of blood from the femoral artery and vein were measured, and the carbon dioxide contents were calculated during apnea in nine anesthetized and paralyzed dogs. The results supported the hypothesis that muscle carbon dioxide reaches equilibrium sluggishly after a change in arterial carbon dioxide tension, thus producing the reversal of the usual venous-arterial concentration differences.

**A68-80853**
**THE EFFECTS OF CAFFEINE ON FREE FATTY ACIDS AND BLOOD COAGULATION PARAMETERS OF DOGS.**
Samuel Bellet, Leonard J. Feinberg, Herschel Sandberg, and Masami Hirabayashi (Philadelphia Gen. Hosp., Div. of Cardiol., Pa.).
*Journal of Pharmacology and Experimental Therapeutics*, vol. 159, Feb. 1968, p. 250–254. 22 refs.
Grants PHS HE-05279 and PHS 5 Sol FR 05508; Found. for Cardiovascular Res. supported research.

Serial blood samples over a four-hr. period were drawn from 11 control dogs and 22 dogs who had received 25 mg./kg. of caffeine sodium benzoate i.v. These samples were analyzed for various parameters of clotting and free fatty acids. No significant differences between the caffeine-treated animals and the controls were noted in the tests for clotting time and partial thromboplastin time. Significant changes in the serum free fatty acid levels, however, were noted as early as 70 to 90 min. after the injection of caffeine. The elevations became more marked one hr. later and were even greater at the end of four hr. During the interval of two- and one-half to four hr. after the administration of caffeine, significant shortening of the *in vitro* heparin tolerance time, recalcification time of the plasma and the one-stage prothrombin time were observed. Only the heparin tolerance time was shortened during the 70- to 90-min. interval. The increase in free fatty acids was possibly the cause of the altered coagulation profile found in the caffeine-treated animals.

**A68-80854**
**SOME MANIFESTATIONS OF ENERGY STORAGE IN ALGAE AND CHLOROPLASTS.**
Roderick K. Clayton (Cornell U., Dept. of Eng. Phys. and Sect. of Genet., Develop. and Physiol., Ithaca, N. Y.).
*Archiv für Mikrobiologie*, vol. 59, Aug. 25, 1967, p. 49–58. 32 refs.
Contract AEC AT(30-1)-375.

**Dark-adapted plants must be "activated" by a flash of light** before they can evolve oxygen in response to a subsequent flash. The chemiluminescence of chloroplasts, evoked by a change of pH or of oxidation potential, also requires prior illumination. Delayed fluorescence and thermoluminescence are by definition dependent on prior illumination. An attempt is made to explain these well

known phenomena on a common basis. The resulting model accomodates many characteristics of the phenomena and suggests some new experiments.

**A68-80855**
**THE EFFECT OF LONG-TERM DESOXYCORTICOSTERONE ACETATE ADMINISTRATION ON THE RENAL EXCRETION OF CALCIUM AND MAGNESIUM.**
Shaul G. Massry, Jack W. Coburn, Lloyd W. Chapman, and Charles R. Kleeman (Veterans Admin. Center, Cedars-Sinai Med. Center, Depts. of Med. and Cedars-Sinai Med. Res. Inst., Los Angeles and Calif., U., School of Med., Los Angeles).
*Journal of Laboratory and Clinical Medicine*, vol. 71, Feb. 1968, p. 212–219. 18 refs.
Grants PHS AM 07190 and PHS AM 06087.

Although the acute administration of mineralocorticoids is without effect on urinary calcium and magnesium, certain data suggest that their excretion may increase under the prolonged effect of these hormones. The influence of desoxycorticosterone acetate (DOCA) administered for six consecutive days was studied in six normal dogs receiving a constant dietary intake. Endogeneous creatinine clearance did not vary. Sodium excretion fell on the first day of DOCA treatment, and then returned to base-line values. In contrast, urinary calcium and magnesium remained unchanged until the second or third day of DOCA administration, when they increased progressively to exceed control levels by six- to fourteen- and two- to fivefold respectively. These observations are consistent with the following sequence of events: (1) DOCA-induced sodium retention produces extracellular expansion; (2) this expansion results in decreased proximal tubular reabsorption of sodium, calcium, and magnesium with increased distal delivery of all; (3) mineralocorticoids promote distal tubular reabsorption of sodium with no effect on that of calcium and magnesium, causing increased excretion of only the last two ions.

**A68-80856**
**DISABILITY GLARE AND AGE.**
Veronica M. Reading (Inst. of Ophthalmol., Dept. of Physiol. Optics, London, Great Britain).
*Vision Research*, vol. 8, Feb. 1968, p. 207–214. 21 refs.
Min. of Transport supported research.

The re-adaptation times of observers subjected to white and yellow glare of equal luminance have been measured. Some eighty-three observers took part within an age range 17–66 yr. There is found to be a positive correlation between re-adaptation time and age in both illuminants. There is some evidence to suggest that, particularly for the younger age groups, the re-adaptation times are significantly lower in the presence of the white glare source. However, long term adaptational effects in the summer months eliminate differences between the two illuminants.

**A68-80857**
**CHROMATIC ADAPTATION AND STEADY-STATE EVOKED POTENTIALS.**
D. Regan (Keele, U., Dept. of Commun., Staffordshire, Great Britain).
*Vision Research*, vol. 8, Feb. 1968, p. 149–158. 20 refs.
Med. Res. Council supported research.

Steady-state scalp potentials were evoked by stimulating the eye with monochromatic light whose intensity was sinusoidally modulated at frequencies between four c.p.s. and 33 c.p.s. The modulated beam was superposed on an adapting beam whose color could be varied. Evoked potentials were recorded with an averaging computer, and with a cross correlator which measured harmonic components of the response waveform. Chromatic adaptation produced marked changes in the curve of response amplitude versus stimulus modulation frequency. The changes depended strongly on the color, but little on the intensity of the adapting light. The spatial distribution of the generators of the evoked potential depended on the colors of the adapting and modulated lights. The characteristics of the responses suggested that different mechanisms are important near the $\alpha$ frequency and around 16 c.p.s.

**A68-80858**
**CORTICAL RESPONSES TO STIMULATION OF THE HUMAN FOVEA.**
R. G. DeVoe, H. Ripps, and H. G. Vaughan, Jr. (N. Y. U., Med. Center, Dept. of Ophthalmol. and Albert Einstein Coll. of Med., Saul R. Korey Dept. of Med., New York City).
*Vision Research*, vol. 8, Feb. 1968, p. 135–147. 37 refs.
Grants PHS MH-06723, PHS NB-02589, PHS 5-K3-NB 18,766, and PHS 5-K3-NB 31,816.

Functional properties of the human fovea were studied by means of the visual evoked response (VER), and the results compared with subjective measurements obtained for equivalent stimulus conditions. Employing a constant VER latency as the response criterion for sensitivity determinations, we found excellent agreement between the VER and subjective thresholds in studies of the area-intensity relation, Stiles–Crawford effect and spectral sensitivity. However, VER and subjective sensitivity measurements differed in one important respect. Whereas the subjective sensitivity of the parafovea exceeded that of the fovea. VER sensitivity decreased markedly with increasing distance from the fovea. Thus, several lines of evidence indicate that the VER provides a valid objective index of foveal function.

**A68-80859**
**TESTING TWO-STATE THEORIES WITH OPERATING CHARACTERISTICS AND A POSTERIORI PROBABILITIES.**
Wayne A. Wickelgren (Mass. Inst. of Technol., Cambridge).
*Psychological Bulletin*, vol. 69, Feb. 1968, p. 126–131. 12 refs.
NASA Grant NsG 496 and Grant NIMH MH 08890-03.

The use of operating characteristics (OCs) and a posteriori probability functions to test 2-state theories of perception or memory is discussed. Such tests require the validity of certain additional assumptions about the operation of the decision system which maps the states of the perceptual or memory system into responses. In the case of OCs generated by the payoff method using binary responses, the required decision-making assumption is one specified by Luce. His 2-state decision rule has been tested by means of a decision-making experiment and shown to be valid. Thus, the binary-response OC generated by the payoff method can be used to both accept and reject the 2-state hypothesis in any situation. Questions are raised with regard to other methods of generating OCs concerning their suitability for testing the 2-state hypothesis. Confidence judgements (rating methods) are found to be less useful for testing 2-state theories, whether the results are analyzed by OCs or a posteriori probability functions.

**A68-80860**
**THE INTERACTION OF NOISE AND PERSONALITY WITH CRITICAL FLICKER FUSION PERFORMANCE.**
C. D. Frith (London, U., Inst. of Psychiat., Great Britain).
*British Journal of Psychology*, vol. 58, May 1967, p. 127–131. 16 refs.
Maudsley and Bethlem Roy. Res. Fund supported research.

A theory of the interaction of arousal, performance, and personality is outlined. On the basis of this theory it is predicted that an increase in noise will improve the performance of extraverts in a critical flicker fusion task more than that of introverts. An experiment confirming this prediction is described.

**A68-80861**
**RADIO TELEMETRIC EXAMINATION OF THE CARDIAC IMPULSE FREQUENCY AT AVERAGE AND LONG DISTANCE RUNNING AT MAXIMAL AND INTERVAL RUNNING DURING ANNUAL RUNNING TRAINING [RADIO-TELEMETRISCHE UNTERSUCHUNGEN DER HERZSCHLAGFREQUENZ AN MITTEL- UND LANGSTRECKENLAUFERN BEI MAXIMAL- UND INTERVALLAUFEN IM LAUFE DES JAHRESTRAININGS].**
Leon Bassan.
*Theorie und Praxis der Körperkultur*, vol. 16, Oct. 1967, p. 920–935. 28 refs. In German.

Heart rate during maximal running was determined at various times by radio-telemetric examination during the performance of highly-trained atheletes. After an adaptation period, a stabilization of the heart rate occurred which continued until the end of the running. During the maximal running, especially during the average distance (1,500 m.), a progressive decrease of the relationship, heart rate/m., was registered. With this relationship, known as the "Quotient of Physiological Stress", it was possible to reproduce the dynamics of the reaction of the organism in a run of changing physical loads. During yearly training, the economy of the physiological response to maximal physical load was determined. The results of telemetric examinations of the heart rate during a series of 400 m. interval work loads showed that an increase in the economy of the physiological response of the organism occurred parallel to the increase in work capacity during physical exercise. On the basis of this clear tendency of heart rate variations during yearly training, and also on the basis of a deterioration of this reaction after interruption of the training or during slight functional disturbances of circulation, it was assumed that an economic heart rate reaction during submaximal and maximal running load under natural conditions could be regarded as a criterion for an improvement of the training conditions of highly-trained athletes.

**A68-80862**
**BASAL CONDUCTANCE LEVEL AND MOTOR PERFORMANCE.**
R. S. Corteen (Edinburgh, U., Psychol. Dept., Great Britain).
*British Journal of Psychology*, vol. 58, May 1967, p. 93–100. 14 refs.

The relations between log. basal conductance and performance on three tasks were investigated. Significant relations were found with end spurt and reminiscence on the pursuit rotor, with overall performance on a dotting task, and with abnormally slow responses and optimum response speed in reaction time. These results are consistent with a view of basal conductance as a measure of 'tonic' activation or the ergotropic-trophotropic dimension of Hess.

**A68-80863**
**REPETITION AND IMMEDIATE MEMORY.**
E. C. Dalrymple-Alford (Beirut, Am. U., Lebanon).
*British Journal of Psychology*, vol. 58, May 1967, p. 63–67. 8 refs.

Subjects were presented with digit-combinations one digit at a time, in such a manner that each succeeding digit was presented only after all the preceding digits had been repeated by the subject in correct order. The number of digits the subjects could 'carry' in general did not differ from their memory spans. This together with the distribution of serial positions at which repetition broke down is taken as evidence for the view that repetition restores but does not further strengthen memory traces.

**A68-80864**
**INFORMATION PROCESSING RELATED TO STIMULUS NOVELTY AND COMPLEXITY IN A SIGNAL DETECTION PARADIGM.**
Bernard Weiner and Paul Feldman (Calif., U., Los Angeles).
*British Journal of Psychology*, vol. 58, May 1967, p. 69–75. 7 refs.
Grant NIH FR-3.

Three experiments are reported which investigated the informational properties of novel and complex stimuli. Irrelevant visual stimuli varying in novelty and complexity were employed as noise in an auditory signal detection task. Signal detection increased over the time of exposure of the visual stimuli, suggesting that the amount of information being processed from a stimulus is a function of its novelty. The judged complexity of the stimulus did not systematically influence signal detection. The investigations employed both within- and between-subjects experimental designs.

**A68-80865**
**CHOICE REACTION TIME: AN ANALYSIS OF THE MAJOR THEORETICAL POSITION.**
Edward E. Smith (St. Elizabeths Hosp., Behavioral and Clin. Studies Res. Center, Washington, D. C.).
*Psychological Bulletin*, vol. 69, Feb. 1968, p. 77–110. 91 refs.
Contract AF 49(638)-1235; NS A supported research.

This report analyzes and evaluates (against experimental findings) contemporary theories of choice reaction time (CRT). The influence of Donders' subtraction method on current theory is assessed, followed by a review of experimental findings concerned with the effects on CRT of (a) number of alternatives, (b) stimulus probability, (c) stimulus value, (d) repetition of stimulus or response, (e) stimulus discriminability, (f) stimulus-response compatibility, (g) practice, and (h) emphasis on speed vs. accuracy. A three-state conceptualization of the central mechanisms operative during the latent period—stimulus preprocessing, stimulus categorization, and response selection—is proposed. The theories are dichotomized on the basis of the process—template matching vs. feature testing—which is assumed to underlie stimulus categorization. The analysis indicates that current theories have neglected response-selection processes and are consequently unable to account for several experimental findings. A final section deals with the relation of CRT theories to perceptual recognition theories.

**A68-80866**
**GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF HUMAN FECAL BILE ACIDS.**
Edmond Evrard and Gerard Janssen (St. Rafaëlsklin., Lab. for Pathol. Biochem. and Rega Inst., Leuven, Belgium).
*Journal of Lipid Research*, vol. 9, Mar. 1968, p. 226–236. 21 refs.
Natl. Fonds voor Wetenschap. Med. Onderzoek, Brussels supported research.

A method for the determination of total bile acids in human feces that is suitable for routine application is described and discussed. Bile acids are extracted from freeze-dried feces with acetic acid and toluene, in the presence of the internal standard 23-nordeoxycholic acid. After saponification of the extract, bile acids and the internal standard are methylated and converted by mild chromic acid oxidation into their ketonic derivatives. The resultant mixture of a few stable compounds can be separated and measured quantitatively by gas-liquid chromatography on a methylsiloxane polymer. A reference bile acid mixture including the internal standard is also taken through the entire procedure with each series of samples. It has been demonstrated that, in spite of the omission of the usual purification steps, the method is specific for bile acids.

**A68-80867**
**COMPARISON OF MOTOR ABILITY, NEW MOTOR SKILL LEARNING, AND ADJUSTMENT TO A REARRANGED VISUAL FIELD.**

A68-80868

Barbara J. Hoepner (Calif., U., Berkeley).
*Research Quarterly*, vol. 38, Dec. 1967, p. 605–614. 15 refs.
Grant NIMH MH08061.

The ability of 48 college women to adjust hand–eye coordination in a rearranged visual field was compared with ability to learn a new motor skill and with present level of motor ability. The measuring instruments utilized included the Scott motor ability test, Moody's new motor skill learning test, and a variation of the mirror-box test of Held and Gottlieb. Subjects were exposed for one min. to each of four experimental treatments—moving chessmen and throwing a ball performed both while wearing prism-glasses and without wearing these glasses. Subjects received one treatment per day, two days per week; then the treatments were repeated in the same order and sequence, making a total of eight experimental sessions. The findings did not justify the conclusion that a relationship exists between motor ability or new motor skill learning and ability to adjust to a rearranged visual field. Wearing prism-glasses did not result in a consistent amount of visual rearrangement with each subject.

**A68-80868**
**EFFECTS OF EXERCISE ON THE BASAL CONCENTRATION OF ATP IN MUSCLE TISSUE.**
Julia W. Harris (N. C., U., Greensboro).
*Research Quarterly*, vol. 38, Dec. 1967, p. 598–604. 29 refs.

The problem involved the determination of the base concentration of adenosine-triphosphate (ATP) in muscle tissue of white rats. These animals had been forced to exercise (train) by swimming. The method used to analyze for ATP involved bioluminescence and spectrophotometry. The luciferin-luciferase system served as the bioluminescence source. The Fisher's *t* test for significance was computed from the data collected. The peak height, obtained from the reaction of ATP and the luciferase system which was recorded, indicated the amount of ATP present. The results obtained were not significant at the .05 level. Based on the findings of this study it was concluded that there was not a significant change in the base concentration of ATP in the experimental rats as compared to the control rats, and that there was a definite trend of an increased basal concentration of ATP in the exercised animals.

**A68-80869**
**DIURNAL ENERGY EXPENDITURE IN METAL WORKERS [SUTOCHNYI RASKHOD ENERGII RABOCHIKH-METALLISTOV].**
A. P. Borisov, N. G. Shchenkin, A. N. Shevchenko, N. V. Ivashchenko, M. T. Biktimirova, and N. A. Nazarova (USSR, Acad. of Med. Sci., Inst. of Nutr., Moscow).
*Voprosy Pitaniia*, vol. 26, Nov.–Dec. 1967, p. 25–31. 6 refs. In Russian.

The daily energy expenditure of 35 workers of an automobile plant was investigated in 1965–1966. Time studies of the daily performance efficiency of the workers were carried out, and pertinent questionnaire forms filled out. Since the 1930's, most of the heavy work requiring considerable muscular effort and high energy output was mechanized. The mechanization and automation of industrial production led to the reduction of the physical exertion and energy output required of the workers. The mean energy requirement of operators employed in six departments of the plant was 3,512 cal./day, for workers residing out of town and those who had to carry heavy loads during the performance of their work the energy requirement reached 4,000 cal. daily.

**A68-80870**
**ULTRASTRUCTURE OF THE MYOCARDIUM AFTER PHYSICAL EXERCISE, FATIGUE AND REST [UL'TRASTRUKTURA MIOKARDA PRI FIZICHESKOI NAGRUZKE, UTOMLENII I OTDYKHE].**
D. S. Sarkisov, B. V. Vtiurin, V. P. Tumanov, and P. IA. Mul'diiarov (USSR, Acad. of Med. Sci., A. V. Vishnevskii Inst. of Surg., Moscow).
*Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 64, Nov. 1967, p. 134–139. 9 refs. In Russian.

Albino rats were used in the study of the ultrastructure of the myocardium during different functional stages: increased functional activity, fatigue and rest. Results showed that intensive physical exercise was accompanied by reversible changes in the cardiac muscle cells. When the rest period following exercise was sufficient to restore completely the ultrastructure of the myocytes, the heart withstood stresses for longer periods. When there was no time for the normalization of the fine structure of myocytes due to the frequency of work loads, the structural changes increased gradually and resulted in cardiac inefficiency. After physical exercise and synchronously with the changes of the ultrastructure of the myocardium, modifications appeared in the corresponding segments of the central nervous system. A theory on intracellular regenerative processes was used to interpret the data obtained.

**A68-80871**
**POISONING BY HYDROGEN DISULPHIDE WITH SUBSEQUENT MEMORY DISORDER IN THE PINENEMERCAPTAN PRODUCTION [OTRAVA SIROVODIKEM PRI VVROBE PINENMERKAPTANU S NASLEDNOU PORUCHOU PAMETI].**
Miroslav Bejsovec, Josef Budlovský, and Borivoi Lehký.
*Pracovni Lékarstvi*, vol. 19, Nov. 1967, p. 413–416. 6 refs. In Czech.

A case of the severe hydrogen disulfide poisoning of a 24-yr.-old man in pinenemercaptan production was described. Brain edema manifestations prevailed during the first days. A slight and non-uniform decrease of intellectual capacity remained as late as two and a half yrs. after the poisoning, marked decrease of spontaneous activity, expressive disorder of fresh memory retention and associative learning were found as well. The manifestations of the poisoning may most probably be explained by a toxic disorder of brain cells and capillaries and secondary edema of the brain. Those structures, which are responsible for the fixation of fresh memory tracks proved to be most sensitive. There should be greater attention to the timely detection of beginning brain edema so that its treatment may begin with the other treatment.

**A68-80872**
**THE ROLE OF POTASSIUM IN HEAT STRESS DISEASE.**
James L. Schamadan (Ariz. State U., Tempe) and W. D. Snively, Jr. (Ala., U., Med. Center, Birmingham).
*Industrial Medicine and Surgery*, vol. 36, Dec. 1967, p. 785–788. 12 refs.

An evaluation was made of the relationship of water and electrolytes to diseases resulting from heat stress. Heat disorders were classified, and characteristics of each were given. From the evaluation of many clinical cases and experimental findings, it was suggested that heat stress is related to changes in potassium metabolism which occur in many individuals during heat acclimatization. The use of multiple electrolytes, including potassium, sodium, calcium, magnesium, citrate, sulfate, chloride, phosphate and lactate (rather than sodium chloride alone) was suggested for persons acclimatizing to heat stress or performing heavy labor in hot environments.

**A68-80873**
**A QUANTITATIVE STUDY OF ERUCTATED GAS EXPULSION IN ALPACAS.**
R. W. Dougherty and Augusto Vallenas P. (San Marcos U., Fac. of Vet. Med., Vet. Inst. for Trop. and High Altitude Res., Lima, Peru).
*Cornell Veterianarian*, vol. 58, Jan. 1968, p. 3–7.
U. N. Develop. Program/Spec. Fund supported research.

Two alpacas were each prepared surgically by establishing two tracheal fistulas as low on the neck near the thoracic inlet as possible. During a two-hr. period, total gas eructated by each alpaca was collected by a tracheal cannula and face mask and measured with spirometers. Total amounts of gas eructated on a weight basis were comparable to results obtained in similar studies in cattle. The proportion of eructated gas collected from the tracheal cannulas in both alpacas was greater than that obtained in the cattle experiments.

**A68-80874**
**MEASUREMENT OF KINESTHETIC SENSITIVITY BY JOINT ANGLE REPRODUCTION AND THRESHOLD FOR LIFTED WEIGHTS.**
Mary Lou Norrie (Calif., U., Berkeley).
*Research Quarterly*, vol. 38, Oct. 1967, p. 468–473.

Thirty college women were given 24 trials on a joint position reproduction task for the right arm and 24 trials on a joint position reproduction task for the right leg. Split half reliability, interindividual variability, and intra-individual variability were computed for each task. The reliability for the arm positioning was .860 and for the leg positioning .892. For both tasks, the intra-individual variability was greater than the interindividual variability. The relationship between the two tasks was negligible. The difference limen for lifted weights was determined for the right hand and the right foot. The first day the subjects were given two descending and two ascending series of comparison weights on each task. Two weeks later they were retested. The test–retest reliabilities were low (.225 for the right hand and .440 for the right foot).

**A68-80875**
**EFFECT OF PRACTICE ON TRUE SCORE AND INTRA-INDIVIDUAL VARIABILITY FOR REACTION AND MOVEMENT TIMES FOR SIMPLE AND COMPLEX MOVEMENTS.**
Mary Lou Norrie (Calif., U., Berkeley).
*Research Quarterly*, vol. 38, Oct. 1967, p. 457–467. 9 refs.

The effect of practice on individual differences and intra-individual variability in reaction and movement times were studied for simple and complex, discrete, motor tasks. Changes with practice for intertrial correlations of adjacent trials and the effects of an increasing number of interpolated trials on intertrial correlations were also observed. For both tasks and for both reaction and movement times, the intra-individual variability decreased with practice. The true score variability for reaction time on both tasks and for movement time on the simple task shows little change with practice. On the complex task, true score variability for movement time decreases with practice. For movement time, adjacent trial correlations increase during the early practice trials then remain stable. For reaction time adjacent trial correlations increase throughout practice. Remoteness effects on intertrial correlations were found for both movement and reaction times for both tasks.

**A68-80876**
**DEVELOPMENT AND MAINTENANCE OF ISOMETRIC STRENGTH OF SUBJECTS WITH DIVERSE INITIAL STRENGTHS.**
Chauncey A. Morehouse (Pa. State U., University Park).
*Research Quarterly*, vol. 38, Oct. 1967, p. 449–456. 10 refs.

Male college students ranging in age from 17 to 28 yr. with diverse initial elbow flexion strengths were trained four days each week for nine wk. The strength development period was followed by an eight-wk. period of strength maintenance during which the intensity and frequency of performing single isometric contractions were varied. The results indicated that groups of subjects with different beginning strength levels make about the same absolute gains in strength at about the same rate. Intensity of isometric contractions seemed to be of greater importance in the maintenance of newly developed strength than the frequency at which contractions were performed.

**A68-80877**
**EFFECTS OF TWO ISOMETRIC ROUTINES ON STRENGTH, SIZE, AND ENDURANCE IN EXERCISED AND NONEXERCISED ARMS.**
Carlton R. Meyers (N. Y., State U., Buffalo).
*Research Quarterly*, vol. 38, Oct. 1967, p. 430–440. 14 refs.

In essence, this study was directed toward three specific concerns: (a) comparative effects of two isometric exercise patterns relative to static strength, muscular endurance and size; (b) cross-education effect of two isometric routines; and (c) specificity of change in strength and muscular endurance as noted by comparison of measures taken at the exercise position and a second position. One pattern of exercise consisted of three six-sec. bouts, whereas the second involved 20 six-sec. bouts. The exercise consisted of elbow flexion from 170° angle, and was performed on alternate days, three times weekly for six wk. Statistical analysis revealed no difference among the one control and two exercise groups, while t-ratios of change within each exercise group showed some significant differences. Evidence suggests that the protracted pattern was more beneficial than the short routine in fostering development of muscle strength, endurance and size. However, further investigation was indicated pertaining to all three aspects of this study, wherein a sample has a reasonably large N and is not limited to relatively well trained subjects.

**A68-80878**
**SPONTANEOUS ACTIVITY PATTERNS OF MALE RATS.**
Dale L. Hanson (Macalester Coll., St. Paul, Minn.).
*Research Quarterly*, vol. 38, Dec. 1967, p. 593–597. 15 refs.

The purpose of this investigation was to determine the diurnal pattern of spontaneous activity of young male albino rats and to study the treatment effects of forced exercise and sedentary existence upon spontaneous activity patterns. The study was conducted for 70 consecutive days with the first 35 days providing a treatment phase and the following 35 days a post-treatment phase. Treatments consisted of forced exercise by swimming with mild overload and sedentary existence. The rats were housed in spontaneous activity cages. Upon the completion of each revolution, the activity wheel would trigger a signal magnet to record an ink marking on a continuously moving monodrum. Monodrum markings were analyzed for amounts of hourly activity. Greatest activity was recorded from 10:00 P.M. to 1:00 A.M., with least activity occurring from 7:00 A.M. to 2:00 P.M. More than two-thirds of the total spontaneous activity occurred from 6:00 P.M. to 6:00 A.M. The treatments of forced exercise and sedentary existence did not markedly alter the activity pattern.

**A68-80879**
**INTER- AND INTRAVARIABILITY OF MOTOR PERFORMANCE.**
Joel E. Grose (Sonoma State Coll., Rohnert Park, Calif.).
*Research Quarterly*, vol. 38, Dec. 1967, p. 570–575. 8 refs.

Fifty-one subjects performed three motor tasks requiring the regulating or the timing of the responses so that its completion would achieve "coincidence" with a moving object. An analysis of the data by the use of conventional methods indicated that practice did not change variability. When the variability was divided into inter- and intravariability, the data indicated a reduction of intravariability.

**A68-80880**
**RELATIONSHIP OF ORGAN WEIGHT AND SWIMMING PERFORMANCE IN THE ALBINO RAT.**
William D. McArdle (N. Y., City U., Queens Coll., Flushing) and Henry J. Montoye (Mich., U., Ann Arbor).
*Research Quarterly*, vol. 38, Dec. 1967, p. 671–677. 23 refs.

The relationship between organ weight and swimming capacity was determined in 42 male albino rats. Upon completion of a four-wk. training program, the animals were forced to swim to exhaustion with 2% of the body weight attached. They were then sacrificed and specific gravity and organ weights determined. The results warrant the following conclusions: A significant ($p < .05$) but low correlation exists between the relative weight of the spleen and lungs with swimming performance. The correlation of relative heart weight and swimming performance approached statistical significance ($p < .06$). Attaching a weight proportional to the body weight to increase the energy cost of swimming penalizes the heavier animals. Correcting for the inverse relationship between body weight and swim time does not alter appreciably the relationships between organ weights and swim time.

**A68-80881**
**DIFFERENTIAL RESPONSE EFFICIENCY TO SIMPLE KINESTHETIC AND TACTILE STIMULI.**
Richard C. LaBarba (Tenn., U., Knoxville).
*Research Quarterly*, vol. 38, Oct. 1967, p. 420–429. 15 refs.

A series of studies was carried out on groups of high school students, college undergraduates and graduate students in order to investigate differential response sensitivity to kinesthetic and tactile stimuli. The hypothesis was that different groups of individuals would show differential sensitivity to differently channeled stimuli. The results of the study only minimally supported this hypothesis, but some interesting data were obtained in terms of the developmental or experiential factors involved in response efficiency. The subtle interaction between tactile and kinesthetic sensitivity was discussed.

**A68-80882**
**COMPARISON OF RECOVERY PROCEDURES FOR THE REDUCTION OF EXERCISE STRESS.**
Harold B. Falls (Southwest Mo. State Coll., Springfield) and Robert D. Richardson (Crossett High School, Ark.).
*Research Quarterly*, vol. 38, Dec. 1967, p. 550–555. 24 refs.

This study investigated the effects of three types of recovery procedure on (a) circulatory recovery from a standardized bicycle ergometer exercise, (b) performance in a second standardized bicycle ergometer exercise, and (c) circulatory recovery from the second exercise. The recovery procedures were complete rest, light activity, and cold showers. Each of ten male subjects underwent each recovery procedure on separate days. Analysis of variance for a randomized complete blocks design was used in the analysis of the data. Results indicated that cold showers decreased recovery heart rate after the first standardized exercise from 115 to 96 beats/min. and after the second exercise from 164 to 152 beats/min. when compared with the other two conditions. Speed of performance in the second exercise was improved from 40.4 and 40.3 sec. in the case of rest and light activity to 38.9 sec. for cold showers. These improvements were all statistically significant at the .05 level. Three physiological explanations, not necessarily independent, are advanced: (a) local vasoconstriction of the skin vessels and vasodilatation of the muscle vessels causing a greater proportion of total blood flow to the working muscles, (b) establishment of a greater thermal gradient between the core and shell of the body allowing heat movement to the surface of the body by conduction between tissues rather than by skin blood flow, and (c) a decrease in sweat rate, thereby suppressing release of bradykinin, a vasodilator substance.

**A68-80883**
**RELATIONSHIP AND POSSIBLE CAUSAL EFFECT OF SELECTED VARIABLES TO TREADMILL ENDURANCE RUNNING PERFORMANCE.**
William C. Adams (Calif., U., Davis).
*Research Quarterly*, vol. 38, Dec. 1967, p. 515–527. 31 refs.

Seventy-one male university students completed a battery of structural anthropometric, motor fitness, circulatory–respiratory, and psychological tests. The battery was divided into three testing sessions, varying in length from one to one and one-fourth hr. Each subject completed the sequence of testing by performing an all-out treadmill run at seven m.p.h., 8.6% grade. The range of scores, mean, and standard deviation for each of 90 variables were presented, together with a correlation matrix of variables most closely associated with the treadmill run time. Through the results of three multiple regression analyses, a tentative division of the structural anthropometric, neuromuscular, circulatory–respiratory, and psychological areas, in terms of percent net explained variance was presented. Thus, the conclusion that treadmill run performance is dependent on the interrelationship of numerous factors was supported. The contention was advanced that the reason for the insignificant unique contribution (in percent of net explained variance) of oxygen intake to all-out run time was due to the fact that it reflects indirectly the contribution of numerous other factors included in the analyses.

**A68-80884**
**EFFECTS OF POSITIONAL TENSIONING AND STRETCH ON REACTION LATENCY AND CONTRACTION SPEED OF MUSCLE.**
Richard A. Schmidt (Ill., U., Urbana).
*Research Quarterly*, vol. 38, Oct. 1967, p. 494–501. 11 refs.

High school boys were carefully positioned on their right sides in a special apparatus. Positional tensioning (temporary, passive elongation) of right hamstrings was varied by means of four levels of hip flexion with a constant knee angle. Reaction and movement times for a maximal-speed knee flexion were measured. Before one testing period a stretching exercise was given. It was found that the flexibility of the hip joint was significantly increased by this exercise. The exercise had no effect on reaction time or on movement time. Increases in positional tensioning decreased reaction time significantly but had no effect on movement time.

**A68-80885**
**MULTIPLE-TASK TRANSFER EFFECTS IN PERCEPTUAL-MOTOR LEARNING.**
Richard S. Rivenes (Calif. State Coll., Hayward).
*Research Quarterly*, vol. 38, Oct. 1967, p. 485–493. 13 refs.

An apparatus was devised which enabled subjects to practice one or more tasks varying in degree of difficulty on a distance dimension. Selected multiple- and single-task practice conditions were introduced, trials were held constant; this was followed by a test for differential transfer effects. Multiple-task practice of relatively easy practice tasks increased transfer, whereas single-task practice of relatively difficult tasks was most advantageous. A test also was made for summation effects when transfer was measured at a point intermediate between various practice tasks. The amount of transfer expected from practice of relatively easy tasks did not combine in a linear summation with the amount of transfer expected from practice of relatively difficult tasks.

**A68-80886**
**AN INFORMATION-PROCESSING EXPLANATION OF SOME PERCEPTUAL PHENOMENA.**
Herbert A. Simon (Carnegie Inst. of Technol., Pittsburgh, Pa.).
*British Journal of Psychology*, vol. 58, May 1967, p. 1–12. 21 refs.
Grant NIMH MH-07722-01.

An information-processing system that scans stimuli serially, part-by-part, and attempts simple interpretations of the parts would experience a number of the well-known perceptual illusions that human subjects report. The hypothesized system has the same basic characteristics as systems which have been used to explain a wide range of cognitive phenomena. The description of the system is proposed as an explanation of some of the mechanisms for human perceptual processing.

**A68-80887**
**CARDIORESPIRATORY ADAPTATIONS TO TRAINING AT SPECIFIED INTENSITIES.**
Brian J. Sharkey and John P. Holleman (Mont., U., Missoula).
*Research Quarterly*, vol. 38, Dec. 1967, p. 698–704. 14 refs.

Sixteen college men were randomly divided into three training groups and one control group in a study of selected cardiorespiratory adaptations to six wks. of training exercises eliciting either 120, 150, or 180 heart rates. Training consisted of walking on the motor driven treadmill for ten min. a day, three days per wk. Highly significant differences were found in the analysis of pre-post Balke treadmill test scores. The Astrand–Ryhming nomogram prediction of aerobic capacity also showed highly significant changes due to training. Analysis of group differences revealed that the 180 training group's improvement was significantly different from all other groups in both tests. The 150 group was found to be significantly different from the 120 and control groups in the Balke test analysis. No changes were noted in resting pulse rate nor in the pulse rate–oxygen consumption relationship. However, there were small positive differences in the grade required to elicit the training heart rates. The study supports the hypothesis that intense activity is necessary to bring about the changes associated with cardiorespiratory endurance.

**A68-80888**
**URINARY CREATININE AS A POSSIBLE INDEX OF MUSCULAR ACTIVITY.**
Frank Konishi (Southern Ill. U., Carbondale).
*Research Quarterly*, vol. 38, Oct. 1967, p. 398–404. 18 refs.

The urinary excretion of creatinine was investigated in a group of obese and nonobese college students to estimate lean muscle mass and apparent physical activity. The obese students excreted significantly more creatinine and had higher creatinine coefficients than the nonobese indicating greater muscle mass presumably due to increased physical activity or an increase in muscle tissue to support and move the excess adipose tissue. This group also had greater creatinine-height indexes. Creatinine levels, therefore, may be useful to characterize and assess the physical activity profiles of individuals. It also may be a useful index to estimate or predict physical fitness and/or physical performance on a fat-free basis.

**A68-80889**
**RELATIONSHIP OF SIZE CONSTANCY TO SELECTED MEASURES OF MOTOR ABILITY.**
John N. Drowatzky (Toledo, U., Ohio).
*Research Quarterly*, vol. 38, Oct. 1967, p. 375–379. 14 refs.

The purpose of this study was to investigate the relationship between size constancy (a form of perceptual organization) and selected motor skills. Significant rank-difference correlation coefficients were obtained between size constancy scores and measures of leg power, dynamic balance, and total body agility. These findings suggest the need for investigations pertaining to the effect of perceptual attitudes on motor learning and the manner in which perceptual-motor behavior is patterned according to spatial and temporal requirements of the environment.

**A68-80890**
**FACTORS INFLUENCING THE SURVIVAL AND REVIVAL OF HEAT-TREATED ESCHERICHIA COLI.**
A. D. Russell and Diann Harries (Wales, U., Inst. of Sci. and Technol., Welsh School of Pharm., Cardiff, Great Britain).
*Applied Microbiology*, vol. 16, Feb. 1968, p. 335–339. 20 refs.

Maximal revival of heat-damaged *Escherichia coli* occurred in nutrient media containing 0.8 to 1.0% (w/v) of Difco yeast extract. Vitamins did not appear to be involved in the recovery process. The situation with amino acids was less clear-cut, and, although certain of these may be essential for revival, proof for this is as yet inconclusive. Replica plating, in which colonies (from cells which had survived a heating process) on a rich medium were replicated into minimal agar, revealed that no auxotrophic mutants had been formed as a result of heat treatment. Bacteria which were heated in 1% (w/v) yeast extract were killed more slowly than those heated in water.

**A68-80891**
**INDIGENOUS FLORA FROM HUMAN SALIVA.**
D. F. Gordon, Jr. and B. B. Jong (Forsyth Dental Center, Boston, Mass.).
*Applied Microbiology*, vol. 16, Feb. 1968, p. 428–429.
Grant NIDR DE-01471 and Colgate-Palmolive Co. supported research.

Isolation and identification of all organisms present in high dilutions of saliva cultivable on blood-agar under anaerobic conditions were attempted. Unstimulated saliva was collected from six adults (age, 21–31 yr.) in sterile test tubes at least two hr. after they ate breakfast. A total of 373 colonies were isolated and partially characterized by standard procedures and distributed into eight microbial groups. The gram-positive facultative cocci represented the largest single group. Streptococci alone comprised 41.0% of the saliva isolates. Fifteen strains resembled staphylococci in morphology but were catalase-valuable and failed to grow on Chapman Stone Medium. Of the 65 strains of gram-negative anaerobic cocci, 58 apparently were *Veillonella* as they grew on Rogosa lactate agar and did not utilize glucose, but reduced nitrate. Presumably, microorganisms are present in saliva as a result of dislodging them from various sites in the oral cavity, e.g., the gingival crevice area, dental plaque, or the tongue. It is difficult to assess the exact source of these organisms.

**A68-80892**
**MICROBIAL GROWTH IN A FUEL–WATER SYSTEM CONTAINING POLYESTERURETHANE FOAM.**
Paul Edmonds and J. J. Cooney (Dayton, U., Dept. of Biol., Ohio).
*Applied Microbiology*, vol. 16, Feb. 1968, p. 426–427.
Contract AF 33(615)-2692.

Samples of two types of polyesterurethane (10 - pore - reticulated type "Z" foam, plain and with 0.33% of tetraethylthiuram disulfide incorporated as a biocide) were examined for their effect on microbial growth in a fuel–water system. A sample of polymer was cut to fit a 1-pint glass-milk bottle. Only 3% of the volume of each system was poly foam material, allowing free circulation of the medium. Each vessel, containing the polymer and 0.35 ml. of a mineral salt solution was sterilized by autoclaving at 15 p.s.i. for 15 min. The 135 ml. of filter-sterilized JP-4 jet fuel was added to each vessel prior to inoculating it with 0.1 ml. of cells from a *Pseudomonas aeruginosa* culture, or with a 1 ml. suspension of

fungal spores and mycelium from a culture of a *Hormodendrum (Clostridium)* sp. Growth of the bacterium was followed by plate counts and growth of the fungus, by visual observation. The growth of both microorganisms was most adversely affected by the polymers. If fungal growth occurred in fuel systems containing such materials, fuel flow might be seriously impaired and other problems might ensue.

**A68-80893**
**SPORICIDAL ACTION OF AUTO-OXIDIZED ASCORBIC ACID FOR CLOSTRIDIUM.**

Charles Eller, Fitzroy F. Edwards, and E. Staten Wynne (USAF School of Aerospace Med., Biosci. Branch, Microbiol. Sect., Brooks AFB, Tex.).

*(Am. Soc. for Microbiol., 67th Ann. Meeting, New York, Apr. 30–May 4, 1967).*
*Applied Microbiology*, vol. 16, Feb. 1968, p. 349–354. 35 refs.

Neutralized ascorbic acid (AA), buffered or unbuffered and autoclaved or filter-sterilized, was sporicidal for *Clostridium*. A 0.2% concentration of AA was generally employed, and spore counts were made in a soft-agar modification of Wynne's medium in Prickett tubes. Spores of *Clostridium botulinum* 115B were less susceptible than those of *C. sporogenes* PA 3679, whereas *C. bifermentans* spores were by far the most sensitive. At 75°C., spores of PA 3679 were killed at a rate of about 9% at 0 min. (warm-up) to 99+% at 100 min. The lower the temperature, the longer the time needed for a given lethality. The percentage of killing increased with increasing concentrations of AA, and the rate of killing was lower at a higher concentration of spores. At least two mechanisms were operative: a major mechanism involving a product(s) of AA auto-oxidation, and a minor mechanism involving copper-ascorbate toxicity. AA reduced in natural gas was not sporicidal after 18.5 hr. at 25°C., whereas 92% of the spores were killed by oxidized AA. Although $H_2O_2$ *per se* was sporicidal, catalase did not reverse lethality of fresh or oxidized AA. Dehydroascorbate was as sporicidal as any AA preparation. Added copper (0.00001%) increased the rate of lethality of freshly prepared AA from 66 to 83% but was not effective with thoroughly oxidized AA. Ethylenediaminetetraacetic acid, $NH_4^+$, and phosphate partially reversed AA toxicity, deionized water had no effect, and complex media, as well as thioglycolate, eliminated AA lethality. Since the percentage of killing was affected by spore concentration, AA did not seem to stimulate "lethal germination."

**A68-80894**
**SYNERGISM BETWEEN HYPEROXIA AND ANTIBIOTICS FOR PSEUDOMONAS AERUGINOSA.**

Olen R. Brown, Robert G. Silverberg, and David O. Huggett (Mo., U., Space Sci. Res. Inst. and School of Med., Dept. of Microbiol., Columbia).

*Applied Microbiology*, vol. 16, Feb. 1968, p. 260–262. 6 refs.
NASA Grant 26004003.

Three strains of *Pseudomonas aeruginosa* were directly exposed on the surface of membrane filters to hyperoxic atmospheres. One of the three strains was found to be sensitive to oxygen. Colonies failed to appear during 18 hr. of incubation in pure oxygen at one atm., but about 40% of the bacteria recovered to produce colonies upon reincubation in air. Similar killing was produced by ten hr. of oxygen exposure. No inhibition or killing was observed with two other strains. Streptomycin (1 μg./ml.) and kanamycin (5 μg./ml.) were more effective in killing the oxygen-sensitive strain in the presence of 60 to 70% oxygen than in air, but polymyxin B (5 μg./ml.) did not show a synergistic effect under such conditions.

**A68-80895**
**ON THE INFLUENCE OF ATTITUDES TO THE SOURCE ON ANNOYANCE REACTIONS TO NOISE.**

Rune Cederlöf, Erland Jonsson, and Stefan Sörensen (Stockholm, U., Dept. of Sociol., Natl. Inst. of Public Health, Dept. of Environ. Hyg.; and Karolinska Inst., Dept. of Hyg., Stockholm, Sweden).

*Nordisk Hygienisk Tidskrift*, vol. 48, no. 2, 1967, p. 46–59. 7 refs.

Earlier laboratory studies have shown that there is a connection between the attitude to a source of inconvenience and the trouble noticed from it. The present paper reports the results reached in a field experiment designed to determine whether it is possible to influence attitudes towards inconvenience. Two hundred seventy participants were divided into two groups, a control group and an experimental group. The attitudes of the latter were influenced in a positive direction to aviation by the distribution of a questionnaire containing leading and tendentious questions, a positive introduction to the "survey", a letter of thanks written in positive terms and a small propaganda booklet on aviation. The control group and the experimental group were afterwards studied simultaneously as to inconvenience from a nearby airfield. The results of this experiment indicate that the frequency of inconvenience for the experimental group was lower (54%) than for the control group (79%). The same tendency is observed as regards the intensity of the inconvenience. The hypothesis that it is possible in practice to decrease the frequency of inconvenience by influencing attitudes was thus verified.

**A68-80896**
**EFFECT OF TEMPERATURE AND GAS VELOCITY ON THE DRY-HEAT DESTRUCTION RATE OF BACTERIAL SPORES.**

Kenneth Fox and I. J. Pflug (Mich. State U., Dept. of Food Sci., East Lansing).

*Applied Microbiology*, vol. 16, Feb. 1968, p. 343–348. 16 refs.
Grant PHS 8 T01U101031

Spores of *Bacillus subtilis* were dried in vacuo for use in dry-heat thermal destruction tests. Survivor curve tests were conducted in a specifically designed dry-heat oven. This oven provided accurate temperature control and permitted air or nitrogen to be passed over the spores during the lethal treatment. Experiments were carried out at various flow rates of the two gases (air and nitrogen) and various temperatures, and the data were expressed as survivor curves from which the decimal reduction time (D value) was obtained. Linear regression analysis methods were used to compute the slope of the survivor curves. The results indicated that as the flow rate of gas is increased, the effect of temperature on the destruction rate of the spores is lessened, the z value becoming very large. It is believed that the higher flow rates of dry gas cause greater dehydration of the spores and that spore moisture loss is one of the major factors in determining the dry-heat thermal destruction rate of bacterial spores.

**A68-80898**
**MAMMALIAN HIBERNATION 3; PROCEEDINGS OF THE THIRD INTERNATIONAL SYMPOSIUM ON NATURAL MAMMALIAN HIBERNATION, TORONTO, CANADA, SEP. 13–16, 1965.**

Edited by Kenneth C. Fisher, E. Schönbaum (Toronto, U., Canada), Albert R. Dawe (ONR, Branch Office, Chicago, Ill.), Charles P. Lyman (Harvard Med. School, Dept. of Anat., Boston, Mass.), and Frank E. South (Mo., U., Space Sci. Res. Center, Dept. of Physiol., Columbia). Edinburgh and London, Oliver and Boyd, 1967, xiv+535 p. 1337 refs.

Reviews on subjects either directly or indirectly associated with hibernation, with brief summaries of the discussion which followed them, were presented from the Third Symposium on Natural Mammalian Hibernation. Subjects included were: (1) the

relation of external conditions to the onset and termination of hibernation and estivation; (2) variations in the patterns of torpidity of small homeotherms; (3) seasonal variation in the hibernating behavior of *Citellus lateralis;* (4) metabolism in the eastern chipmunk *(Tamias striatus)* and the southern flying squirrel *(Glaucomys volans)* during the winter and summer; (5) physiological observations of subarctic bears under winter den conditions; (6) temperature regulation and hibernation; (7) temperature regulation in the little brown bat, *Myotis lucifugus;* (8) the internal rhythms of hibernators; (9) circadian rhythms in hibernation and the influence of light; (10) lowered body temperature, learning and behavior; (11) sleep; (12) heart and circulation in hibernators; (13) cesium-137 metabolism in active and hibernating *Citellus lateralis;* (14) water and electrolyte metabolism in heterotherms; (15) urine production in the hibernating bat; (16) normal seasonal and experimentally induced changes in kidneys of active summer and hibernating winter bats: histochemical and electron microscope observations; (17) energy metabolism in hibernation; (18) brown fat in hibernation; (19) nonshivering heat production during arousal from hibernation and evidence for the contribution of brown fat; (20) cold adaptation of tissues of hibernating mammals (21) intestinal absorption in hamster and ground squirrel, *in vivo;* (22) cell proliferation kinetics in the tongue and intestinal epithelia of hibernating dormice, *Glis glis;* (23) erythrocyte glycolytic intermediates of control, cold-exposed and hibernating hamsters; (24) response of hibernating mammals to physical, parasitic and infectious agents; and (25) hibernation in the space age. An extensive bibliography was included also.

**A68-80899**
**GENESIS OF THE COCHLEAR ENDOLYMPHATIC POTENTIAL.**

Brian M. Johnstone (Western Australia, U., Dept. of Physiol., Nedlands).

*Current Topics in Bioenergetics*, vol. 2, 1967, p. 335–352. 42 refs.

Natl. Sci. Found., Am., Western Australia, U. and Natl. Health and Med. Res. Council supported research.

The positive endocochlear potential in mammals causes a current drain of such a magnitude (2.5 mamp./cm.$^2$) that it requires considerable expenditure of energy for its maintenance. It is probably bound up with the formation of the curious ionic composition of endolymph (high $K^+$ and low $Na^+$). In addition to the potential, considerable energy is probably expended in actively transporting the various ions, notable $K^+$ and $Cl^-$. Very few measurements of parameters of biochemical importance are available, probably because of the difficulty of working with such a small preparation that is firmly encased in bone. Insufficient information is available at the present time to decide whether the ionic pumps are electrogenic or not, but it is possible to arrive at an approximate figure of minimal, short-term, oxygen consumption (0.5 $\mu$l./hr. per mm. of cochlear length). New techniques have been developed such as intracochlear microperfusion, simultaneous multiple microelectrode measurements, vascular perfusion, and biochemical analysis of endolymph, and these studies promise to reveal a great deal about this most puzzling system.

**A68-80900**
**RADAR ORNITHOLOGY.**

Eric Eastwood.

London, Methuen and Co. Ltd., 1967, xii+278 p. 146 refs.
$13.50.

The work is a general review of the progress made in radio ornithology. One of its purposes is to explain some of the principles and practices of microwave radar, and to show how radar equipment based on these ideas have become important to the point of indispensability in the study of bird movements. Included are: (1) principles of radar; (2) extraction and display of radar information; (3) interpretation of radar echoes; (4) radar "angels" and birds; (5) time variation of angel echoes; (6) radar patterns of bird migration in Europe; (7) radar patterns of bird migration in North America; (8) flight behavior of migrants; (9) ring angels; (10) soaring and gliding; (11) altitudes of migratory flights; (12) counting birds by radar; (13) influence of radio waves on birds; and (14) the future of radar in ornithological research. Knowledge of bird movements may be of great importance in the prevention of aircraft collisions with flocks of birds.

**A68-80901**
**DISPLAY SYSTEMS ENGINEERING.**

Edited by H. R. Luxenberg and Rudolph L. Kuehn (Douglas Aircraft Co., Missiles and Space Systems Div., Santa Monica, Calif.).

New York, McGraw-Hill Book Co., 1968, xvi+444 p. Many refs.
$16.50

The work is a background book concerning information display systems and is intended to integrate the present knowledge of the increasingly complex man-machine interactions of modern computer-based information systems. The first portion of the book is concerned with the essential theoretical foundation of display systems, and the second portion is concerned with technological reduction to practice. Of special interest are two chapters involving visual experience, colorimetry and image analysis. An extensive bibliography is included.

**A68-80902**
**MAGNESIUM PEMOLINE: FACILTATION OF MAZE LEARNING WHEN ADMINISTERED IN PURE DIMETHYLSULFOXIDE.**

Donald G. Stein, John J. Brink, and Arthur Patterson (Clark U., Worcester, Mass.).

*Life Science*, vol. 7, Feb. 15, 1968, p. 147–153. 6 refs.
Grants NIH MH 13705-01 and NIH MH 13576-01; Biomed. Sci. Res. Fund supported research.

Rats were tamed and pretrained to run for a water reward until testing in the maze was begun. The animals were given high and low dosages of pemoline in dimethylsulfoxide and pemoline alone. Some were tested with amphetamine. Results showed a significant facilitation of learning in the maze. Motivation for reward, actively in open fields or central nervous system stimulation could not account for increased acquisition with the magnesium pemoline.

**A68-80903**
**THE EFFECT OF CAFFEINE ON DRUG METABOLISM.**

Chozo Mitoma, Theodore J. Sorich II, and Susanna E. Neubauer (Stanford Res. Inst., Dept. of Biomed. Res., Menlo Park, Calif.).

*Life Sciences*, vol. 7, Feb. 1, 1968, p. 145–151. 10 refs.
Contract PHS PH 43-65-1061.

Rats were fed caffeine twice daily for three days at dose levels of 50, 75 or 100 mg./kg. Microsomal activity in the liver of acetanilide, o-nitroanisole, and aminopyrine metabolism was assayed and found to be higher in the caffeine groups than in the controls. The induction effect of caffeine on liver metabolism was blocked by drug action namely that of ethionine, puromycin. The effect of caffeine was interpreted as due to increased enzyme synthesis. It is thought that in man, when based on metabolic weight, eight cups of coffee would show effects on the liver in a 70 kg. individual.

**A68-80904**
**THE INEFFECTIVENESS OF EXCITATION OF THE PRIMARY ENDINGS OF THE MUSCLE SPINDLE BY VIBRATION AS A RESPIRATORY STIMULANT IN THE DECEREBRATE CAT.**

H. J. F. Hodgson and P. B. C. Matthews (Oxford, U., Lab. of Physiol., Great Britain).

*Journal of Physiology*, vol. 194, Feb. 1968, p. 555–563. 20 refs.

A68-80905

Small-amplitude high-frequency longitudinal vibration (for example, 100 $\mu$ peak to peak amplitude at 250 c./s.) was applied to the triceps surae muscle of the decerebrate cat without producing any appreciable change in its respiration. Manual squeezing of the same muscle produced a large increase in ventilation. As vibration is known to be a powerful stimulus for the primary endings of the muscle spindle it is concluded that these receptors are unlikely to have any significant role to play in the reflex regulation of breathing.

**A68-80905**
**COMPARATIVE EXERCISE—CARDIORESPIRATORY PERFORMANCE OF NORMAL MEN IN THE THIRD, FOURTH, AND FIFTH DECADES OF LIFE.**

John S. Hanson, Burton S. Tabakin, and Arthur M. Levy (Vt., U., Coll. of Med., Dept. of Med., Cardiopulmonary Lab. and Vt., Med. Center Hosp., Mary Fletcher Unit, Burlington).

*Circulation*, vol. 37, Mar. 1968, p. 345–360. 43 refs.
Grant NHI HE-06121.

The circulatory and respiratory responses to five levels of treadmill exercise were recorded for 75 normal males divided equally in the age groups 20 to 29, 30 to 39, and 40 to 49 yr. Parameters studied included heart rate, cardiac output, stroke volume, intra-arterial blood pressure, minute ventilatory volume, oxygen uptake, and carbon dioxide elimination. Values for peripheral vascular resistance, left ventricular work, and stroke work indices were calculated. Intergroup and intragroup differences were analyzed by modified covariance technique using oxygen uptake per square meter of body surface area as the concomitant variable reflecting a specific midrange work level. Significant differences were observed between groups in cardiac output, stroke volume, systolic, diastolic, and mean arterial blood pressure as well as pressure-related variables with regard to absolute values and trend over the exercise spectrum. The results indicate that normal untrained males in the fourth and fifth decades of life react to moderate and heavy upright exercise with statistically significant systemic pressure elevations as compared to 20-yr.-olds. A tendency toward initially high cardiac output and stroke volume during light exercise was observed in the older men. Relatively small subsequent increments in cardiac output with resultant low absolute values during heavier work were also characteristic for this group as reflected in their decreasing stroke output at submaximal loads.

**A68-80906**
**ROLE OF HISTAMINE IN HYPOXIC PULMONARY HYPERTENSION IN THE RAT. II. DEPLETION OF HISTAMINE, SEROTONIN, AND CATECHOLAMINES.**

Anton Hauge and Kenneth L. Melmon (Calif., U., San Francisco Med. Center, Cardiovascular Res. Inst. and Depts. of Med. and Pharmacol., Div. of Clin. Pharmacol., San Francisco).

*Circulation Research*, vol. 22, Mar. 1968, p. 385–392. 18 refs.
Grants PHS HE-09964, PHS HE-06285, PHS GM-01791, and PHS 1FO5TW1080.

The present investigation was undertaken to see if any of the naturally occurring vasoactive substances was likely to act as a mediator for the pulmonary vasoconstrictor response to acute alveolar hypoxia. Rats were treated with agents that deplete local stores of vasoactive amines or inhibit their synthesis. Lungs from these animals were isolated, ventilated, and perfused with homologous blood at constant volume inflow. Their pressor responses to two to three min. periods of ventilation hypoxia (2% $O_2$) were observed. The histamine-releasing agent 48/80 or the histidine decarboxylase inhibitor NSD 1055, or both, depleted 73% of the histamine in the lung but had no consistent effect on the pressor responses to hypoxia. When 48/80 (0.2 to 1 mg.) was given *in vitro*, histamine in the lung was reduced to 10% of normal, or less, and the pressor response to alveolar hypoxia was completely abolished. Reserpine, guanethidine, or alpha-methyl-tyrosine reduced catecholamine stores in heart tissue (as an index of general tissue changes) by a maximum of 90% and reserpine decreased serotonin in the lung by 93% without inhibiting the hypoxic pressor responses. The findings strengthen the concept that histamine mediates the pressor response to acute alveolar hypoxia in the rat.

**A68-80907**
**ROLE OF HISTAMINE IN HYPOXIC PULMONARY HYPERTENSION IN THE RAT. I. BLOCKADE OR POTENTIATION OF ENDOGENOUS AMINES, KININS, AND ATP.**

Anton Hauge (Calif., U., San Francisco Med. Center, Cardiovascular Res. Inst. and Depts. of Med. and Pharmacol., Div. of Clin. Pharmacol., San Francisco).

*Circulation Research*, vol. 22, Mar. 1968, p. 371–383. 22 refs.
Grants PHS HE-09964, PHS HE-06285, and PHS GM-01791.

Pharmacological agents that block or potentiate the effects of naturally occurring vasoactive substances were used to try to determine which substance, if any, mediates the vasoconstrictor response to acute alveolar hypoxia in isolated rat lungs. Isolated and ventilated lungs of rats were perfused at 37°C. with homologous blood at constant-volume, pulsatile inflow, and pressor responses to brief periods of ventilation hypoxia (2% $O_2$) were recorded (control, 21% $O_2$). Antihistamines of four different chemical classes in concentrations of 70 to 140 $\mu$g./ml. abolished all pressor responses to alveolar hypoxia without interfering with the effects of injected bradykinin, ATP, or serotonin. A histaminase-inhibiting compound, semicarbazide, potentiated the hypoxic pressor response. The hypoxic pressor response could not be abolished by $\alpha$-receptor, serotonin-, or ATP-blocking agents. The results suggest that endogenous histamine in the lung is involved in the vasoconstrictor response to acute alveolar hypoxia.

**A68-80908**
**SLEEP.**

William C. Dement (Stanford U., School of Med., Stanford Med. Center, Dept. of Psychiat., Palo Alto, Calif.).

IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 175–199.

A review concerning a number of new facts about sleep and possible theories arising from them was presented. The electro-encephalographic (EEG) characteristics of the various stages of non-rapid eye movement (NREM) sleep, and its possible mechanisms were given. The basic nature of NREM sleep was given in terms of changes in the pattern of cerebral activity organization which has its most profound effect on sensorimotor interaction with the environment. The processes involved in the development of NREM sleep appeared complex and interrelated, and probably both passive and active. EEG characteristics of rapid eye movement (REM) sleep were also given. In general, the organism is completely flaccid during REM sleep. Temporal relationships of NREM and REM sleep were discussed. The function of sleep has not yet been ascertained. No close analogies between sleep and hibernation could be suggested from the present knowledge of sleep.

**A68-80909**
**CIRCADIAN RHYTHMS IN HIBERNATION AND THE INFLUENCE OF LIGHT.**

Hermann Pohl (Max-Planck-Inst. für Verhaltensphysiol., Seewiesen and Erling-Andechs, West Germany).

IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 140–151.

Ten-dormice *(Glis qlis L.)* were used to demonstrate a circadian rhythm of spontaneous locomotor activity under constant conditions of light and temperature during hibernation. The influence of light–dark cycles and different light intensities on the circadian rhythms were emphasized. It was concluded that: (1) a circadian rhythm of spontaneous locomotor activity, as well as a rhythm of timing of arousal from hibernation, may persist in the hibernating dormouse at 8°C. ambient temperature and constant illumination (0.5 and 0.02 lux); (2) light–dark cycles of 6:18 and 12:12 hr. (50:0.5 lux) entrain the free-running rhythm of locomotor activity during hibernation and are able to synchronize the rhythm of timing of arousal; and (3) changing the light intensity from 0.5 to 0.02 lux at constant illumination affects the circadian rhythm of activity in the non-hibernating dormouse, but does not significantly influence the frequency of the free-running rhythm when the animal is hibernating.

**A68-80910**
**THE INTERNAL RHYTHMS OF HIBERNATORS.**
Felix Strumwasser, Floyd R. Schlechte, and John Streeter (Calif. Inst. of Technol., Div. of Biol., Pasadena).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 110–139.
NASA Grant NGR 05-002-031 and Contract DA-49-193-MD-2119.

A review of research concerning the field of biological clocks was given in an attempt to determine some of the mechanisms involved during induction of or arousal from hibernation in mammals. Included in a discussion of circadian clocks in mammals and birds were: (1) terminology and the circadian rule; (2) entrainment; and (3) Wever's model for circadian rhythms. Periodograms, autocorrelograms and power spectra were used for the analysis of stationary time series, and the various analytic techniques were compared. Discussions of circadian rhythms in hibernating mammals included: (1) problems of analyzing circadian clocks during hibernation; (2) analysis of entire hibernating seasons; (3) a three-factor theory of arousal frequency; (4) circadian and ultra-dian oscillations in the brain and single neutrons; and (5) the role of a circa-annual clock in hibernation. The evidence presented showed that there are progressive and continuous changes during the hibernating season. It was indicated that a statistical analysis of continuous time series from single individuals during an entire hibernating season is needed to demonstrate and properly evaluate the oscillator theory of hibernation.

**A68-80911**
**ESTIMATION OF ANGLES.**
Keith E. Beery (Calif., U., San Francisco Med. Center).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 11–14. 5 refs.
Grant PHS MPD 19,097.

In a study designed to test the adequacy of a long-held belief that acute angles are overestimated and obtuse angles underestimated, 20 adult subjects reproduced acute and obtuse angle sizes. The findings challenge this traditional view of angle estimation.

**A68-80912**
**STIMULUS INTENSITY AND ADAPTATION LEVEL AS DETERMINANTS OF SIMPLE REACTION TIME.**
**David L. Kohfeld (Ill., U., Urbana).**
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 468–473. 13 refs.
Grant PHS MH 08033.

Simple reaction time (RT) was investigated within the framework of adaptation level (AL) and stimulus intensity effects. Subjects were preadapted to various levels of tonal intensity or to equally loud noise signals and given a reaction test series of tones immediately afterward. The persistence of AL effects over time was tested by giving one-half of the subjects the test series again 24 hr. later. The results were consistent the AL theory in that RT was a function of both stimulus intensity and the prevailing AL. Other results indicated that: (a) exposure to silence did not establish an effective preadaptation level; (b) the effects of preadaptation persisted for at least 24 hr.; and (c) preadaptation to tone produced larger AL effects than did preadaptation to white noise.

**A68-80913**
**DEVELOPMENT AND DISSIPATION OF A VISUAL SPATIAL AFTEREFFECT FROM PROLONGED HEAD TILT.**
N. J. Wade and R. H. Day (Monash U., Victoria, Australia).
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 439–443. 10 refs.

Visual judgments of verticality were made before and after a period at 30° lateral head tilt with closed eyes. Experiment I investigated the size of the resulting visual spatial aftereffect with 15, 30, 45, 60, 75, 90, 105, 120, and 180 sec. duration of head tilt. In Experiment II head tilt duration was 120 sec.; the aftereffect was measured with 0, 20, 40, 60, 80, 100, 120, and 180 sec. between return of head to the upright and presentation of the test stimulus. The aftereffect was shown to develop and decay exponentially.

**A68-80914**
**NOTE ON DEES' SIZE CONSTANCY EXPLANATION OF THE MOON ILLUSION.**
Frederick N. Dyer (Alberta, U., Edmonton and Calgary, Canada).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 25–26. 6 refs.

Monocular cues for distance do not seem to produce faulty reversed perceptions of distance and this suggests that binocular cues and not monocular cues as Dees argued are involved in these distance judgments and also possibly in the moon illusion.

**A68-80915**
**HIGH ALTITUDE AND THE HEART.**
J. S. Sanders (Mo., U., School of Med., Dept. of Internal Med., Columbia).
*Medical Times*, vol. 96, Mar. 1968, p. 302–311. 23 refs.

The various cardiovascular adaptations necessary for man to tolerate the atmospheric changes of high altitude are discussed. The highest altitude at which long term residence is possible is approximately 18,000 ft. Tolerance of much higher altitudes up to 28,000 ft. is possible in well-conditioned individuals for shorter periods. Various mountain expeditions are discussed in this light. Some of the illnesses which may result from exposure to high altitude are discussed, along with treatment and preventive measures. These diseases include cardiovascular and pulmonary conditions with involvement of edema, hypertension, electrolyte imbalances, etc.

**A68-80916**
**EFFECTS OF TEMPERATURE AND TIME OF DAY ON TIME JUDGMENTS.**
Donald Pfaff.
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 419–422. 11 refs.
NASA Grant NSF 496 and John Hartford Found. supported research.

Normal circadian variations in body temperature were used to test Hoagland's conclusion, based on artificial temperature variations, about the effect of body temperature on time judgments. Subjects produced instructed time intervals faster (method of production) and overestimated the length of presented time intervals (method of estimation) during the afternoon, when their body

temperature was highest. These correlations of time judgments with normal circadian temperature variations support Hoagland's conclusion that subjective time judgment depends partly on an internal "clock" which accelerates when body temperature is raised.

**A68-80917**
**SPACE MEDICINE IN EDUCATION.**
Constantine D. J. Generales, Jr. (N. Y., State Med. Soc., Sect. on Space Med., New York City).
*(N. Y., State Med. Soc., 160th Ann. Meeting, New York City, Feb. 17, 1966).*
*New York State Journal of Medicine*, vol. 68, Mar. 15, 1968, p. 763–768. 11 refs.

A discussion is presented of the need for professional training in the field of aerospace medicine. Institutions in the United States offering course work in aerospace medicine are listed and discussed in relation to the medical education in general. The benefits of the type of education to mankind now and in the future are stressed.

**A68-80918**
**PHYSIOLOGICAL PERFORMANCE OF MEN SUBJECTED TO DIFFERENT WATER REGIMES OVER A TWO-DAY PERIOD.**
N. B. Strydom, C. H. van Graan, J. H. Viljoen, and A. J. S. Benade (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab., Johannesburg, South Africa).
*South African Medical Journal*, vol. 42, Feb. 3, 1968, p. 92–95. 6 refs.

Thirty men were observed over a period of two days, during which time they were required to walk a total distance of 25 mi. over a desert-like area. They carried packs weighing approximately 45 lb. and walked at 3–3.5 m.p.h. At the end of the walk on the second day they had to shoot at targets at various ranges. The highest globe temperature recorded was 112°F., while dry-bulb temperatures remained below 85°F. for most of the time. In spite of this, the group of men who were given two bottles (2.04 l.) of water/man/day became severely dehydrated. As a result, the body temperatures of four of the ten men rose to dangerously high levels of 103°F. or above. Their heart rates were excessively high, while sweat rates were decreased. The physiological stress imposed was so severe that these men barely managed to complete the walk on the second day. The group provided with one gal./man/day (4.54 l.) performed fairly well on the first day, but progressively developed a greater water deficit on the second day. At the completion of the walk on the second day, an average rectal temperature of 101°F. was recorded and heart rates were similar to those of the above group. The marksmanship of these two groups was affected, resulting in 15–20% lower scores than on control days. The men who were given water *ad libitum* gave by far the best performance. Their body temperatures and heart rates were comparatively low, and not higher than would be expected from subjects doing the same level of exercise in cool environments. Their marksmanship was unaffected by the walk. The effects of a water deficit on the morale and drive of the men in the two water-restricted groups were obvious. Behavioral and symptomatic effects became more pronounced as the extent of water depletion increased on the second day. Appetites were poor, and during the intermediate afternoon and evening these men were listless and morose.

**A68-80919**
**OXIDATIVE ENZYMES AND PATHWAYS OF HEXOSE AND TRIOSE METABOLISM IN CHLORELLA.**
Robert M. Devlin and Raymond A. Galloway (Md., U., Dept. of Botany, College Park).
*Physiologia Plantarum*, vol. 21, no. 1, 1968, p. 11–25. 67 refs.
NASA supported research.

Cell-free preparations of *Chlorella pyrenoidosa* Chick, van Niel's strain, were assayed for oxidative enzymes, utilizing isotopic and spectrophotometric techniques. The enzyme activity of heterotrophic and autotrophic cells was compared. The study was divided into categories, one concerned with the spectrophotometric detection of enzymes involved in the initial reactions of glycolysis and the hexose monophosphate shunt, and the other with the direct oxidation of glucose as compared with that oxidized via glycolysis. The reduction of pyridine nucleotides in crude extracts was studied with glucose, glucose-6-phosphate, 6-phosphogluconate, and fructose-1-6-diphosphate as substrates. Enzymes detected in both heterotrophic and autotrophic cells were hexokinase, fructose-diphosphate-aldolase, NAD-linked 3-phosphoglyceraldehyde dehydrogenase, glucose-6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase, and NADP-linked 3-phosphoglyceraldehyde dehydrogenase. In addition to isotopic studies designed to make an appraisal of the hexose monophosphate shunt, a comparison of the rate of reduction of NADP by glucose-6-phosphate and 6-phosphogluconate in relation to the reduction of NAD by 3-phosphoglyceraldehyde was made in light- and dark-grown cells. The rate of reduction of NADP appeared to be lowered in the light-grown cells, suggesting, as did also the isotopic studies, that the hexose monophosphate shunt is less active in autotrophic metabolism than in heterotrophic metabolism.

**A68-80920**
**MULTIPLE FORMS OF POLYGLUCOSIDE-BRANCHING ENZYME IN THE ALGAE.**
Jerome F. Fredrick (Dodge Chem. Co., New York Div., Res. Labs., Bronx, N. Y.).
*Physiologia Plantarum*, vol. 21, no. 1, 1968, p. 176–182. 26 refs.
Dodge Inst. for Advan. Studies, Miami and Boston supported research.

Three isozymes specifically concerned with the "branching" of linear polyglucosides have been detected in algae. These enzymes were detected using two-dimensional polyacrylamide gel electrophoresis, and were found to be present in blue-green, red and in green algae. Two isozymes were found in *Oscillatoria princeps*; three enzymes were present in *Spirogyra setiformis*, and two and three such enzymes were detected in red algae of the *Rhodymenia* type. The significance of the multiple forms of this branching enzyme was assessed in light of the type of storage polyglucosides formed by these plants. The "degree of branching" of the storage sugar appeared to be related to the evolutionary status of these algae.

**A68-80921**
**THE EFFECT OF OXYGEN LACK ON THE TRACHEAL CILIARY ACTIVITY.**
Tore Dalhamn and Åke Rosengren (Karolinska Inst., Inst. of Hyg. and Swed. Tobacco Co., Chem. Res. Dept., Stockholm, Sweden).
*Archives of Environmental Health*, vol. 16, Mar. 1968, p. 371–373. 8 refs.
Am. Med. Assn. Educ. and Res. Found. supported research.

*In vitro* exposure of specimens of rabbit trachea to nitrogen or argon atmospheres with very low oxygen content rapidly produced ciliostasis. This did not occur when the specimens were exposed in an aerosol of atmospheric air.

**A68-80922**
**DISTINCTIVE FEATURES OF CORTICAL ASSOCIATION RESPONSES EVOKED BY DIFFERENT PERIPHERAL STIMULI [OB OTLICHIIAKH KORKOVYKH ASSOTSIATIVNYKH OTVETOV, VOZNIKAIUSHCHIKH NA RAZNYE PERIFERICHESKIE RAZDRAZHENIIA].**

S. P. Narikashvili and A. S. Timchenko (Georgian SSR, Acad. of Sci., Inst. of Physiol., Tbilisi).
*Fiziologicheskii Zhurnal SSSR*, vol. 53, Nov. 1967, p. 1322–1330. 11 refs.
In Russian.

Studies (auditory, cutaneous and photic) in cats were made to determine the longest time interval between two single stimuli causing a blocking of the unconditioned response (cortical), when one or several afferent nerve impulses were stimulated. Results of experiments were the following: (1) The time interval between two single stimuli, causing blocking of the associative unconditioned response depended on the modality of the combined stimuli. It was longer when the stimuli affected only one afferent system. The blocking of the unconditioned responses occurred at noticeable shorter intervals after stimuli of a different modality. The difference in duration was related to the modality of the stimulus. (2) When cutaneous, photic, and auditory stimuli were combined, different results were obtained, depending on which one was conditioned and which one was unconditioned. The associative response to light, following a conditioned cutaneous stimulus, was blocked after a shorter time interval then when the sequence was reversed. Response to light following a conditioned auditory stimulus was blocked after a shorter interval than when the order was reversed. The conditioned auditory stimulus inhibited the asociative response to cutaneous stimulation after a shorter interval than when the order was reversed. (3) The different character of interaction of the cortical association responses evoked by different peripheral stimuli were unlike the inhibition evoked by two similar stimuli, which confirmed the fact that groups of cortex neutrons were activated. On the basis of these observations it might be infered that the intergration of impulses of different modalities must originate at the cortex level through the coordination of different complexes of neuron associations.

**A68-80923**
**DEPENDENCE OF CALORIC NYSTAGMUS ON THE EFFECT OF CENTRIFUGAL FORCE [ZAVISIMOST'KALORICHESKOGO NISTAGMA OT DEISTVIIA TSENTROBEZHNOI SILY].**

V. A. Kisliakov, M. M. Levashov, and I. V. Orlov (USSR, Acad. of Sci., I. P. Pavlov Inst. of Physiol., Lab. of Physiol. of Vestibular Apparatus, Leningrad).
*Fiziologicheskii Zhurnal SSSR*, vol. 53, Nov. 1967, p. 1359–1366. 18 refs.
In Russian.

The effect of the centrifugal force on caloric nystagmus was studied in pigeons. The experiments were monitored on an oscillograph. The results could be satisfactorily explained by the theory of fluid movement of the semicircular canal function, without involving the interaction mechanisms of the vestibular and ampullar receptors. No evidence refuting the influence of the otolithic organs on the reactions of the semicircular canals was found. It could be inferred, that the effect of the centrifugal forces on the fluid movement in the semicircular canals subjected to caloric stimulation, were significant enough to conceal the role played by the otoliths. The caloric testing did not provide enough data on the influence of vestibular receptors on the reactions of the semicircular canals. The data obtained strengthened and enlarged the theory of fluid movement in caloric vestibular reactions and the experiments helped to clarify the processes occurring in the cupula-endolymph system during simultaneous action of the two stimuli, caloric testing and centrifugal force.

**A68-80924**
**DYNAMICS OF ALTERATIONS IN GAS CONTENT OF DOG BLOOD DURING DEVELOPMENT OF ACUTE HYPOXIA [DYNAMIKA ZMIN HAZOVOHO SKLADU KROVI SOBAK PID CHAS ROZVYTKU HOSTROI HIPOKSII].**

A. I. Nazarenko (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Lab. of Comp. Physiol., Kiev).
*Fiziolohichnyi Zhurnal*, vol. 13, Nov.–Dec. 1967, p. 774–777. 8 refs. In Ukrainian.

The experiments were carried out on dogs breathing gas mixtures with gradually decreasing oxygen content to as low as 3.4%. The oxygen saturation of arterial blood, arterial $O_2$ and $CO_2$ tension, arteriovenous oxygen (A-V $O_2$) differences, and $O_2$ capacity of the blood were determined. The breathing of gas mixtures with lower than normal $O_2$ concentration caused regular changes in the gas composition of the blood such as lowering of arterial $O_2$ tension and A-V $O_2$ differences, and decreased $O_2$ capacity of blood. Reduction of $O_2$ saturation of the arterial blood to 20% and the fall of the A-V $O_2$ differences to 0.6% resulted in the death of the animals.

**A68-80925**
**RESPIRATION AND GAS EXCHANGE IN YOUNG AND ELDERLY PEOPLE UNDER CONDITIONS OF MUSCLE ACTIVITY [DYKHANNIA TA HAZOOBMIN LIUDEI MOLODOHO TA POKHYLOHO VIKU V UMOVAKH M'IAZOVOI DIIAL'NOSTI].**

I. V. Muravov and K. T. Sokolov (UkrSSR, Acad. of Med. Sci., Inst. of Gerontol., Kiev).
*Fiziolohichnyi Zhurnal*, vol. 13, Nov.–Dec. 1967, p. 778–783. 10 refs. In Ukrainian.

The changes in breathing and gas exchange during physical exercise and rest were investigated in 398 subjects aged 20 to 98 yr. The results showed that with age the transition from rest to work became more arduous. During the initial stage of physical exercise the following modifications in the respiratory processes were observed: (1) dyspnea, disruption of movement coordination, (2) increase of the oxygen debt, and (3) a sharp fall of arterial blood oxygen capacity. With age the increase of oxygen consumption did not always correspond to the work intensity, in subjects aged 70 to 79 yr. the oxygen consumption increased with light to moderate work load and decreased with strenuous exercise. The oxygen debt was always higher in elderly people than in young and the highest increase in oxygen consumption occurred in the first minutes of the recovery period. These changes in oxygen consumption could be considered as one of adaptation of the breathing regulation to age.

**A68-80926**
**RATIO BETWEEN SUGAR AND LIPIDS IN HUMAN BLOOD DURING DIFFERENT HEAVY PHYSICAL EXERCISES [SPIVVIDNOSHENNIA MIZH TSUKROM I LIPIDAMH V KROVI LIUDYNY PRY VELYKYKH FIZYCHNYKH NAVANTAZHENNIAKH RIZNOHO KHARAKTERU].**

I. E. M. Kozhukhar (Kiev. Inst. of Phys. Culture, Dept. of Biochem. UkrSSR).
*Fiziolohichnyi Zhurnal*, vol. 13, Nov.–Dec. 1967, p. 784–787. 7 refs. In Ukrainian.

Results are reported of studies of athletes during physical training for various athletic events. They showed that the exchange processes taking place in the human body during training were in direct relationship to the intensity, speed, duration and repetition of the sport performed. The dynamics of sugar and lipids in the blood during strenuous exercise performed at high speed revealed a high content of sugar (hyperglycemia) and a higher one of lipids (hyperlipemia) in comparison with preexercise data; when training for endurance opposite results were obtained. Effective training programs to improve work capacity, physical fitness and increase the ability to work with increasing age could be planned using the data obtained.

**A68-80927**
**TESTING OF ANTIRADIATION PROPERTIES OF PROPOLIS [VYPROBUVANNIA ANTYPROMENEVYKH VLASTYVOSTEI PROPOLISU].**
O. P. Horodets'kyi and P. M. Kuliabko (UkrSSR, Acad. of Sci., O. O. Bohomolits, Inst. of Physiol., Kiev).
*Fiziolohichnyi Zhurnal*, vol. 13, Nov.–Dec. 1967, p. 805–808. 13 refs. In Ukrainian.

Three series of experiments were conducted on white mice. Experimentals and controls were irriadiated with 600 r, and the dosage of the propolis solution [product of bee venom] received by experimental mice was 0.1 ml. The controls received a physiological solution. In a first series of experiments (20 experimentals and 10 controls) the propolis solution was administered everyday for seven days before irradiation; in a second series (20 experimentals and 10 controls) the propolis was given to the mice after irradiation everyday for seven days; in the third series (155 experimentals and 111 controls) the mice received the propolis before and after irradiation everyday for seven days. The survival of experimental mice in the first and second series of experiments was 25 and 20% respectively and in the third 37%. These experiments showed that propolis had prophylactic and thereapeutic properties in case of radiation injuries.

**A68-80928**
**METOCLOPRAMIDE FOR VERTIGO.**
J. R. Salas (Wellington Hosp., New Zealand).
*New Zealand Medical Journal*, vol. 66, Dec. 1967, p. 870–872.

Metoclopramide has been tried as an antivertiginous drug in 22 cases of labyrinthine vertigo. It has shown considerable promise in the effective relief of vertigo and in stabilizing the patients with labyrinthine imbalance. There have been no serious side effects and only one patient of the 22 treated was adversely affected by the drug. Tinnitus is not relieved. The hearing is not improved.

**A68-80929**
**THE INFLUENCE OF TYPE OF DIETARY CARBOHYDRATE. EFFECT ON HISTOLOGICAL FINDINGS IN TWO STRAINS OF RATS.**
Anna M. Allen Durand, Murray Fisher, and Mildred Adams (Agr., Dept., Agr. Res. Serv., Human Nutr. Res. Div., Beltsville, Md.).
*Archives of Pathology*, vol. 85, Mar. 1968, p. 318–324. 12 refs.

Investigations were undertaken to determine survival and tissue structure of two strains of rats fed different types of carbohydrate. The carbohydrates studied were sucrose, glucose, and cornstarch. The extent of fat deposition in livers of rats fed diets containing 25% cooked egg varied with strain and with the type of carbohydrate. Fat was periportal and cirrhosis did not occur. Rats of the BHE strain had more stainable liver fat than comparable Wistar rats. Renal disease was the chief cause of death in BHE rats and was accelerated by a diet containing sucrose; BHE rats died earlier than Wistar rats when fed a diet containing sucrose. Respiratory disease was the chief cause of death in Wistar rats. Survival of Wistar rats did not differ with carbohydrates and was similar to BHE rats fed cornstarch or glucose.

**A68-80930**
**ORIGIN OF ORGANIC MATTER IN EARLY SOLAR SYSTEM—II. NITROGEN COMPOUNDS.**
Ryoichi Hayatsu, Atsuko Oda, Kiyono Fuse, Edward Anders (Chicago, U., Enrico Fermi Inst., Ill.), and Martin H. Studier (Argonne Natl. Lab., Chem. Div., Ill.).
*Geochimica et Cosmochimica Acta*, vol. 32, Feb. 1968, p. 175–190. 40 refs.
NASA Grant NsG-366 and AEC supported research.

Previous identifications of nitrogen compounds in the Orgueil meteorite were confirmed. Guanylurea was identified as an additional, major constituent (270 p.p.m.). All of the nitrogen compounds seen in carbonaceous chondrites (adenine, guanine, melamine, ammeline and guanylurea) form spontaneously, in yields of 0.1–0.5%, when CO, $H_2$, and $NH_3$ are allowed to react in the presence of iron meteorite powder. Cytosine, cyanuric acid, biuret and urea also form, along with an assortment of hydrocarbons similar to those in meteorites. These results support the suggestion of previous work that the organic compounds in meteorites formed in the solar nebula, by spontaneous reactions of CO, $H_2$ and $NH_3$. A large part of the prebiotic organic matter on the Earth may have originated in a similar manner.

**A68-80931**
**ORIGIN OF ORGANIC MATTER IN EARLY SOLAR SYSTEM—I. HYDROCARBONS.**
Martin H. Studier (Argonne Natl. Lab., Chem. Div., Ill.), Ryoichi Hayatsu, and Edward Anders (Chicago, U., Enrico Fermi Inst. and Dept. of Chem., Ill.).
*Geochimica et Cosmochimica Acta*, vol. 32, Feb. 1968, p. 151–173. 57 refs.
NASA Grant NsG-366 and AEC supported research.

Organic compounds in the Orgueil and Murray carbonaceous chondrites were examined by combination gas chromatography/mass spectrometry. Above $C_{10}$ normal paraffins are the principal species, with lesser amounts of 2-methyl-, 3-methyl, and other slightly branched paraffins and olefins. Below $C_{10}$, aliphatic hydrocarbons are markedly deficient, while benezene and alkylbenzenes dominate. COS, $CS_2$, m- and p-dichlorobenzene were also seen in both meteorites. Three isoprenoid hydrocarbons ($C_{11}$, $C_{13}$, $C_{14}$) were tentatively identified in Murray. A similar hydrocarbon distribution was synthesised from CO and $D_2$ in the presence of iron meteorite powder. This reaction (essentially a Fischer–Tropsch synthesis) yields a metastable distribution of normal and slightly branched paraffins and olefins, including isoprenoid hydrocarbons from $C_9$ to $C_{19}$. Sustained reheating causes partial transformation of aliphatics to aromatics, the degree of conversion depending on time and temperature. At 900°C., polynuclear aromatic hydrocarbons such as pyrene, benzopyrene and coronene were obtained in yields of 1–8%. Catalytic reactions of this type may have taken place on a large scale in the solar nebula, converting CO to less volatile carbon compounds, and thus enabling carbon to condense in the inner solar system. Further opportunities for hydrocarbon synthesis would be provided during impact of carbon-bearing planetesimals or comets on the Earth, Moon and Mars.

**A68-80932**
**TELEMETRIC MONITORING OF THE REFLEX BLINK RATE.**
Barbara L. Drinkwater and M Marilyn Flint (Calif., U., Santa Barbara).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 303–307. 12 refs.
Grant Calif., U. 265.

A technique for using telemetry to transmit the muscle action potentials of the eyeblink to a biological recorder is described in detail. Samples of oscillograph recordings are included to illustrate the patterns obtained from a variety of facial movements. Considering the high objectivity and reliability coefficients obtained, this procedure is recommended to those interested in using the blink rate as an experimental variable.

**A68-80933**
**PERCEPTION BIBLIOGRAPHY: LIII. PSYCHOLOGICAL ABSTRACTS, 1937, VOLUME 11, SECOND HALF.**
C. H. Ammons and R. B. Ammons (Mont., U., Missoula).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 283–286. 104 refs.

In this alphabetical listing are 104 items on perceptual research.

**A68-80934**
**EYE MOVEMENTS AND THE SPIRAL AFTEREFFECT.**
Alan Maxwell (Vassar Coll., Poughkeepsie, N. Y.).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 266.

Earlier investigators stated the observance of two distinct phases in the duration of the spiral aftereffect, the first of which they called the "Alpha phase" and the second the "Beta phase". In spite of these observations, there is no experimental study known to the author which has probed this aspect of spiral aftereffect. This, of course, may only mean that those who are aware of it regard it as an inherent feature of the phenomenon unworthy of further examination. However, it appears that such a view may be unwarranted and that this intermittency represents a characteristic of individual observers and not of the phenomenon as such. Data attempting to justify this idea are discussed.

**A68-80935**
**MOTOR SKILLS BIBLIOGRAPHY: LXXXVI. PSYCHOLOGICAL INDEX NO. 29, 1922.**
R. B. Ammons and C. H. Ammons (Mont., U., Missoula).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 245–246. 57 refs.

Fifty-seven items dealing with motor skills are listed alphabetically.

**A68-80936**
**EFFECT OF HIGH ELEVATION UPON PHYSICAL PROFICIENCY, COGNITIVE FUNCTIONING AND SUBJECTIVE SYMPTOMATOLOGY.**
R. P. Carver and F. R. Winsmann (U.S. Army Res. Inst. of Environ. Med., Natick, Mass.).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 223–230. 8 refs. Advan. Res. Proj. Agency supported research.

To assess the possible decremental effects associated with an abrupt exposure to high elevation, eight basic fitness tests, one intelligence test, and a self-report symptoms card were administered to 43 adult subjects at sea level and at 13,000 ft. At the high elevation, the possible facilitating effect of the drug acetazoleamide was studied by administering it to 21 subjects. It was concluded that abrupt exposure to an elevation of 13,000 ft.: (1) does affect running proficiency but does not affect other aspects of physical proficiency; (2) does not disrupt cognitive functioning; and (3) does produce headache, dizziness, nausea, shortness of breath and insomnia. Acetazoleamide (1) was effective in reducing reports of headache, dizziness, and nausea while facilitating sleep and (2) did not affect physical proficiency or cognitive functioning.

**A68-80937**
**MOTOR SKILLS BIBLIOGRAPHY: LXXXV. PSYCHOLOGICAL INDEX NO. 28, 1921.**
C. H. Ammons and R. B. Ammons (Mont., U., Missoula).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 217–218. 56 refs.

This listing contains 56 references to work on motor skills.

**A68-80938**
**TRANSMISSION OF SENSORY INFORMATION THROUGH ASCENDING SPINAL HINDLIMB PATHWAYS DURING SLEEP AND WAKEFULNESS.**
O. Pompeiano, G. Carli, and H. Kawamura (Pisa, U., Ist. di Fisiol. and C.N.R., Ist. di Med. Sper., Sez. di Neurofisiol., Pisa, Italy).
*Archives Italiennes de Biologie*, vol. 105, Nov. 1967, p. 529–572. 65 refs.
Grant PHS NB 05695-02; IBRO/Unesco and Min. della Pubb. Istruzione supported research.

The transmission of somatic afferent volleys through ascending spinal hindlimb pathways was investigated during physiological sleep and wakefulness in unrestrained, unanesthetized cats. A late mass discharge was recorded from the ventral quadrant of the spinal cord on single shock stimulation of ipsilateral hindlimb nerves. The response was elicited polysynaptically by stimulation of the cutaneous and high threshold muscular afferents. On the contrary both an early and a late discharge were recorded from the dorsal part of the lateral funicle on single shock stimulation of the ipsilateral hindlimb nerve. While the early response was elicited monosynaptically by stimulation of group I and possibly group II muscular afferents, the late response appeared on stimulation of the high threshold muscular afferents. All the ascending mass discharges elicited polysynaptically by stimulation of the cutaneous and high threshold muscular afferents were not affected during quiet wakefulness and synchronized sleep, nor was any detectable change observed during desynchronized sleep in the absence of ocular movements. A depression of these responses, however, occurred particularly during the bursts of rapid eye movements (REM) characteristic of the desynchronized sleep and also during the transient orienting reaction associated with arousal of the animal. Contrary to these findings the monosynaptic response recorded from the dorsolateral funicle on stimulation of the group I muscle afferents was not modified during the sleep–waking cycle. These results are explained by assuming that during REM as well as during the induced arousal there is a supraspinal inhibition of the interneurons which transmit the cutaneous and the high threshold muscular afferent volleys to the neurons of the ipsilateral ascending hindlimb pathways, coursing along both the ventral and the lateral funicles.

**A68-80939**
**URINE PRODUCTION IN THE HIBERNATING BAT.**
Frank C. Kallen and Harold A. Kanthor (N. Y., State U., Schools of Med., Depts. of Anat., Buffalo and Rochester, U., N. Y.).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 280–294.
Grants PHS HE-06260, GRS 0306-632B-100, and MSR T5-GM-6.

A previous view that hibernating bats are anuric is not supported by observations of urine flow in catheterized little brown bats (*Myotis lucifugus*). Flow sufficient to be of significance in bladder distension is seen down to 9.0°C. in summer and 6.6°C. in winter. Urine is probably produced below these levels, in amounts below reliable limits of the procedure (of the order of 0.0005 $\mu$1./min./g. body weight). Steady state urine flow at 39.4°C. is 0.206±0.030 $\mu$1./min./g. body weight (mean±S.E.), falling to 0.0010±0.0001 at 8.1°C. Comparison with Hong's data on cold-exposed rats and ground squirrels is consistent with the suggestion that a glomerular filtration barrier forms in hibernators to keep hydration of renal tissue within tolerable limits at low temperature. The bat kidney should need only a slight barrier, however, owing to a relatively great total resorptive capacity. Relevance of the findings to events occurring during hiberation in the wild is discussed.

**A68-80940**
**HEART AND CIRCULATION IN HIBERNATORS.**
Bengt W. Johansson (Gen. Hosp., Heart Lab., Malmö, Sweden).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 200–218.

Information on the circulation of mammalian hibernators was summarized, and some notes on the anatomy of the heart were given. Areas reviewed included: (1) heart rate in both hibernators and non-hibernators; (2) cardiac resistance to hypothermia; (3) cardiac output; (4) blood pressure; (5) peripheral resistance; (6) peripheral and regional circulation; (7) blood volume; (8) electrocardiograms in hibernators and non-hibernators; (9) arrhythmias; (10) autonomic and hormonal influences; and (11) metabolic differences in hibernators and non-hibernators.

**A68-80941**
**ERYTHROCYTE GLYCOLYTIC INTERMEDIATES OF CONTROL, COLD-EXPOSED AND HIBERNATING HAMSTERS.**
Mary Ann Brock (HEW, Dept., PHS, NIH, Bethesda and Baltimore City Hosps., Md.).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 409–420.

Analyses of trichloroacetic acid extracts of erythrocytes and plasma plus ion exchange column chromatography techniques were used to quantify carbohydrates and phosphorylated glycolytic intermediates in the rapidly extracted blood of warm room control, cold-exposed and hibernating hamsters, and preserved hamster blood. After cold exposure for several weeks, hamsters which eventually hibernated had increased hematocrits, characteristic of hibernators rather than controls. ADP, AMP, FDP, PGA, HDP and weak acid phosphates were present in about the same concentrations in control, cold-exposed and hibernating hamster blood. ATP, DPG and pentose-P concentrations were somewhat increased in cold-exposed hamsters, while the same compounds were slightly lower in concentration in hibernators as compared to controls. IP was significantly higher in both erythrocytes and plasma of hibernators compared to control and cold-exposed hamsters. When hibernators were compared to cold-exposed animals, the decreased ATP and pentose-P concentrations of the hibernators were significant. The ATP concentration during hibernation did not fall much below that of control animals. It is suggested that before or during hibernation some adaptive change in glycolysis occurs which results in the maintenance of phosphorylated intermediate concentrations, particularly ATP, at the low *in vivo* temperature.

**A68-80942**
**CELL PROLIFERATION KINETICS IN THE TONGUE AND INTESTINAL EPITHELIA OF HIBERNATING DORMICE (GLIS GLIS).**
S. J. Adelstein, C. P. Lyman, and Regina C. O'Brien (Harvard Med. School, Dept. of Anat., Boston, Mass.).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 398–408.
Contract AF-41(609)-2296, Grants PHS AM 04219, and PHS GM 05611.

Adult dormice (*Glis glis*) are used in an attempt to define the state of cellular division in epithelial populations of the hibernating dormouse, and to describe the dynamics of the cells' response to arousal. During hibernation DNA synthesis takes place at a markedly reduced rate but the number of epithelial cells synthesizing DNA is the same in active and hibernating animals. Labelled mitotic figures are not seen up to 96 hrs. of continuous hibernation after the administration of tritiated thymidine. This suggests that there is a block in $G_2$. The mitotic index drops in hibernation and anaphases or telophases are seen, suggesting the presence of an intermitotic block as well. On arousal, there is a flourishing of mitoses with the appearance of anaphases, telophases and labelled mitotic figures indicating that both blocks have been relieved.

**A68-80943**
**TEMPERATURE REGULATION AND HIBERNATION.**
H. T. Hammel (John B. Pierce Found. Lab., New Haven, Conn.).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 86–96.

Investigations utilizing dogs, cats and monkeys were cited in order to present the central nervous mechanism which regulates body temperature. Generalizations resulting from these studies included: (1) the hypothalamus, particularly the preoptic region, is essential for physiological temperature regulation; (2) the preoptic region is sensitive and responsive to changes in its own temperature; and (3) the temperature regulating mechanism within the hypothalamus and including the preoptic region responds to environmental temperature. Thermoregulatory responses to fever, exercise and sleep were also discussed. A model showing how neurons within the hypothalamus may be interconnected in order to accomplish temperature regulation was presented suggesting what modifications might occur in temperature regulation at the onset of hibernation. An account of the state of thermoregulation during and in arousal from hibernation was also given.

**A68-80944**
**TEMPERATURE REGULATION IN THE LITTLE BROWN BAT, MYOTIS LUCIFUGUS.**
Robert C. Stones (Mich. Technol. U., Dept. of Biol. Sci., Houghton) and Jacob E. Wiebers (Purdue U., Dept. of Biol. Sci., Lafayette, Ind.).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 97–109.
Grants NIH GM-10811 and PRF X-R 3269.

An attempt was made to determine basic aspects of temperature regulation in the hibernating species. *Myotis lucifugus*. Rates of oxygen consumption and body temperatures were measured at different ambient temperatures and during different seasons. Seasonal difference in the thermoregulatory response to changes in ambient temperature were indicated. The pattern of thermoregulation for *M. lucifugus* when regulating a high and active temperature appeared to be opposite that of most other natural acclimatized mammals. Thermoregulatory mechanisms were observed operating in animals exposed to moderate heat and cold stress. The ability to arouse and rewarm to active levels of temperature was found to be directly proportional to the number of days winter rats were exposed to heat prior to cold exposure. It was concluded that *M. lucifugus* should not be considered mammals with highly developed thermoregulatory mechanisms, especially when inactive; however, they should be given rightful distinction for their homeothermic as well as their poikilothermic attributes of thermoregulation.

**A68-80945**
**PHYSIOLOGICAL OBSERVATIONS OF SUBARCTIC BEARS UNDER WINTER DEN CONDITIONS.**

G. Edgar Folk, Jr. (Iowa, U., Dept. of Physiol., Iowa City).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 75–85.
ONR and NSF supported research.

This study shows that, in summer, the sleeping heart rate of bears is high, ranging in different sized bears from 40 to 70 b./m. up to 92 b./m. As winter rest in dens develops, the sleeping heart rates are depressed by over 75%. There is little body temperature reduction. The hearts of bears made hypothermic were able to beat very slowly without fibrillation, when cold.

**A68-80946**
**VARIATIONS IN THE PATTERNS OF TORPIDITY OF SMALL HOMEOTHERMS.**
Jack W. Hudson (Rice U., Dept. of Biol., Houston, Tex.).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 30–46.
Grants PHS GM 11368 and NSF GE 6303.

Variations in the patterns of torpidity of small homeotherms were presented. The phylogenetic history of homeothermy suggested three stages in the evolution of hibernation, each represented by living groups. The general phenomenon of daily torpor, the intermediate stage, was reviewed. The ecological significance of daily torpor was assumed to be an energy-saving device for animals which either subsist on reduced foodstuff or depend on stored food. Factors affecting the torpor, both daily and seasonal, of different species of mice were presented including: body temperature; ambient temperature; metabolic rate; and heart rate. The review concentrated on the general mechanisms utilized for induction of, and arousal from, torpidity. It was suggested that research involving ecological, taxonomic and plylogenetic factors affecting torpidity is needed. A discussion followed.

**A68-80947**
**THE RELATION OF EXTERNAL CONDITIONS TO THE ONSET AND TERMINATION OF HIBERNATION AND ESTIVATION.**
E. T. Pengelley (Calif., U., Dept. of Life Sci., Riverside).
IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 1–29.
Grant NSF GB2155 and Riverside County (Calif.) Heart Assn. supported research.

The factors which influence, the onset and termination of hibernation have been examined in detail in two species (*Mesocricetus auratus* and *Citellus lateralis*). Other species have been compared to these. The temporal nature of hibernation in some species is considered to be governed by an endogenous rhythm of approximately a year's duration. It is proposed that such rhythms be referred to as 'circannian'. The nature of possible 'Zeitgebers' for this rhythm are discussed. The timing of hibernation in other species seems to be governed by a continuous response to periodic environmental information. It is suggested that this may be linked to a circadian clock. In yet other species the factors influencing its onset and termination are unknown. Environmental temperature, photoperiod, food, water and access to a means of locomotor activity have all been shown to have an influence on the time sequence of hibernation,; but this influence varies between species. It has been suggested that long-term studies under controlled environments are an essential feature for a sound understanding of hibernating phenomena.

**A68-80948**
**VITAMIN EXCRETION IN THE URINE OF SCHOOL CHILDREN DURING DIFFERENT TRAINING INTENSITIES IN SWIMMING [EKSKRETSIIA VITAMINOV S MOCHOI U SHKOL'NIKOV PRI RAZLICHNYKH NAGRUZKAKH PO PLAVANIIU].**
O. V. Maksiutinskaia, T. K. Pavlenko, and O. I. Snigur (L'vov Sci.-Res. Inst. of Pediat., Obstet., and Gynecol., UkrSSR).
*Gigiena i Sanitariia*, vol. 32, Dec. 1967, p. 82–84. 11 refs. In Russian.

The requirements for vitamin $B_6$, niacin and vitamin C were studied in 20 young swimmers (ages 10 to 14) during training of different intensity. The children were divided into two equal groups, one group received daily multivitamin pills (A, $B_1$, $B_2$ and C) the other served as control. The vitamin excretion in the urine of all children was studied daily, for two wk. Results of the studies showed that the dosage of multivitamin pills administered to the young swimmers was insufficient during increased physical activity. It was recommended to add vitamin $B_6$ to the multivitamin pills given to the young athletes.

**A68-80949**
**OBJECTIVE DETERMINATION OF DARK ADAPTATION CURVES [OB"EKTIVNOE OPREDELENIE KRIVYKH TEMNOVOI ADAPTATSII GLAZA].**
L. N. Gassovskii, V. A. Gan'kovskaia, A. M. Dmitrieva, L. V. Krivoshapova, and I. A. Kolesnikova.
*Oftal'mologicheskii Zhurnal*, vol. 22, no. 5, 1967, p. 346–350. 8 refs. In Russian.

Dark adaptation curves were determined in 16 subjects repeated five times, on days, with the help of the objective method using optokinetic nystagmus (OKN) and two subjective methods one utilizing a Nagel's adaptometer. It was established that both subjective and objective adaptation curves follow the same but pass at various height over the abciss axis. The values of the correlation coefficients between the values threshcld obtained with objective curves and the same thresholds determined with subjective curves were established as well. The coefficients of cone vision were 0.74, while those of rod vision were 0.37. The similarity of the shape of dark adaptation curves plotted with the help of objective and subjective curves as well as the possibility to plot a subjective curve based on the objective one, shows that the objective method may be used in clinical practice for the diagnosis of diseases in light perceptive components of the eye.

**A68-80950**
**THE RHEOCARDIOGRAM IN THE NORMAL SUBJECT.**
G. Borroni and D. Ciocia (Osped. Fatebenefratelli Fatebenesorelle Ciceri-Agnesi, Fourth Med. Serv., Milan, Italy).
*Panminerva Medica*, vol. 9, Nov. 1967, p. 514–520. 42 refs.

The value of the rheocardiographic method in the analysis of the cardiac cycle was studied in normal subjects, by polygraphic comparison with other well-known tracings (electrocardiogram, phonocardiogram, carotid sphygmogram, apex-cardiogram, jugular phlebogram and ballistocardiogram). The opinion is expressed that, it is always possible to localize some reference points on the rheocardiogram curve, and this subdivide the cardiac cycle in its various phases; intersystole, isometric systole, isotonic systole (rapid and slow ejection), isometric diastole, slow and rapid refilling and atrial contraction. Emphasis is placed on the diagnostic value of the rheocardiographic method in that it gives more complete information than other individual tracings.

**A68-80951**
**EFFECT OF HYPOXIA ON TISSUE SENSITIVITY TO ACETYLCHLINE IN ANIMALS OF DIFFERENT AGE [VPLYV HIPOKSII NA CHUTLYVIST' TKANYN DO ATSETYLKHOLINU U TVARYN RIZNOHO VIKU].**

A68-80952

O. O. Markova (Ternopol Med. Inst., Dept. of Pathol. Physiol., UkrSSR).
*Fiziolohichnyi Zhurnal*, vol. 13, Nov.–Dec. 1967, p. 827–830. 8 refs. In Ukrainian.

Variations of the heart and brain sensitivity to acetylcholine was studied in young rats, while adult rats were used as controls. The rats were under light anesthesia during the experiments, their electrocardiogram (ECG) and electrocorticogram (ECoG) were monitored. The acetylcholine was injected into the jugular vein in doses of 2.5 μg./100 g. The brain of young rats showed a higher sensitivity to acetylcholine. The starting point of sensitivity to acetylcholine of the heart and brain having been established, the rats were subjected to a simulated altitude of 12,000 m. in a low-pressure chamber at an ascent rate of one to two min. until acute hypoxia occurred. They were then returned to normal barometric pressure, and tested for their acetylcholine sensitivity after one to two min. Results showed the ability of the young animals to withstand hypoxia better than adults. One to two min. after return to sea-level the electric activity of the cortex decreased sharply, and the ECoG of all adult and most young rats registered an active spiking area. In adult rats the sensitivity of the heart to acetylcholine decreased during acute hypoxia, but no lowering of sensitivity was observed in young animals.

**A68-80952**
**SOME DATA ON COMPARATIVE CHARACTERISTICS IN THE ADJUSTMENT PROCESS IN HYPOXIA AND THE METHOD OF GRADUAL ACCLIMATIZATION TO HIGH ALTITUDE ENVIRONMENT [DEIAKI DANI DO PORIVNIAL' NOI KHARAKTERYSTYKY PROTSESU ADAPTATSII DO HIPOKSII I METODU STUPINCHATOI AKLIMATYZATSII DO VYSOKOHIRNOHO KLIMATU].**
N. M. Shumyts'ka (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Kiev).
*Fiziolohichnyi Zhurnal*, vol. 13, Nov.–Dec. 1957, p. 824–827. 8 refs. In Ukrainian.

Studies on dogs showed that compensatory adjustments during hypoxia were related to the decrease of oxygen pressure in the inspired air and the rate of ascent. In acute exposure to a high altitude environment without previous acclimatization, the stress resulting from oxygen deficiency was higher in the dogs. Gradual acclimatization to high altitudes in dogs, over 24 days, were beneficial to a series of adaptations involving the various organ-systems and the tissues of the body. The retention of a general adaptation was observed for two to three mo. after return to normal barometric pressure. Need for further research was stressed, the data obtained would help in the training of athletes in high altitudes ascents and in the treatment of sicknesses associated with oxygen deficiencies.

**A68-80953**
**VISUAL FUNCTIONING AND EMBEDDED FIGURES TEST PERFORMANCE.**
Gerald V. Barrett, Patrick A. Cabe, and Carl L. Thornton (Goodyear Aerospace Corp., Akron, Ohio).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 40.

The relationship was studied between Embedded Figures Test (EFT) scores and measures of both near-lateral phoria and macular stereopsis, both of which were considered elemental in efficient visual functioning. Of a sample of 44 male engineering and technical personnel, previously tested for near lateral phoria and macular stereopsis by use of a Keystone Orthoscope and for perceptual style using the Rod-and-frame Test, 37 subjects were retested approximately six mo. later using a form of EFT. Due to the nature of the distributions, Spearman rhos were computed among the measures. Rhos of −.07 ($P > .05$, non-corrected) were obtained between both EFT and phoria and EFT and stereopsis. Lack of significant relationship suggests that visual functioning is not a factor in performance on the EFT. Furthermore, if the EFT may be considered a measure of perceptual style, the present results support the previous finding that visual functioning is not a factor in perceptual style.

**A68-80954**
**MOTOR SKILLS BIBLIOGRAPHY: LXXXIII. PSYCHOLOGICAL INDEX NO. 26, 1919.**
C. H. Ammons and R. B. Ammons (Mont., U., Missoula).
*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 41–42. 53 refs.

Fifty-three references to items concerned with motor skills are listed.

**A68-80955**
**CONCEPTS OF PERCEIVED NOISINESS, THEIR IMPLEMENTATION AND APPLICATION.**
K. D. Kryter (Stanford Res. Inst., Menlo Park, Calif.).
*Journal of the Acoustical Society of America*, vol. 43, Feb. 1968, p. 344–361. 55 refs.
NASA supported research.

The concepts and methods of estimating the perceived noisiness of sounds from subjective and physical measurements are described. A general method, called Effective Perceived Noise Level (EPNL), of estimating the perceived noisiness of a single sound or a total sound environment taken over a 24-hr. period is proposed, and its relations to the Effective Composite Noise Rating (ECNR) scheme are discussed. It would appear that the average threshold of general noisiness or annoyance for the sound environment of a typical residential area occurs at about 50 $PNdB_t$ for sounds measured indoors and at 70 PNdB for sounds measured outdoors; these threshold values can be utilized to advantage in conjunction with EPNL and ECNR. The virtue of using EPNL and ECNR, which in essence, are the same in certain applications as "CNR," "NNI" and "$\overline{Q}$" quantities developed in the U.S.A., Great Britain, and Germany, respectively, is that they can combine the variable factors of duration, number of occurrences, spectrum and intensity of sounds into a single unit that allows meaningful intercomparisons of the over-all effect upon human behavior of noises and noise environments that may differ markedly from each other in these dimensions. Tolerable limits are proposed in terms of EPNL, ECNR, CNR, NNI, and $\overline{Q}$ for: (a) annoyance due to noise generated and measured outdoors but heard outdoors and/or indoors; (b) annoyance due to noise present indoors; and (c) damage risk to the ear for noise present at the listener's ears.

**A68-80956**
**CRITERION CHANGE IN CONTINUOUS RECOGNITION MEMORY.**
Wayne Donaldson and Bennett B. Murdock, Jr. (Toronto, U., Canada).
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 325–329. 7 refs.
Grants NSF 4545 and NRC, Canada APA 146.

Signal-detection analysis was applied to a continuous short-term recognition memory task for three-digit numbers. The typical increasing false-positive rate accompanying progress through the task was indicated to be due solely to a shifting criterion and not to a buildup in proactive interference. This suggests that, in terms of memory capacity, a "steady state" has been obtained.

**A68-80957**
**BINOCULAR SUMMATION OVER TIME IN THE PERCEPTION OF FORM AT BRIEF DURATIONS.**
Charles W. Eriksen and Thomas S. Greenspon (Ill., U., Urbana).
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 331–336. 9 refs.
Grants PHS MH-1206 and PHS K6-MH-22014.

Monocular form-identification accuracy was determined separately for the right and left eyes at brief exposure durations and dichopic presentation to corresponding and to noncorresponding areas was studied when the same form stimulus was presented simultaneously, immediately successive, and at interstimulus intervals (ISIs) as long as 200 msec. Increased form identification (summation) was found when the dichopic stimulation was to corresponding areas of the two retinas at ISIs of 10 msec. or less. No evidence for summation was obtained at ISIs longer than 50 msec. Dichopic stimulation to noncorresponding retinal areas resulted in a level of identification performance to be expected from two independent chances to perceive at all ISI values.

**A68-80958**
**INTERACTIONS BETWEEN ITEMS IN VISUAL SEARCH.**
Ian E. Gordon (St. Andrews, U., Queen's Coll., Dundee, Great Britain).
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 348–355. 8 refs. Sci. and Ind. Res., Dept. supported research.

A series of cancellation tasks was studied in which the number of different irrelevant items was systematically varied. It was found that when two or four different irrelevant items were used in the same task, difficulty increased in a manner not predictable from the effects of these items when each occurred as the only irrelevant item. The interactions between irrelevant items occurred with alphabetical and with nonsense material. A possible explanation is offered in terms of subject's perception of the degree of homogeneity of strings of items during visual search.

**A68-80959**
**SEQUENTIAL PROBABILITIES AND THE PERFORMANCE OF SERIAL TASKS.**
Don Trumbo, Merrill Noble, and Jane Quigley (Kan. State U., Manhattan).
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 364–372. 9 refs.
NASA Grant NsG606.

In two experiments, second-order probabilities among target events were varied in step-function tracking tasks. In both studies, tracking error was disproportionately increased by increases in event uncertainties. Fine-grained analyses revealed complex response strategies in anticipating target events, including "probability matching" when alternatives were in opposite directions, and "averaging" when alternatives were in the same direction but differed in amplitude. Decision times were greater for the directional than for the amplitude choices.

**A68-80960**
**PROLONGED OSCILLATION OF THE EYES INDUCED BY CONFLICTING POSITION INPUT.**
Brian Craske and William B. Templeton (Durham, U., Great Britain).
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 387–393. 10 refs.

A new pendular oscillation of the eyes is reported which results from the subject viewing his own body through displacing prisms. The oscillation, about either a vertical or a horizontal axis, is maintained indefinitely until the system is reset by giving the subject usable positional information, e.g., letting the subject see his limbs, when it is abolished permanently. It can also be suppressed temporarily by instructing the subject deliberately to center his eyes rather than let them freely position themselves. It would seem that the position which the eye takes up is reflecting a change in the eye-position control mechanism such that sinusoidal variation in the resting tonus of a given pair of eye muscles takes place, the variation in one muscle being 180° out of phase with respect to the other.

**A68-80961**
**RESPONSE LATENCY, RESPONSE UNCERTAINTY, INFORMATION TRANSMITTED AND THE NUMBER OF AVAILABLE JUDGMENTAL CATEGORIES.**
William Bevan and Lloyd L. Avant (Johns Hopkins U., Baltimore, Md.).
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 394–397. 10 refs.
Contract ONR N00014-67-A-0163-001.

The interrelations among response latency and two informational measures, response uncertainty ($E_r$) and information transmitted ($I_t$), were studied in six independent groups. All subjects made categorical size judgments of the same series of ten squares, but different groups made judgments in terms of response scales containing, 2, 4, 8, 16, 32, and 64 categories. Mean response latency was lowest in the two-category situation and increased with each increase in number of categories to the limit used (64). $E_r$ increased as number of available categories increased to 32 but did not change substantially beyond this point. $I_t$ increased until number of categories approximated the number of stimuli but was little affected by further increases in scale complexity.

**A68-80962**
**EFFECTS OF REPETITION OF VOLUNTARY RESPONSE: FROM VOLUNTARY TO INVOLUNTARY.**
In-Mao Liu (Natl. Taiwan U., Taipei, Republic of China).
*Journal of Experimental Psychology*, vol. 76, Mar. 1968, p. 398–406.
Grant NIH 1 R05 TW-00207-01 and Natl. Council of Sci. Develop. of Republic of China.

Six groups of subjects were instructed to press a key in a quick motion, upon seeing a light, to a distance of 3.5 cm. Each subject pressed the key to lift one weight (either 500 or 1,000 gm.) for a certain number of trials (one, five, or ten), followed by a test trial on which the weight was changed (from 500 to 1,000 gm. or from 1,000 to 500 gm.). For subjects in the heavy-to-light groups, it was found on the test trials that the press distance and speed of pressing increased, and that the response magnitude and latency decreased. The opposite trends were obtained for subjects in the light-to-heavy groups. The results suggest: that one-trial experience is sufficient in rendering a certain amount of force or energy ready before its release, that, in turn, the inhibition associated with the guidance and termination of the acts is lost, and that the adjustment mechanism is brought into action at a change in the weight.

**A68-80963**
**TONIC AND PHASIC CHANGES IN THRESHOLD OF AROUSAL DURING DESYNCHRONIZED SLEEP.**
M. M. Gassel and O. Pompeiano (Pisa, U., Ist. di Fisiol. and C.N.R., Ist. di Med. Sper., Sez. di Neurofisiol., Pisa, Italy).
*Archives Italiennes de Biologie*, vol. 105, Nov. 1967, p. 480–498. 50 refs.
Grant PHS NB 02990-03.

In the unrestrained, unanesthetized cat repetitive stimulation of cutaneous and high threshold muscular afferents performed on a background of quiet wakefulness elicits not only a flexion reflex, but also an orienting reaction characterized by desynchronization of the electroencephalogram, contraction of the posterior cervical muscles, ocular movements and pupillary dilation. All these events appear at slightly higher thresholds if performed on a background of synchronized sleep. The threshold for all these ascending events increases tonically during desychronized sleep, while a further phasic increase in threshold appears during the large trains of rapid eye movements (REM). The tonic increase in arousal threshold induced by the somatic afferent volleys during desynchronized sleep is exclusively due to depressed excitability of the ascending reticular

activating system, whereas the phasic increase occurring at the time of the large bursts of REM is due, at least in part, to a block in transmission of cutaneous and high threshold muscular afferent volleys to the neurons of the ascending spinoreticular pathways.

**A68-80964**
**SLEEP VARIABLES AS A FUNCTION OF AGE IN MAN.**

I. Feinberg (N. Y., State U., Downstate Med. Center, Dept. of Psychiat., Brooklyn) and V. R. Carlson (Natl. Inst. of Mental Health, Washington, D. C.).

*Archives of General Psychiatry*, vol. 18, Feb. 1968, p. 239–250. 28 refs.

This study determined whether the changes with age of sleep pattern variables were linear or curvilinear, and whether the function changed uniformly toward an asymptotic value or showed changes in direction and acceleration with increasing age. The trends in the sleep variables for 38 normal subjects aged five to 96 yr. were analyzed, as well as data representative of other potentially related variables available in literature for psychometric test scores, brain oxygen uptake, body metabolism and cortical cell density as function of age. The subjects were divided in six subgroups of mean age 6, 10, 21, 30, 69 and 84 yr., and were studied in absence of drugs, with care taken to prevent daytime sleep. The different sleep variables were recorded electroencephalographically (EEG) for three to five consecutive nights. The results were extensively illustrated with tables and age curves. The analysis of the EEG patterns during nocturnal sleep had expanded the study of brain function. The changes observed with age reflected alterations in brain activities which seemed linked to the changing ability to learn and solve problems. This sleep-cognition hypothesis receives further encouragement from the evidence that age curves for sleep variables are at least grossly consistent with age curves for brain metabolism, neuronal density and those still unknown central nervous system processes reflected by performance on cognitive tasks. It is pointed out that more detailed knowledge of the effects of age on psychological function, cerebral anatomy and cerebral physiology taken in association with the data on changes in biological sleep pattern would shed new light on the relationships of brain to behavior.

**A68-80965**
**ON OZONE DISINFECTION OF WATER CONTAINING DRUG RESISTANT FORMS OF DYSENTERY BACILLI AND ADENOVIRUSES [K VOPROSU OBEZZARAZHIVANIIA OZONOM VODY, SODERZHASHCHEI LEKARSTVENNOUSTOICHIVYE FORMY BAKTERII DIZENTERII I ADENOVIRUSY].**

G. P. Iakovleva and A. P. Il'nitskii (USSR, Acad. of Med. Sci., D. I. Ivanovskii Inst. of Virol. and I. M. Schenov I Moscow Med. Inst., Moscow).

*Gigiena i Sanitariia*, vol. 32, Dec. 1967, p. 17–19. 7 refs. In Russian.

The comparative resistance to ozone of the drug resistant strains of Shigella flexneri No. 1402 and S. newcastle no. 687 and that of the Escherichia coli No. 685 was studied. The efficiency of ozone disinfection of the water, containing the drug resistant dysentery strains and coli bacilli, was determined by the amount of residual ozone present in the water after treatment. A study of the effect produced by the extent of the initial bacterial contamination and the temperature on ozone disinfection of the water containing adenoviruses was undertaken as well.

**A68-80966**
**ENERGY METABOLISM IN HIBERNATION.**

F. E. South and W. A. House (Mo., U., Space Sci. Res. Center, and Dept. of Physiol., Columbia and Colo. State U., Dept. of Physiol., Fort Collins).

In: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 305–324.
NASA Grant NGR-06-002-015 and Grant NIH GM-9584.

The fundamental metabolic requirement for successful hibernation at body temperatures within a few degrees of freezing is that the animals remain capable of transforming and transporting chemical energy at a quantity and rate sufficient to retain its functional integrity. Present knowledge indicates that in general, the food habits of hibernation are similar to ecologically equivalent non-hibernators. The important question concerns the ability of hibernators to metabolize the energy made available to them. Included discussions concerning general metabolism are: (1) behavioral regulation; (2) metabolic rate; (3) respiratory quotient; (4) glycogen metabolism; and (5) blood glucose. The metabolic pathways of glycolysis, the pentose shunt and cell-tissue oxidations are reviewed. Metabolic adaptations associated with hibernation are extremely complex, and many of the changes appear to occur at the molecular level. The physiological phenomenon of hibernation seems to be dependent on an enzyme, or enzyme system, that is relatively stable. Regardless of what takes place on the molecular level in hibernation, the total effect is that the animal which is prepared for hibernation is better fitted to obtain, store, transport and, what is crucial, effectively couple the available energy so that it may be utilized for useful work.

**A68-80967**
**COLD ADAPTATION OF ACTIVITIES OF TISSUES OF HIBERNATING MAMMALS.**

J. S. Willis (Ill., U., Dept. of Physiol. and Biophys., Urbana).

IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967, p. 356–381.

The evidence regarding the maintenance of activity of cells at low temperature in hibernators was summarized, and the question of whether the observed adaptations of metabolism are by themselves adequate to account for that maintenance of activity was considered.

**A68-80968**
**NORMAL SEASONAL AND EXPERIMENTALLY INDUCED CHANGES IN KIDNEYS OF ACTIVE SUMMER AND HIBERNATING WINTER BATS: HISTOCHEMICAL AND ELECTRON MICROSCOPIC OBSERVATIONS.**

Robert M. Rosenbaum, Arnold Melman, and Harold Sobel (Albert Einstein Coll. of Med., Dept. of Pathol., New York, N. Y.).

IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965
Edinburgh and London, Oliver and Boyd, 1967, p. 295–304.

With use of histochemical visualization methods for the light microscope, several distinct differences in activity of nucleoside and acid phosphatases were demonstrated between proximal renal tubular epithelium of summer active and winter hibernating *Myotis lucifugus*. These included increased numbers of acid phosphatase-rich droplets in active animals as well as localization of staining of basal lamellar membranes for ATPase activity. In hibernating winter bats, the proximal tubular epithelium showed a less distinct staining of the basal lamellae and the presence of ATPase-positive vesicles in the Golgi zone. Electron microscopy of

renal proximal tubular epithelium from winter hibernating bats showed the presence of an expanded vesicular-vacuolar network beneath the microvilli of the brush border. Vesicular structures, attached to the pits of adjacent microvilli by channels, appear to contain a highly soluble ATPase activity. Vacuoles, unattached by channels, show activity for a less soluble ATPase. These structures cannot be detected in active summer bats. In addition, proximal epithelia from hibernating bats show marked reduction in numbers of dense bodies and in rough endoplasmic reticulum when compared with cells from active summer bats. In active summer bats, cold-storage, desiccation and treatment with antidiuretic hormone, produced morphologic changes in proximal renal tubular epithelium midway between those seen in active animals as compared to hibernating animals. The observed changes suggest a highly specialized type of renal resorption possibly related to the need for conservation or pooling of nucleoside phosphate metabolites.

**A68-80969**
**NONSHIVERING HEAT PRODUCTION DURING AROUSAL FROM HIBERNATION AND EVIDENCE FOR THE CONTRIBUTION OF BROWN FAT.**

J. S. Hayward and C. P. Lyman (Harvard Med. School, Dept. of Anat., Boston, Mass.).

IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967. p. 346–355.
Contract AF 31(609)-2296, Grants PHS GM 05611-07, and PHS GM 05197-08.

The capabilities of three different hibernators to use nonshivering sources of heat production during arousal from hibernation have been assessed by paralyzing their muscles with curare. Curarized, artifically-ventilated bats (*Eptesicus fuscus*) can be aroused to peak body temperatures at a rate that is insignificantly different from control individuals. Rodents (*Mesocricetus auratus* and *Glis glis*), on the other hand, are unable to arouse at a normal rate when shivering is blocked. Our data indicate that the hibernating bat (*E. fuscus*) may have the highest capability for nonshivering thermogenesis of any species yet examined. The size, structure and density of mitochondria of bat brown adipose tissue is circumstantial evidence of the oxidative capacity of this tissue. More directly, the temperature changes recorded within brown adipose tissue, and the striking thermographic display of radiant heat loss from the region of this tissue, lend support to the thesis that brown adipose tissue is an important source of heat for the process of arousal from hibernation.

**A68-80970**
**BROWN FAT IN HIBERNATION.**

Robert L. Smalley (Kan. State Teachers Coll., Dept. of Phys. Sci., Emporia) and Robert L. Dryer (Iowa, U., Dept. of Biochem., Iowa City).

IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967. p. 325–345.
Grant NIH AM08476; Am. Cancer Soc., Iowa, U., and Kan. Heart Assn. supported research.

The current state of the knowledge regarding the relationship of lipid metabolism to hibernation was examined. The general involvement of white fat in hibernation and its use as an energy source was discussed briefly, but greater attention was paid to the metabolism of brown fat. A summarization of data which link brown fat to metabolic thermogenesis in cold acclimatized mammals and arousing hibernation, and the mechanisms which might be involved included: (1) function of brown fat; (2) distribution of brown fat in mammals; (3) structure of brown fat; (4) chemical morphology of brown fat; (5) enzymology of brown fat; (6) neural influences on heat production in brown fat; (7) hormones and non-thermogenic functions of brown fat; and (8) the relationship of brown fat to other tissues.

**A68-80971**
**INTESTINAL ABSORPTION IN HAMSTER AND GROUND SQUIRREL, IN VIVO.**

X. J. Musacchia and A. V. Bramante (Mo., U., Space Sci. Res. Center and Dept. of Physiol., Columbia).

IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967. p. 382–397.
NASA Grant NsG 271-62, Grants PHS AM 07779 02 and PHS AM 10402-01.

Intestinal absorption of glucose takes place *in vivo* in isolated segments of duodenum, jejunum and ileum in the hamster and the ground squirrel. Experimental runs were for 30 min. In the hamster, fasting for 24, 48 and 72 hr. enhances glucose absorption. In the ground squirrel, the jejunum and ileum have the highest level of glucose absorption. Glucose absorption in the hibernating ground squirrel is much reduced. Phloridizin $5\times10^{-4}$M and $5\times10^{-2}$M inhibits absorption of glucose *in vivo* in the hamster, whereas a concentration of $5\times10^{-6}$M does not. In ground squirrels intestinal segments treated with phloridzin $5\times10^{-4}$M showed inhibition of glucose uptake, whereas other segments, in the same animal, not treated with phloridzin, did show glucose uptake. Accepting that phloridzin in low concentrations inhibits glucose active transport, the results provide some evidence for glucose active transport *in vivo*. Levels of glucose absorption were similar four and 21 hr. respectively after arousal from hibernation. The *in vivo* experiments corroborate earlier *in vitro* investigations of glucose absorption in intestinal segments from the hamster and ground squirrel.

**A68-80972**
**HIBERNATION IN THE SPACE AGE.**

Robert G. Lindberg (Northrop Space Labs., Bioastronautics Lab., Hawthorne, Calif.).

IN: MAMMALIAN HIBERNATION III; Proc. of the Third Intern. Symp. on Nat. Mammalian Hibernation, Toronto, Canada, Sep. 13–16, 1965.
Edinburgh and London, Oliver and Boyd, 1967. p. 439–444.

An estimate is made of the biological requirements for a ten-man team during an Earth to Mars return trip which would require a total of 600 days. The total weight associated with the metabolic needs of the men is very large. Any technique or procedure, therefore, which would reduce the metabolic requirements of men without degrading the abilities that warrant sending him into space would be of great interest. Human hibernation could conceivably make interplanetary travel feasible though its value might not concern logistics so much as survival in an emergency. It is pointed out that human beings are not hibernators, however, and it may therefore be some while before a practical application of hibernation in humans can be made. Finally space should also be thought of as an experimental laboratory in which the prevailing conditions differ from those on the surface of the Earth and which, therefore, may provide new ways of attacking old problems.

**A68-80973**
**EFFECTS OF LOW-INTENSITY ACOUSTICAL STIMULATION ON VISUAL THRESHOLDS.**

Laurence P. Ince (Fla. State U., Tallahassee).

*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 115–121. 5 refs.

The effects of low-intensity acoustical stimulation on the visual threshold of two subjects were investigated. Four levels of

white noise intensity were used, paired in random sequence with ten different intensities of light, and randomly alternated with periods of quiet. It was found that white noise affects visual threshold, although the exact nature of this effect was not determined.

**A68-80974**
**EVIDENCE FOR A DILATOR ACTION OF CARBON DIOXIDE ON THE PULMONARY VESSELS OF THE CAT.**

Peter H. Viles and John T. Shepherd (Mayo Clin. and Mayo Found., Sect. of Physiol. and Minn., U., Mayo Graduate School of Med., Rochester, Minn.).

*Circulation Research*, vol. 22, Mar. 1968, p. 325–332. 15 refs.
Grants PHS HE-5883 and PHS HE-5515.

Isolated cat lungs perfused at constant flow (75 ml./min. per kg. total body weight) were ventilated with gases of varying $CO_2$ content (0 to 10%), 20% $O_2$, and the balance $N_2$. Tidal volume was constant, and airway pressure did not change. Left atrial pressure was held constant, and changes in pulmonary artery pressure ($P_{PA}$) were taken to reflect changes in pulmonary vascular resistance. Progressive hypercapnia ($P_{CO_2}$=0 to 60 mm. Hg) resulted in an increase in $P_{PA}$ as pH decreased. Equivalent degrees of acidosis, produced by the infusion of 0.3 N lactic acid, resulted in a higher $P_{PA}$. Changes in $P_{PA}$ produced by lactic acid were reversible with 0.89 M sodium bicarbonate. With $P_{CO_2}$ constant, and pH changed by lactic acid or sodium bicarbonate infusion, $P_{PA}$ was higher in lungs ventilated with room air ($P_{CO_2}$=0) than in those ventilated with 5 or 10% $CO_2$($P_{CO_2}$=30 or 60 mm. Hg) at the same hydrogen ion concentration of the perfusate. These findings can be explained by two opposing actions of $CO_2$ on pulmonary vessels: a dilator action due to the direct effect of $CO_2$ and a constrictor action caused by the increase in hydrogen ion concentration.

**A68-80975**
**CEREBELLAR RESPONSES EVOKED BY SOMATIC AFFERENT VOLLEYS DURING SLEEP AND WAKING.**

G. Carli, K. Diete-Spiff, and O. Pompeiano (Pisa, U., Int. di Fisiol. and C. N. R., Ist. di Med. Sper., Sez. di Neurofisiol., Pisa, Italy).

*Archives Italiennes de Biologie*, vol. 105, Nov. 1967, p. 499–528. 41 refs.
Grant PHS NB 05695-02; IBRO/Unesco and Consiglio Nazl. delle Ric. supported research.

In the unrestrained, unanesthetized cat single shock stimulation of hindlimb nerves elicits an early, small-amplitude, positive evoked potential which can be recorded ipsilaterally from the anterior lobe of the cerebellum between the vermal and the intermediate cortex; this response is followed by a late, large-amplitude, positive-negative potential. While the early component of the spino-cerebellar evoked potential is due to stimulation of group I muscular and of some low-threshold group II cutaneous and muscular afferents, the late component of the response is due to stimulation of cutaneous and high threshold (group II and III) muscular afferents. There is no change in amplitude of the early component of the spino-cerebellar evoked potential during the sleep-waking cycle. On the contrary the late component of that response shows some changes during particular phases of sleep and wakefulness. The late component is not modified during transition from quiet wakefulness to synchronized sleep, nor does any significant change occur during the desynchronized phase of sleep in the absence of the ocular movements. A depression of this response occurs, however, during the orienting reaction produced by arousing stimulation on a background of quiet wakefulness or synchronized sleep, and also during desynchronized sleep at the time of the ocular movements. In particular this late component of the spino-cerebellar evoked potential is phasically abolished during the large trains of high frequency ocular movements (REM). A depression, however, occurs, although smaller in amplitude, during the isolated ocular movements and also during the trains of low frequency ocular movements intercalated between the typical REM. The phasic depression of the late component of the spino-cerebellar evoked potential was not abolished by complete hemisection of the contralateral spinal cord at the postbrachial level and/or after bilateral section of the ventral quadrants. It persisted also after bilateral ablation of the sensory-motor cortex. The nature and the mechanisms of this depression were discussed.

**A68-80976**
**DEPOLARIZATION OF OPTIC FIBER ENDINGS IN THE LATERAL GENICULATE BODY.**

N. Kahn, F. Magni, and R. V. Pillai (Pisa, U., Ist. di Fisiol. and C.N.R., Ist. di Med. Sper., Sez. di Neurofisiol., Pisa, Italy).

*Archives Italiennes de Biologie*, vol. 105, Nov. 1967, p. 573–582. 21 refs.
Contract AF 61(052)-830 and Grant NIH N. 7 FII NB 1010-03 AI NSRB; IBRO/UNESCO supported research.

The depolarization of optic nerve fibers elicited by stimulation of the mesencephalic reticular formation is investigated by means of intracellular recording from optic tract fibers. Reticular stimulation produces a net depolarization of the optic tract fibers, that lasts for more than 100 msec. At low body temperature, action potentials are generated on the peak of the depolarization. Reticular stimulation affects "on", "off" and "on-off" fibers. It is concluded that the depolarization of optic fibers induced by reticular stimulation is generated by an active mechanism.

**A68-80977**
**MICROELECTRODE ANALYSIS OF TRANSFER OF VISUAL INFORMATION BY THE CORPUS CALLOSUM.**

G. Berlucchi, M. S. Gazzaniga, and G. Rizzolatti (Pisa, U., Ist. di Fisiol., and C. N. R., Ist. di Med. Sper., Sez. di Neurofisiol., Pisa, Italy).

*Archives Italiennes de Biologie*, vol. 105, Nov. 1967, p. 583–596. 34 refs.
Contract AF F6 1052 67 C 0028 and Grant PHS 1 F2 Nb,18080-01; Min. della Pubb. Istruzione supported research.

Responses to patterned visual stimuli were recorded with tungsten microelectrodes from single fibers of the posterior third of the corpus callosum in midpontine pretigeminal cats. Visual receptive fields of these units were similar to those observed with cells in cortical areas 17, 18, 19. However, callosal visual receptive fields were all located along the vertical meridian of the visual field. The data are discussed in relation to (a) the possible interhemispheric association of the right and left halves of the visual field, and (b) the interhemispheric transfer of visual pattern discriminations in animals with lateralized optic input.

**A68-80978**
**IMPROVEMENT OF HEARING ABILITY BY DIRECTIONAL INFORMATION.**

Masanao Ebata, Toshio Sone, and Tadamoto Nimura (Tohoku U., Dept. of Elec. Eng., Sendai, Japan).

*Journal of the Acoustical Society of America*, vol. 43, Feb. 1968, p 289–297. 25 refs.

An investigation is undertaken of the ability to hear a signal sound in the presence of noise, when the signal and the interfering sound each have a directional characteristic and are separated from each other more than a certain degree, compared with the case when both are not separated. An attempt is made to determine through what process in the human auditory system such a phenomenon occurs. It is thought that, when there are many sounds coming from many directions, directional information is extracted from neural signals from both ears in the auditory system, each sound is localized in each place or direction, and a certain particular sound is selected and listened to. There is considerable difference, in the subject's ability to hear the sound, between the case in

which a subject concentrates his attention on it, and the case in which he does not. For this interpretation, "attention" is introduced. It is clarified that the function that maintains the attention leads to the selective hearing of a signal relative to its direction and timbre.

**A68-80979**
**RECEIVER-OPERATING CHARACTERISTICS DETERMINED UNDER SEVERAL INTERAURAL CONDITIONS OF LISTENING.**

David S. Emmerich (Ind. U., Hearing and Commun. Lab., Bloomington).

*Journal of the Acoustical Society of America*, vol. 43, Feb. 1968, p. 298–307. 12 refs. USAF OSR, NSF, and Ind. U. supported research.

The ability of subjects to detect sinusoidal signals in a continuous background of white Gaussian noise was investigated for several different interaural relations of the signal and of the noise stimuli. The functions, referred to as receiver operating characteristics (ROC's), relating the proportion of correct detections of the signal to the proportion of false alarms were determined in each case. A rating procedure was employed to determine the ROC's. The area under the ROC was found to be a good estimate of the percent correct obtained with a two-interval forced-choice technique—a relation to be expected on theoretical grounds. The ROC's were not significantly affected by the presence of trial-by-trial feedback.

**A68-80980**
**DETECTION AND RELATIVE DISCRIMINATION OF AUDITORY "JITTER".**

Irwin Pollack (Mich., U., Mental Health Res. Inst., Ann Arbor).

*Journal of the Acoustical Society of America*, vol. 43, Feb. 1968, p. 308–315. 21 refs. Natl. Sci. Found. supported research.

Thresholds for the minimal departure from periodicity and thresholds for discrimination of relative departures from periodicity were obtained in order to explore the limits of temporal resolution for auditory pulse trains. In a forced-choice test, listeners were presented pulse trains, one of which was subjected to more variability, or "jitter", than the other three. His task was to select that pulse train that was different from the other three. The principal experimental variables examined were: the number of intervals, the mean interpulse interval; and, the jitter of the reference pulse train. Minimum thresholds for jitter, relative to the center interpulse interval, are less than 0.1% for large number of pulses. Threshold jitter decreases with shorter interpulse intervals for a large number of pulses. Jitter thresholds are minimal for interpulse intervals of four to six msec. for a small number of pulses. Jitter discrimination is approximately independent of the reference jitter for a small number of pulses and is nearly directly proportional to the reference jitter for a large number of pulses. The temporal precision of the auditory system, in contrast to its precision of spectral analysis, appears to be insufficient to account for minimal jitter thresholds.

**A68-80981**
**HAZARDOUS EXPOSURE TO IMPULSE NOISE.**

R. Ross A. Coles (Roy. Naval Med. School, Alverstoke, Hampshire, Great Britain), Georges R. Garinther, David C. Hodge (U.S. Army Human Eng. Labs., Aberdeen Proving Ground, Md.), and Christopher G. Rice (Southampton, U., Inst. of Sound and Vibration Res., Great Britain).

*Journal of the Acoustical Society of America*, vol. 43, Feb. 1968, p. 336–343. 57 refs. Med. Res. Council supported research.

This paper presents impulse-noise damage-risk criteria based on conclusions of independent British and American studies and on the work of other research workers in this field. Most of the studies that led to this criterion were performed with noise from small arms, but the criterion is general enough to permit assessment of most other types of impulse noise. The variables that must be considered in determining the potential hearing hazard and in the practical application of the criteria are presented, and the parameters that must be measured are defined. The measurement technique and type of transducers to be used are discussed.

**A68-80982**
**EFFECTS OF NOISE AND DIFFICULTY LEVEL OF INPUT INFORMATION IN AUDITORY, VISUAL, AND AUDIOVISUAL INFORMATION PROCESSING.**

Hower J. Hsia (Wis., U., Madison).

*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 99–105. 10 refs.
HEW, Dept. supported research.

To examine the effects of noise in auditory (A), visual (V), and audiovisual (AV) channels with varying difficulty levels of input information, 192 seventh grade subjects were tested under six conditions: A, V, and AV with and without noise. It was determined that noise had no detrimental effects upon information processing when input was not difficult, only A was significantly deteriorated by the presence of noise, whereas noise seemed to alert subjects in the AV treatment, AV was generally found to be better than A, which in turn was generally better than V, channel difference vanished when input was very difficult.

**A68-80983**
**NYSTAGMOGRAM IN OBJECTIVE INVESTIGATION OF DARK ADAPTATION [NISTAGMOGRAMMA PRI OB"EKTIVNOM ISSLEDOVANII TEMNOVOI ADAPTATSII].**

I. A. Viazovskii and G. A. Todor (V. P. Filatov Sci.-Res. Inst. of Eye Diseases, Odessa, UkrSSR).

*Oftal'mologicheskii Zhurnal*, vol. 22, no. 5, 1967, p. 343–346. In Russian.

To study the causes leading to subjective and objective discrepancy in light thresholds during adaptation, a detailed registration of the following indices was made: (1) the eye movements; (2) the moment of subjective light perception recorded by the patient; (3) the moment of visual discovery of optikinetic nystagmus (OKN) noted by the investigation. All the indices were recorded on a nystagmogram. For adaptometry, the Hartinger's adaptometer adjusted to induce OKN, was used. The eye movements were registered with the help of a light ray on a photokymograph using an infrared convertor. The investigation was carried out on normal right eyes of eight subjects. The analysis of 17 nystagmograms registered at various phases of dark adaptation showed that prior to the moment of visual nystagmus, the eye performs a few adjusting movements which gradually elicit the appearance of OKN of small amplitude, gradually changing to great amplitude. On the basis of the findings obtained it may be said that the discrepancy in the degree of subjective and objective curves of dark adaptation mentioned by many authors depends on the method of registration. The moment of the appearance of OKN is practically the same as the subjective light perception by the subject.

**A68-80984**
**MAGNESIUM PEMOLINE: ENHANCEMENT OF BRAIN RNA SYNTHESIS *IN VIVO*.**

Lionel N. Simon and Alvin J. Glasky (Intern. Chem. and Nucl. Corp., Nucleic Acid Res. Inst., City of Industry, Calif.).

*Life Sciences*, vol. 7, Feb. 15, 1968, p. 197–202. 8 refs.

Injecting rats with magnesium pemoline it was shown by *in vivo* labeling techniques that magnesium pemoline increases the synthesis of brain *nuclear* ribonucleic acid (RNA) and this supports an earlier proposal (based on the activation of brain RNA

polymerase) that the main mode of action of magnesium pemoline is to enhance the synthesis of brain nuclear RNA. In addition, magnesium pemoline has no effect on the major system in brain responsible for protein synthesis.

**A68-80985**
**AGE DIFFERENCES IN THE RELATIONSHIP BETWEEN EEG AROUSAL AND REACTION TIME.**

Larry W. Thompson and Jack Botwinick (Duke U., Med. Center, Durham, N. C.).

*Journal of Psychology*, vol. 68, Mar. 1968, p. 167–172. 13 refs.
Grants PHS HD-00668, PHS HD-01325, and PHS 5153.

An electroencephalogram (EEG) measure of arousal was investigated in relation to the preparatory interval (PI) in the context of a reaction time (RT) study for each of two age groups. The two groups (19–35 and 62–87 yr.) reacted differently to the PI variations with respect to the arousal measure, but not with respect to RT. Measures of arousal and RT were uncorrelated. These results, plus the finding of a statistically significant age difference in RT but not in the EEG measure, lead to the conclusion that, in this study at least, EEG changes did not explain the slowing in old age.

**A68-80986**
**TRANSFER OF SOCIAL INFLUENCE EFFECTS ON PSYCHOPHYSICAL JUDGMENTS.**

Robert K. Yin and Herbert D. Saltzstein (Mass. Inst. of Technol., Cambridge).

*Journal of Psychology*, vol. 68, Mar. 1968, p. 313–319. 9 refs.
NASA Grant NsG 496 and Grant NICHHD HD01786-01A1.

Systematic changes in judgments on a psychophysical task were found to occur from one private session to another as a result of exposure to discrepant judgments of a confederate during an intervening session. The changes obtained included direct effects and transfer to new stimuli. The stimuli were different grades of aluminum oxide abrasives, presented to obtain cross-modality matchings of subjective roughness with length of lines. Each subject made a series of such judgments in an initial private session, yielding an individual relationship typical of the psychophysical power function. In a second session, each subject repeated the task twice. First, subject's judgments for a subset of the original stimuli were interspersed with those of a confederate trained to produce discrepant responses approximating a different power function. Second, after the confederate left, subject made judgments of the entire original set of stimuli. Results were assessed in terms of the differences between each subject's pre- and postinfluence power functions. It was found that the power functions of one group of seven subjects had changed upward after exposure to judgments discrepant in an upward direction ($p < .005$, one-tailed); and another seven subjects exposed to a downward influence treatment also showed an effect ($p < .025$, one-tailed), while those of a control group of five subjects did not change.

**A68-80987**
**VARIABILITY OF TEMPORAL JUDGMENT: INTERSENSORY COMPARISONS AND SEX DIFFERENCES.**

Sanford Goldstone (Cornell U., Med. Coll., Ithaca and New York Hosp., Westchester Div., N. Y.).

*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 211–215. 11 refs.
Grant PHS MH 01121.

Previous work with 7- to 13-yr.-old children demonstrated that the time judgments of girls were more variable than boys, and this sex difference was greater for visual than auditory judgments. This study used the same method with an adult population. Subjects rendered nine-category absolute judgments of short auditory and visual durations using a social or a subjective internal temporal standard, and a measure of intrasubject response variance was obtained. The women were more variable than men, and this sex difference was independent of sense model and temporal standard; the significant effects due to sense mode and temporal standard were dependent upon the differential locations of the auditory and visual, social and subjective transition zones. The sex difference is discussed in light of the changing pattern of results obtained since 1894.

**A68-80988**
**MOTOR SKILLS BIBLIOGRAPHY: LXXXIV. PSYCHOLOGICAL INDEX NO. 27, 1920.**

R. B. Ammons and C. H. Ammons (Mont., U., Missoula).

*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 181–182. 56 refs.

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

**A68-80989**
**THE DISTRIBUTION OF URANIUM IN THE BODY OF RATS AFTER INHALATION OF AMMONIUM DIURANATE [RASPREDELENIE URANA V ORGANIZME KRYS PRI INGALIATSIONNOM VVEDENII DIURANATA AMMONIIA].**

G. P. Galibin.

*Gigiena i Sanitariia*, vol. 32, Dec. 1967, p. 40–43. 10 refs. In Russian.

The distribution patterns, deposition, retention and elimination of uranium in the body of rats after inhalation of ammonium diuranate was studied. The rats were exposed to a single inhalation lasting four hr., the concentration of uranium in the aerosol was 10 mg./m$^3$. The data obtained showed that 15 min. after the exposure, the body of the rat retained 14% of uranium from the inhaled aerosol. A small fraction (5%) of uranium deposited in the lungs was eliminated very slowly over a period of 240 days and the time of uranium elimination from the bone structure ranged from 250 to 300 days. From the kidneys, liver, and spleen as well as from the muscles and the gastrointestinal tract tissues, excretion did not exceed 16 to 32 days. The uranium did not remain for long in the blood. The amount of substance found in the blood after a single inhalation did not reflect the total amount retained in the body.

**A68-80990**
**NOTE ON RESPONSE SETS ON THE ROD-AND-FRAME TEST.**

Patrick A. Cabe (Goodyear Aerospace Corp., Akron, Ohio).

*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 94.

To test for response sets, data collected by previous investigators for a sample of 46 male technical and engineering personnel were reanalyzed. The number of responses to the left or to the right of true vertical without regard to magnitude of error on the three series of the Rod-and-Frame Test (RFT) were counted, and the numbers of responses to either side were compared for each of the series using a sign test. Of the 46 subjects, 19 showed a significant preferance in responding to one side or the other ($p < .05$), with 16 of these favoring the left over the right. Results of this analysis suggest that in procedures in which direction of error is used as a response measure, there is a strong possibility of biased results as a consequence of tendencies to respond to one side or the other in orienting the rod to the vertical.

**A68-80991**

**FIELD DEPENDENCY-INDEPENDENCY AND EYE-MOVEMENT PATTERNS.**

Rodney C. Conklin (Calgary, U., Canada), Walter Muir, and Frederic J. Boersma (Alberta, U., Edmonton and Calgary, Canada).

*Perceptual and Motor Skills*, vol. 26, Feb. 1968, p. 59–65. 18 refs.

Grant A.A.C.E.S. 20066.

Eye-movement patterns of high and low scorers on a test of field-dependency-independency were compared. Significant differences were found for track length and informative search but none for sex and duration of fixation. Support for the notion that field-independent subjects employ more effective search patterns is suggested.

A68-80991

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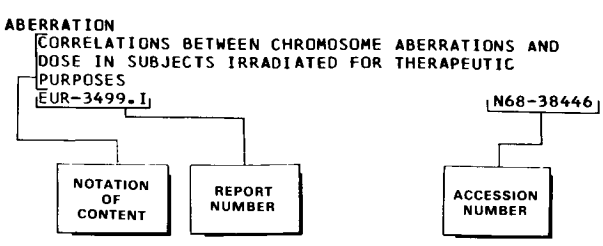


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AMRL-TR-66-233 N68-18737

AGRICULTURAL RESEARCH SERVICE, ITHACA, N. Y.
SOURCES AND SINKS OF CARBON DIOXIDE IN CORN CROP ASSESSED BY MOMENTUM BALANCE - ENERGY BUDGET AT EARTH SURFACE
RR-398 N68-18375

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MUTAGENIC EFFECTS OF CHRONIC AND ACUTE GAMMA RADIATION ON DAHLBOMINUS FEMALE FECUNDITY
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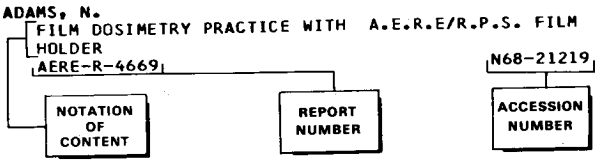


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