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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA SP-7011 (02)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during the period June, 1964–July, 1964

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. SEPTEMBER 1964

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INTRODUCTION

SP-7011 (02) is the third issue of *Aerospace Medicine and Biology*, NASA's continuing bibliography for the abstracting and announcement of current references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project (AMBBP) of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics, 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, SP-7011.

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 during the period June 5-July 9, 1964.

Each entry in SP-7011 (02) consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

a. NASA entries identified by their *STAR* accession numbers (N64-10000 series),
b. AIAA entries identified by their *IAA* accession numbers (A64-10000 series); and
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AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography SEPTEMBER 1964

STAR ENTRIES

N64-20012 Joint Publications Research Service, Washington, D.C.
CYBERNETIC CONTROL OF THE REVERSIBLE HYPOTHERMY PROCESS
Ye. V. Maystrakh, I. V. Yeremenko, G. I. Il'yutkin, and V. A. Konstantinov 7 May 1964 10 p Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 151, no. 3, 1963 p 714–717
(JPRS-24504; OTS-64-31198)

A reversible hypothermy automatic apparatus is discussed. The first step in designing this apparatus consisted of selecting the system or technical-data sensing units. In later steps, the following were developed: (1) a logic circuit that automatically processes the indications of sensing devices in a manner that insures preference of the technical automatic device in the "competition" between the biological and technical automatic devices during the given time of hypothermy, and insures preference of the biological automatic devices during all other periods of time; (2) a programing circuit that enables the duration and the schedule of the hypothermy process to be fixed and regulated; (3) an operating system that enables the administration of the components of the gas mixture through the mask, and the administration of the cooling or heating liquids to the apparatus that cools the animals. The main elements of the logic circuits in both the contour of temperature regulation and gas-mixture regulation are four-input decoders with subsequent assembly circuits. The apparatus discussed has been operated with sufficient reliability. I.v.L.

N64-20020 Library of Congress, Washington, D.C. Science and Tech. Div.
ABSTRACTS OF CURRENT LITERATURE: AEROSPACE MEDICINE AND BIOLOGY
Arnold J. Jacobius Repr. from Aerospace Med., v. 35, no. 4, Apr. 1964 p 389–400 refs
(Supported by NASA)

Categories covered by the abstracts presented include: (1) biology; (2) general physiology; (3) neurophysiology and sensory physiology; (4) psychology and psychiatry; (5) environmental physiology and psychology; (6) aerospace personnel (the effect of age on performance and on various physiological factors); (7) medical problems and pharmacology; (8) toxicology; (9) safety, survival, and rescue; and (10) man–machine integration and life-support systems. I.v.L.

N64-20181 Chicago U., Ill. USAF Radiation Lab.
[RESEARCH ON CERTAIN BIOLOGICAL AND MEDICAL ASPECTS OF ATOMIC ENERGY] Quarterly Progress Report No. 51
Kenneth D. Du Bois 15 Apr. 1964 131 p refs
(Contract AF 41(609)-1693)
(AD-438895)

Research activities in the following areas are discussed: (1) toxicity and mechanism of action of 2-mercaptoethylamine; (2) influence of X-irradiation on the development of a thiophosphate-oxidizing enzyme system in the livers of rats; (3) influence of steroids and other factors on the development of radiation sensitive detoxification systems; (4) effects of 2-imino-thiazolidine-4-carboxylic acid on the radioprotective activity of various chemical agents; (5) influence of various chemical compounds on radiation lethality in mice; (6) dose-mortality relationships for several radioprotective agents; (7) role of sodium nitrite in radioprotection in mice; (8) chemical radioprotection against absorber-moderated protons; and (9) effect of the addition of 2-mercaptoethylamine or para-aminopropiophenone to the diets of chronically irradiated mice and the production of methemoglobin by feeding a diet containing para-aminopropiophenone. P.V.E.

N64-20194 National Aeronautics and Space Administration, Washington, D.C.
OPTIMUM CONDITIONS FOR RECORDING ELECTROPLETHYSMOGRAMS OF PARTS AND ORGANS OF THE HUMAN BODY [OPTIMAL'NYYE USLOVIYA REGISTRATSII ELEKTROPLETIZMOGRAMMY UCHASTKOV TELA I ORGANOV CHELOVEKA]
Yu. Ye. Moskalenko May 1964 11 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (Moscow), v. 48, no. 2, 1962 p 214–218
(NASA TT F-203) OTS: $0.50

The biophysical phenomena that arise in the electric parameters of parts of the human body are examined to determine the optimum conditions for recording electroplethysmograms. Frequencies of 100 to 150 kc were found to be best for recording purposes. Author

N64-20229 Joint Publications Research Service, Washington, D.C.
STUDIES IN AUDITORY MEDICAL RESEARCH
8 May 1964 17 p refs Transl. into ENGLISH of 3 articles from Vestn. Otorinolaringol. (Moscow), no. 1, Jan.–Feb. 1964 p 3–7, 76–78
(JPRS-24519; OTS-64-31227) OTS: $0.50

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1. THE FUNCTION OF THE AUDITORY ANALYSOR IN THE LIGHT OF MODERN BIOLOGY V. I. Voyachek p 1–8 refs

2. NEW ACCESSORY ILLUMINATOR FOR MICRO-OPERATIONS ON THE EAR B. S. Preobrazhenskiy, Yu. A. Tsepelev, and V. I. Remizov p 9-12

3. INSTRUMENT FOR BOUGIENAGE OF EUSTACHIAN TUBES DURING DIRECT ADENOTOMY A. G. Amirov p 13-14

N64-20232 Joint Publications Research Service, Washington, D.C.

THE NATURE OF ULTRAVIOLET LUMINESCENCE OF CELLS

S. V. Konev et al 14 May 1964 21 p refs Transl. into ENGLISH from Biofizika (Moscow), vol. 8, no. 4, 1963 p 433-440

A study was made of the luminescence spectra at room and low temperatures, after integral and monochromatic excitation, as well as of luminescence excitation spectra and luminescence polarization spectra (with respect to absorption), of the isolated fractions of mitochondria and nuclei of white rat liver cells. The spectra indicated that the luminescence of mitochondria and nuclei of these cells, excited with spectral region of 250 to 300mμ, is due exclusively to proteins (tryptophan). Author

N64-20233 Joint Publications Research Service, Washington, D.C.

NUCLEAR MEMBRANE POTENTIAL OF THE NERVE CELL

B. W. Veprintsev and D. A. Sakharov 14 May 1964 6 p refs Transl. into ENGLISH from Biofizika (Moscow), vol. 8, no. 4, 1963 p 526

(JPRS-24607; OTS-64-31261) OTS: $0.50

The large nerve cells of the snail, *Lymnaea stagnalis*, were investigated. The size of the nucleus amounted to about half of the external diameter of the cell. Upon insertion of a microelectrode into a single cell the resting potential (RP) in many cases reached its maximum value by leaps rather than immediately after the piercing of the nerve cell membrane. On the penetration of the electrode into the cell the value of RP either remained constant until the reemergence of the microelectrode tip on the other side of the cell, or changed with a leap up to −70 mv. The maximum value of RP obtained was −70 mv. During the passage of the microelectrode through the cytoplasm and the nucleoplasm, the RP did not change. R.T.K.

N64-20318 Human Factors Research, Inc., Los Angeles, Calif.

THE EFFECT ON THE LEVEL OF VIGILANCE OF AN ADJACENT SECONDARY VIGILANCE TASK Technical Report 750-4

J. O'Hanlon, Jr. and E. A. Schmidt Apr. 1964 27 p refs

(Contract Nonr-4120(00))

(AD-437334)

The purpose of this study was to determine whether performance of a main visual vigilance task could be enhanced by presenting observers with knowledge of their performance of an adjacent and concurrent secondary visual vigilance task. Observers were told that adequate or inadequate performance of the secondary task revealed the adequacy of their performance of the main task. A preliminary experiment involving 16 observers established criteria of adequate and inadequate performance for the main experiment. During the main experiment, 16 observers undertook a control condition and an experimental condition in which knowledge of the secondary task performance was supplied. Another 16 observers undertook the same control condition and an experimental condition in which the same secondary display was presented but signals were ignored. Performance of a main visual vigilance task is impaired by an adjacent visual vigilance display on which occasional secondary signals are presented. This is true regardless of whether instructions indicate that secondary signals are to be responded to or ignored. Author

N64-20329 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.

PSYCHOLOGICAL PROBLEMS IN DISORIENTATION Report No. 8

Randall M. Chambers 31 Dec. 1963 32 p refs

(NADC-MA-6321; AD-432968)

This report reviews and summarizes research on the varied aspects of disorientation encountered by man during space travel. Disorientation refers to false sensations, incorrectly sensed cues, misperception, and inappropriate responses to stimuli resulting in false perceptual frames of reference. Time disorientation and visual disorientation are evaluated for astronauts during prolonged space flight. In considering disorientation in position and motion, the role of the visual system, the labyrinthine system (vestibular apparatus of the inner ear), and the extralabyrinthine system (peripheral pressure, muscle, and posture senses) are summarized. Illusions of position and motion are described, and their involvement in space flight operations is discussed. Once the stimuli, responses, and basic physiological and psychological mechanisms are understood for specific space flight missions, techniques of selection, adaptation, training, and human engineering may be used to increase man's ability to tolerate the stress and to perform reliably in any spacecraft. Author

N64-20373 Naval School of Aviation Medicine, Pensacola, Fla. Naval Aviation Medical Center

THE PROTECTIVE EFFECT OF XYLOCAINE ON THE TOLERANCE OF VIBRATED RATS TO EXPLOSIVE DECOMPRESSION Research Report No. 6

Donald E. Furry 1 Nov. 1963 8 p refs

(AD-432880)

Tolerance of restrained Sprague-Dawley male rats to explosive decompression from sea level to 40,000 ft in approximately 0.01 sec is markedly reduced when the animals are previously exposed to 30 min of whole body mechanical vibration of 25 cps frequency and 0.25-in. displacement (peak to peak). The administration of an intraperitoneal injection of 1.0 ml of 2 percent Xylocaine, however, effectively increases this tolerance. Major pathologic findings were confined to the lungs and consisted of gross and histological evidence of pulmonary hemorrhage, edema, and atelectasis. Author

N64-20380 School of Aerospace Medicine, Brooks AFB, Tex.

THE EEG IN AEROSPACE MEDICINE. THE ELECTROENCEPHALOGRAM IN AIRCREW AND ASTRONAUT SELECTION

Donald R. Bennett and Roger C. Duvoisin Dec. 1963 23 p refs

(Rept 12-63; AD-433104)

Attempts to correlate flying aptitude with the electroencephalogram have so far been unsuccessful. Although difficulties have arisen in establishing criteria for rejection of apparently normal individuals, the EEG has been shown to have a definite, if limited, value in screening aircrewmen for epileptics. Those with specific paroxysmal patterns should not be accepted for flying duties whether or not a history of previous episodes of loss of consciousness or seizures can be obtained. Hyperventilation and photic stimulation are useful activating procedures, but convulsive agents such as Metrazol have not proved helpful in identifying epileptics. It is not justifiable to reject a candidate on the basis of nonspecific EEG abnormalities when his neurologic history and examination are normal. In-flight EEG recordings are as yet experimental, and their interpretation requires simultaneous recording of other physiologic variables, including alveolar CO_2 and blood pressure. Author

N64-20409 Human Factors Research, Inc., Los Angeles, Calif.
THE USE OF REFERENCE SIGNALS IN A VISUAL VIGILANCE TASK. II. REFERENCE SIGNALS DISPLAYED WHEN DEMANDED AND WHEN ARBITRARILY PROGRAMMED Technical Report 750-2
C. H. Baker and J. O'Hanlon, Jr. Dec. 1963 31 p refs
(Contract Nonr-4120(00))
(AD-428282)

The purpose of this experiment was to determine whether or not performance on a visual vigilance task is aided by displaying reference signals adjacent to the display constituting the vigilance task. Four conditions were studied with 24 observers employed in each. In a control condition the adjacent reference display was never employed. In a second condition, the observers could demand activation of the reference display whenever they wished, and reference signals were generated during the activation period. In a third condition, the experimenter activated the reference display at arbitrarily chosen intervals, and reference signals were generated during the activation period. In a fourth condition, the experimenter activated the reference display at arbitrarily chosen intervals but reference signals were never generated. Neither the reference signals demanded by the observer nor the reference signals arbitrarily programed by the experimenter were an aid in improving the general level of detection performance in the vigilance task. Author

N64-20445 Stanford U., Calif.
THE DISTRIBUTION OF BLOOD FLOW IN HUMAN SKIN Progress Report, Jul. 1, 1960–Jun. 30, 1962
J. M. Crismon 16 May 1963 20 p refs
(Grant DA-MEDDH-60-9)
(AD-405777)

Methods were devised for simultaneous measurement of total forearm blood flow and clearance of I-131 from the skin after intradermal injection or iontophoresis of the isotope. These methods were used to study the effects of reactive hyperemia, general body heating and the action of topically applied rubifacient substances on total forearm blood flow and upon clearance of I-131 from the skin. The increased blood flow of reactive hyperemia was reflected during the early period of isotope clearance, but factors other than blood flow dominated the clearance of isotope from skin 25 to 40 minutes later. N-hexyl nicotinate, an active rubifacient applied to the skin by inunction of a 2% cream increases both total blood flow and flow through the superficial capillaries of the skin. The relative increases of skin blood flow and clearance of isotope were consistent with an increase of total skin blood flow larger than the effective or "nutrient" blood flow through the region sampled by the clearance. The large increase of blood flow through the skin produced by general body heating is poorly reflected by increased clearance of radioactive iodide into the skin. A method for graphical analysis of semilog plots of complex regressions with more than one exponent was devised. Author

N64-20450 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.
ELECTROENCEPHALOGRAPHIC CHANGES IN HUMAN SUBJECTS DURING BLACKOUT PRODUCED BY POSITIVE ACCELERATION Report No. 12
Russell D. Squires, R. E. Jensen, W. C. Sipple, and J. J. Gordon 6 Apr. 1964 22 p refs
(NADC-ML-6402; AD-438485)

Each of 13 human subjects was subjected alternately to a set of peak accelerations of 6 g and 7 g on two separate occasions. One channel of EEG was recorded by placing two active electrodes, one on the right and one on the left side of the calvaria, approximately 2 cms above and lateral to the occipital protuberance. Analysis of the taped EEG signals was accomplished by a 14-channel continuous frequency analyzer using bandpass filters. The voltage output of each bandpass filter was rectified and passed through a smoothing filter to obtain a direct current voltage proportional to the amplitude of the frequency band passed by each filter. An increase in beta frequencies, 16 to 36 cps, occurred showing the same general amplitude pattern as the acceleration profile. The lower beta frequencies, 16 to 19 cps, had a tendency to level out or to decrease during each blackout coincident with an increase in the lower frequency components. The alpha frequencies, 8 to 13 cps, often appeared during grayout and blackout, but may disappear during very deep blackout when bursts of high-amplitude, low-frequency components appear. The best index of the level of consciousness appears to be the inverse relationship between the depth of blackout and the amplitude of EEG frequencies in the range of 5 cps. The 5- to 7-cps frequency band is associated with cerebral hypoxia, which occurs during positive acceleration. Author

N64-20477 Atomic Energy Commission, Washington, D.C. Div. of Technical Information
THE TRANSPORTATION OF RADIOACTIVE MATERIALS
N. I. Leshchinskii Apr. 1964 247 p refs Transl. into ENGLISH of the book "Transportirovanie Radioaktivnykh Veshchestv" Moscow, Gosatomizdat., 1962 195 p
(AEC-TR-6315) OTS: $3.00

There are four chapters as follows: (1) "The Effect of Radioactive Materials on the Human Organism"; (2) "Rules for the Transportation of Radioactive Materials in the Soviet Union"; (3) "International Rules for Shipment of Radioactive Materials"; and (4) "A Comparison of the Soviet and International Rules for Transportation of Radioactive Materials." A.W.

N64-20483 Joint Publications Research Service, Washington, D.C.
STRAIN ON THE VISUAL ANALYZER
A. A. Zubkov and G. G. Rud' 13 May 1964 7 p Transl. into ENGLISH from Zdravookhr. (Moscow), v. 6, no. 2, 1963 p 38–41
(JPRS-24592; OTS-64-31256) OTS: $0.50

The visual analyzer was investigated by studying a form of work that required the use of a magnifying glass making it possible to reliably determine the alternation of the right and left eye in controlling the operation. The critical flicker frequency is used as an index of eye fatigue. It was demonstrated that the alternate use of both eyes is a definite advantage when compared with the continuous use of one eye. This is shown, first, by the significantly higher critical flicker frequency of both eyes (measured together and separately) at the beginning of the day and, second, by the slight reduction toward the end of the day. From the data, it is concluded that alternating the function of cortical representations of the right and left eyes increases the functional ability of the cortical end of the visual analyzer as a whole and increases its resistance to fatigue. R.T.K.

N64-20485 New Jersey State Dept. of Health, West Orange Radium Research Project
SURVIVAL EXPERIENCE OF THE RADIUM CASES
Abraham H. Libove and Lester A. Barrer Washington, AEC, Div. of Tech. Inform., Mar. 1963 46 p refs
(Contract AT(30-1)-2181)
(NYO-2762) OTS: $1.00

Described are the results of attempting to establish a procedure for comparing actual survival rates with the expected survival rates of a group of individuals under investigation. The procedure used was developed for comparing survival of

individuals exposed to radium with the expected rates computed from the general life tables for New Jersey men and women. This method also serves to describe some of the characteristics of the exposed group. From a universe of 921 persons, known to be former employees of the radium industry, a nonrandom sample of 289 was selected. The basis of selection was data concerning each individual including sex, date of birth, and date of death or year last known to be alive, as well as data regarding exposure to radium—age at initial exposure, year of first exposure, and place, type, length of time, and continuity of exposure. Inferences drawn from this trial should not be considered applicable to the entire population of known radium cases, since no valid statistical relationship was established between the sample selected for trial and the total data available. Author

N64-20517 Lockheed Missiles and Space Co., Sunnyvale, Calif.
RADIATION EFFECTS UPON EXPERIMENTAL ANIMALS, MAN, AND PLANTS, VOLUME I, A-L Annotated Bibliography, 1961-1962
Jack B. Goldmann, comp. Jan. 1963 440 p refs
(SB-62-60; Rept. 5-10-62-54)

The scope of this annotated bibliography is comprehensive, but not exhaustive. The 2,203 references reflect the volume of literature available in English and foreign languages (June 1961–June 1962) in the sequential order indicated by the title. Lethal doses, genetic effects, illness, and decrease of life span are some of the subject areas identified with the experimental animals, man, and plants. An author index is included. Author

N64-20559 Aerospace Industries Assn. of America, Inc., Washington, D.C. Electronic Equipment Technical Committee
RELIABILITY ASPECTS OF HUMAN ENGINEERING BIBLIOGRAPHY
D. Meister (Gen. Dynamics/Astronautics) Apr. 1964 21 p refs
(EETC-7, Rev. A) Available from Natl. Standards Assn., Inc.: $1.00

This bibliography lists publications dealing with reliability aspects of human engineering, under the following categories: (1) a general description of human engineering; (2) human factors and reliability; (3) human error and human-initiated equipment failures; (4) the prediction of man–machine reliability or the integration of human factor aspects into new system design; (5) human factors and the maintainability aspects of reliability; and (6) the evaluation of the reliability of man–machine performance. Short abstracts accompany most of the reports. I.v.L.

N64-20588* Itek Corp., Palo Alto, Calif.
A STUDY OF AUSCULTATORY BLOOD PRESSURES IN SIMULATED ARTERIES
Alvin H. Sacks, K. R. Raman, and Jack A. Burnell [1963] 29 p Presented at the 4th Intern. Congr. on Rheology, Brown U., 26–30 Aug. 1963
(NASA Contract NAS2-1137)
(NASA CR-56024) OTS: $2.60 ph

After preliminary analysis of the pulsatile viscous flow in flexible tubes, a large-scale pulsating flow system was constructed. Various simulated arteries of 1-inch inside diameter were tested under varying conditions of pulse rate, pressure level, and pulse pressure, using first, various mixtures of water and glycerol and, finally, whole steer blood as the fluid. The oscillatory intra-arterial pressures were recorded by pressure transducers that were attached to both static and total pressure probes in the flow itself; these were compared with measurements of the systolic and diastolic pressures obtained by the clinical auscultatory technique, using a stethoscope and a specially designed pressure chamber. In addition, simultaneous measurements were made of arterial-wall displacements and the velocity of the pulse wave along the tube. The simulated system exhibits many of the qualitative features of a living human subject, and the entire spectrum of characteristic Korotkoff sounds is reproduced in the artery. Test results are presented. R.T.K.

N64-20591 National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DECK MOTION SIMULATOR PROGRAM HORIZONTAL SINUSOIDAL OSCILLATION: EFFECTS UPON PERFORMANCE OF STANDING WORKERS
J. S. Seeman and R. B. Williams 3 Mar. 1964 54 p refs
(NASA TM X-53011) OTS: $5.60 ph

An experiment was performed to assay effects of horizontal linear sinusoidal oscillation of two discrete frequencies (0.33 cps and 0.80 cps) and one amplitude (±7 inches) upon psychomotor performance of standing personnel. No significant differences were found in performance of the tasks at 0.33 cps. Significant performance decrements were found at 0.80 cps. Implications of results are discussed pertaining to Saturn V servicing. Author

N64-20597 Alto Scientific Co., Inc., Palo Alto, Calif.
VOICE/CARDIAC SOUNDS UNDER STRESS Final Report
28 Aug. 1963 50 p
(NASA Contract NAS2-1394)
(NASA CR-53501) OTS: $4.60 ph

The objectives of the study were to determine if Alto speech recognition detect circuits can measure changes in a pilot's speech under varying environmental g stress, and to make a preliminary evaluation to determine whether peak power asymmetry measuring techniques show promise in obtaining a sophisticated phonocardiogram, particularly as related to measuring change in cardiac sounds under varying g stress. Of the large amount of data taken, the most suitable for preliminary reduction was at the higher 6 g level; and because of constraints in the accumulation of data, no attempt was made to reduce cardiac data from actual centrifuge runs beyond the conclusion that the heart sounds do display asymmetry. Limited laboratory data may indicate a relationship between cardiac asymmetry and respiration. R.T.K.

N64-20598 Columbia U., New York, N.Y. Electronics Research Labs.
DESIGN AND IMPLEMENTATION OF PHYSIOLOGIC MONITORING SYSTEMS Semi-Monthly Progress Letter MPL-1/191, May 23–Jun. 15, 1962
L. B. Lambert [1962] 3 p
(NASA Contract NAS2-878)
(NASA CR-53652) OTS: $1.10

The object of this project is to develop the required instrumentation for the monitoring of experimental animals' physiological behavior in the experimental balloon flights, in order to observe the effects of cosmic radiation. The final design for the flight model of the blood flowmeter was determined, and a working model was tested successfully. A number of amplifiers are required for each flight to service the various instrumentation channels as well as the life-support system. Several types of amplifiers were evaluated; the Telemedics amplifier was found to be acceptable. An electromyogram integration technique was successfully tested; therefore the respiration-rate signals can be recorded and can be considered as reliable data. Capsule wiring was designed. R.T.K.

N64-20636 Oak Ridge National Lab., Tenn.
AN AUTORADIOGRAPHIC AND HISTOLOGIC STUDY OF SPLEEN WHITE PULP GERMINAL CENTERS DURING EARLY INTERVALS OF THE PRIMARY IMMUNE RESPONSE
M. G. Hanna, Jr. May 1964 109 p refs
(Contract W-7405-ENG-26)
(ORNL-3595)

This study is concerned with the quantitative and histologic aspects of germinal center dissociation and the migration and fate of germinal center cells in the spleen of normal and antigenically stimulated animals during the primary immune response. Studies were made on the spleen white pulp since it is the only lymphatic tissue receiving a large direct exposure to the antigen after intravenous injection, thus permitting a synchronized cellular response. Autoradiographic labeling techniques were used and were predicated on the uptake of tritriated (H^3–) thymidine as an index of DNA synthesis. Investigations were also made of changes of germinal center volume during the primary immune response with concurrent measurements of cellular changes in the peripheral blood. The fate of germinal center cells was interpreted from autoradiographic preparations of spleen imprints. R.T.K.

N64-20666 Flying Personnel Research Committee (Gt. Brit.)
MODIFICATION TO FACEPIECE OF P AND Q TYPE OXYGEN MASKS
J. E. Gabb (RAF Inst. of Aviation Med.) London, Air Min., Jan. 1963 5 p
(FPRC/MEMO-194)

Deficiencies in the stability of the P and Q oxygen masks make it unsatisfactory on certain faces in routine flight, and generally liable to be displaced during escape. Prototype improved masks were made by dipping methods, without changes to the facepiece mould. Tests have shown these facepieces improve the stability of the mask under normal flight and airblast conditions, and make the satisfactory fitting of some aircrew easier. The masks are preferred by those aircrew who have used them. It is recommended that a number should be made by more precise methods for further evaluation in the laboratory and in flight. Author

N64-20672 California U., Los Angeles School of Medicine
LUNG PHOTOSCANS WITH MACROAGGREGATES OF HUMAN SERUM RADIOALBUMIN (EXPERIMENTAL BASIS AND INITIAL CLINICAL TRIALS)
G. V. Taplin, D. E. Johnson, E. K. Dore, and H. S. Kaplan Apr. 1964 47 p refs
(Contract AT(04-1)-GEN-12)
(UCLA-12-521)

Human lungs were not visualized by photoscanning until recently, for lack of a metabolizable, particulate test material, safe to inject intravenously. A method for preparing such an agent, namely 5-25μ macro-radioalbumin aggregates (MRAA) is described. Experimental evidence in animals insures a tremendous factor of safety (~ 1000 fold) for injecting the minute quantities needed for scanning. Experience from scanning more than 100 patients has verified the safety and revealed the diagnostic value of the procedure. It has the unique capacity to detect regional pulmonary ischemia caused by emboli and other diseases obstructing pulmonary arterial blood flow before signs of these lesions are recognizable in routine chest X-ray films. Author

N64-20679 Thompson Ramo Wooldridge, Inc., Cleveland, Ohio Electromechanical Div.
CO_2 REDUCTION UNIT DESIGNED FOR CONTINUOUS ZERO GRAVITY OPERATION Final Technical Report
A. D. Babinsky 18 Apr. 1964 69 p refs
(Contract NASw-650)
(NASA CR-54060; ER-5907) OTS: $6.60 ph

A carbon dioxide reduction unit was designed, fabricated, and tested. Carbon dioxide was reduced by hydrogen to carbon and water using flat iron plates as the catalyst. Carbon and water were continuously removed from the reaction gases. Product water was electrolyzed to oxygen and hydrogen. All components were designed for operation in a zero-gravity environment. Tests on the one half-man capacity unit were carried out at a system pressure of 2 psig. Steady reaction rates up to 900 cc/min of reaction gases were obtained at a reactor temperature of 1,200° F. Carbon was successfully removed from the reactor during operation of the system. Total accumulated test time was 40 days of operation with one continuous run of 25-days duration. Author

N64-20682 Esso Research and Engineering Co., Linden, N.J.
DEVELOPMENT OF HYDROCARBON ANALYSES AS A MEANS OF DETECTING LIFE IN SPACE Quarterly Report
W. G. Meinschein 1 Oct. 1963 21 p refs
(NASA Contract NASw-508)
(NASA CR-52217) OTS: $2.60 ph

Data have been collected which permit a testing of the hypotheses that the biochemically and chemically least active biological molecules may accumulate unaltered in the elimination products of living things and, in turn, in terrestrial sediments. The concentrations of alkanes in the benzene extracts of cow manure, bat guano, and terrestrial sediments are comparable. These concentration exceed by more than two orders of magnitude the concentrations of alkanes in the benzene extracts of plants, animals, and a food, butter. Mass spectrometric analyses indicate that alkanes from living things, biological elimination products, and terrestrial sediments are composed of the same types of compounds. Optical activities of hydrocarbons in a crude oil obtained from a 1.1-billion-year-old sediment have been found to be of the same sign and magnitude as are the optical activities of some relatively young oils. Author

N64-20696 Rochester U., N.Y.
ON ADDITION OF MODES OF RADIATION INJURY IN PRODUCING LETHALITY IN DOGS AND RODENTS
Henry A. Blair 28 May 1964 33 p refs
(Contract W-7401-ENG-49)
(UR-654)

It is deduced from mouse and rat data on lethal dose protracted in the one-day range that about two-thirds of the body has a recovery half-time of a few days, whereas the remainder has a recovery half-time of a few hours. The slower division presumably includes the hematologic and the faster division the intestinal modes of injury. The injuries are completely additive in producing lethality as are partial body injuries produced by partial body exposures. It is deduced from data on mixed gamma and neutron exposures that injuries from these radiations add completely in mice. Partial body injuries in the dog are not directly additive. This occurs because the lethal threshold is inversely proportional to the volume in which the injury is contained. For this reason a given amount of injury is more lethal when distributed within the whole body than within a part and, consequently, partial body lethal doses are much higher relative to whole body lethal dose in dogs than in rodents. Author

N64-20705 Stanford Research Inst., Menlo Park, Calif.
STUDIES ON THE HILL REACTION ACTIVITY OF SOLUBLE CHLOROPLAST EXTRACTS Quarterly Progress Report No. 4, 1 Dec. 1963-29 Feb. 1964

Lloyd K. Moss, Janice E. B. Coomber, and Luman F. Ney
20 Apr. 1964 8 p
(NASA Contract NASr-49(11); SRI Proj. BU-4435)
(NASA CR-56130) OTS: $1.10 ph

The effect of dimethylsulfoxide (DMSO) and caffeine on the Hill reaction activity of chloroplast preparation was investigated. Results indicate that: (1) DMSO may become a useful solubilizing agent for proteins without causing marked changes in the biological properties of the proteins. Within experimental error, the Hill reaction activity of chloroplast solutions containing it was unchanged or slightly enhanced. (2) A 1%-caffeine content is not considered as a photosynthetic inhibitor, although there was a decrease in the Hill reaction activity of both whole chloroplasts and fragments. Also, operating conditions for high-voltage preparative electrophoresis on the carrier-free instrument, the Elphor FF, are described. In contrast to curtain electrophoresis, chloroplast preparations can be studied easily on a preparative scale and under high-power conditions. I.v.L.

N64-20715 Rochester U., N.Y. Radiology and Biophysics Div.

THE RETENTION OF STRONTIUM-90 IN THE RATS AS INFLUENCED BY DOSE, AGE AND ADMINISTRATION ROUTE

L. W. Tuttle, R. C. Baxter, B. J. Hopkins, and G. W. Casarett
18 May 1964 27 p refs
(Contract W-7401-ENG-49)
(UR-642)

The fractional retention of strontium-90 was measured in a total of 460 rats following a series of doses, 71 to 789μc administered either orally, intravenously, or intraperitoneally to animals that ranged in age from 40 to 470 days. Fractional retention was independent of the total dose within the range of 71 to 142μc in rats that were 6 weeks old, and 252 to 789μc in rats that were 124 days old. The fraction of the total dose retained at a given time after ingestion of Sr^{90} decreased as the age of the animal increased between the ages 40 and 346 days, but there was no further decrease for treatment after 1 year of age. The value of the slope of the line representing retention vs. time in log-log plots of the data increased with age to 1 year of age beyond which there was no further increase. Fractional retention was 5 to 6 times greater at day 15 post-treatment in animals of uniform age given intravenous or intraperitoneal injections compared with those given the isotope orally. The slope values of the retention curves were similar regardless of administration route for the portion of the curve between the 10th day after the end of the dosage regimen and the terminal observation day. Author

N64-20729 Naval School of Aviation Medicine, Pensacola, Fla.

VESTIBULAR MECHANISMS AND VISION

Earl F. Miller, II and Ashton Graybiel 1963 39 p refs Presented at the Armed Forces-NRC Vision Comm. Session on Recent Advances in the Study of Physiol. Reflex and Mech. in Vision, Washington, D.C., 9 May 1963
(NASA Order R-47)
(NASA CR-56080) OTS: $3.60 ph

The results of some investigations dealing with the vestibular and visual systems under the influence of unusual gravitational-inertial force environments (GIFE) are summarized. Among the topics discussed are: (1) otolith organs and vision, (2) egocentric visual localization, (3) semicircular canals and vision, and (4) vestibular organ interaction and vision. R.T.K

N64-20730 Naval School of Aviation Medicine, Pensacola, Fla.

VESTIBULAR SICKNESS AND SOME OF ITS IMPLICATIONS FOR SPACE FLIGHT

Ashton Graybiel 1963 33 p refs Presented at the 11th Ann. Sci. Meeting of the Houston Neurological Soc. and the Dept. of Neurology, Baylor U. Coll. of Med., Houston, Tex., 14–16 Mar. 1963
(NASA Order R-47)
(NASA CR-53958) OTS: $3.60 ph

Recent investigations dealing with functional disturbances of vestibular origin are summarized, and their relevance to manned space flight is indicated. These studies employed a constantly rotating or counter-rotating environment and used normal human subjects, as well as those with vestibular defects. The report deals with (1) the symptomatology resulting from brief exposure to different force environments, and (2) the time course of the appearance and disappearance of symptoms with prolonged exposure in the slow rotation room. R.T.K.

N64-20731 Naval School of Aviation Medicine, Pensacola, Fla.

HUMAN REACTIONS TO SLOW ROTATIONAL MOVEMENTS

Ashton Graybiel 1963 17 p refs Presented at the SHAPE Meeting, Paris, 27–29 May 1963
(NASA Order R-47)
(NASA CR-53988) OTS: $1.60 ph

Human subjects exposed to Coriolis rotation in a slow rotation room had the symptoms of canal sickness (vestibular sickness) varying greatly in severity, ranging from mild malaise to prostration. The unique symptom was the Coriolis illusion. The cardinal symptoms are nausea, increased salivation, and drowsiness, and the cardinal signs are nystagmus, pallor, cold sweating, and vomiting. The relation between stimulus and response reveals the phenomena of temporal summation, the perseveration of symptoms after cessation of stimulation, and adaptation. Symptoms do not appear in persons who have lost the function of the canals and are negligible in those with partial loss of function. Preventive measures and drug therapy can aid in minimizing the symptomatology. R.T.K.

N64-20749 Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.

FIRE AND BLAST HAZARDS FROM METEOROID PENETRATION

In its Space-Cabin Atmospheres, Pt. II 1964 p 47–77 refs (See N64-20744 14-26) GPO: $1.00

The meteoroid penetration of vehicle walls results in the passage of molten metal and vaporized materials (projectile and wall) into the cabin space or fuel compartments. Spallation of the cabin wall may well result in secondary missiles that may penetrate containers, disrupt tubes and pipes, and even cut electric wires. The release of flammable liquids and gases by these secondary projectiles creates fire hazards. However, the most significant hazard in cabin penetration appears to be the formation of an "explosive" flash of oxidizing metal vapors in the gaseous environment of the cabin. Experiments showing the pathological effects of "explosive" flashes are discussed. I.v.L.

N64-20811 Research Triangle Inst., Durham, N.C. Operations Research Div.

SHELTER MEDICAL SUPPORT SYSTEM STUDY Final Report

W. T. Herzog, W. L. Wells, and W. J. Cromartie 31 Aug. 1963 135 p refs
(Contract OCD-OS-62-271)
(OU-107)

This study asked four questions: (1) Can a single, community, fallout shelter be medically self-sufficient? (2) Can a community fallout-shelter complex be medically self-sufficient? (3) What demands will a medical-support system place on the community civil-defense services? (4) What is the best medical-support system? Answers to these questions were: (1) The 94% of the nonradiation sick and injured would survive in the single shelter if a doctor and proper supplies are provided. (2) The community-shelter complex has many variables connected with it, and would work efficiently only if all these variables, such as communications and transportation, were efficiently organized. (3) The demands on community civil-defense services would be so great after nuclear attack that a medical-support system would not receive adequate support. (4) The best system is minimum transfer of cases and maximum availability of medical personnel and supplies in the single community shelter. G.D.B.

N64-20823 Atomic Energy Commission, Washington, D.C. Div. of Technical Information
PROCEEDINGS OF THE TASHKENT CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, VOLUME III
Ya. Kh. Turakulov, ed. Mar. 1964 856 p refs Transl. into ENGLISH of Tr. Tashkentsk. Konf. Po Mirnomu ispol'z. At. Energ., T. III, Tashkent, Isd. AN Uz.SSR, 1961
(AEC-TR-6293) OTS: $8.75

Contained in these proceedings are results of investigations using radioactive isotopes and nuclear radiations in the field of medicine, biology, and agriculture. Great emphasis was placed on the changes in the organism under the action of small doses of X-ray radiation, on the formation of iodinated substances in the organism when radioiodine is used, and on an evaluation of the functional state of the vascular system by the radioisotope method. Various cases of the use of labeled atoms to study exchange processes in the organism, various aspects of metabolism in animals in the normal state and during radiation sickness, and the physiological-biochemical action of ionizing radiation on plants are discussed. A number of reports indicate general ways to use ionizing radiation in agriculture. The proceedings are designed for scientists and specialists of scientific research institutions and enterprises, who use radioactive isotopes and nuclear radiations in their work. Author

N64-20827 Joint Publications Research Service, Washington, D.C.
EFFECTS OF RADIATION SICKNESS
M. I. Ravich-Shcherbo et al 21 May 1964 20 p refs Trans. into ENGLISH from Byull. Eksptl. Biol. i Med. (Moscow), no. 12, 1963
(JPRS-24704; OTS-64-31304) OTS: $0.50

CONTENTS:

1. CAUSES OF THE PROTECTIVE EFFECT PRODUCED BY BACTERIAL ANTIGENS IN ACUTE RADIATION SICKNESS M. I. Ravich-Shcherbo and L. G. Prokopenko p 1-5
2. ACCUMULATION OF I^{131} BY THE SKIN AND HAIRS OF ANIMALS AND MAN A. Ya. Loshak and A. V. Terman p 6-11
3. REGENERATION OF THE SCIATIC NERVE IN ACUTE RADIATION SICKNESS O. N. Bayshtruk and Ya. I. Ryss p 12-17

N64-20943 Joint Publications Research Service, Washington, D.C.
STUDIES IN MEDICAL RADIOLOGY
4 May 1964 62 p refs Transl. into ENGLISH of 6 articles from Med. Radiol. (Moscow), v. 9, no. 2, Feb. 1964 p 22-28, 64-71, 75-84, 94-103
(JPRS-24452; OTS-64-31197) OTS: $1.50

CONTENTS:

1. THE CONDITION OF CARCINAMOTOUS LARYNGEAL MUCOSA AFTER X-RAY THERAPY S. N. Lapchenko p 1-8 refs
2. CASE OF RADIATION SICKNESS FROM INTERNAL IRRADIATION Ye. I. Safronov p 9-19 refs (See N64-20944 14-16)
3. TEMPERATURE REACTION TO IRRADIATION IN MONKEYS N. A. Volokhova p 20-27 refs (See N64-20945 14-16)
4. SERUM PROPHYLAXIS AND THERAPY OF BACTERIAL INTOXICATIONS IN IRRADIATED ANIMALS D. R. Kaulen and T. I. Bulatova p 28-34 refs (See N64-20946 14-16)
5. THE USE OF CYBERNETICS IN THE DEVELOPMENT OF RADIATION THERAPY I. O. Kruglyakov, L. D. Lindenbraten, and Ye. A. Likhtenshteyn p 35-46 (See N64-20947 14-16)
6. CLASSIFICATION OF RADIATION SICKNESS G. D. Baysogolov and A. K. Gus'kova p 47-57 refs (See N64-20948 14-16)

N64-20944 Joint Publications Research Service, Washington, D.C.
CASE OF RADIATION SICKNESS FROM INTERNAL IRRADIATION
Ye. I. Safronov *In its* Studies in Med. Radiol. 4 May 1964 p 9-19 refs (See N64-20943 14-16) OTS: $1.50

A description is presented of the symptoms, medical treatment, and reactions to the treatments of a patient who sustained a one-stage oral intake of 2.03 millicuries of radium. P.V.E.

N64-20945 Joint Publications Research Service, Washington, D.C.
TEMPERATURE REACTION TO IRRADIATION IN MONKEYS
N. A. Volokhova *In its* Studies in Med. Radiol. 4 May 1964 p 20-27 refs (See N64-20943 14-16) OTS: $1.50

A study was made of the rectal and skin temperatures of monkeys (Macacus rhesus) irradiated with a dose of 15,000 r; 10,000 r, 6,500 r, and 350 r, and the results were compared with similar studies made on dogs. In monkeys, in contrast to dogs, a marked drop in body temperature was observed immediately after irradiation with a dose of 15,000 r. In dogs, even those irradiated with very much higher doses (30,000 r), there was no such sharp drop in body temperature. A comparison of the temperature reactions after irradiation with a dose of 350 r in dogs and monkeys revealed no essential differences in the first few hours or days after irradiation. However, beginning with the 13th day, marked differences were noted in the nature of the temperature curve. In the majority of cases, the dogs died with elevated temperatures, whereas a low body temperature was characteristic of the monkeys. It is concluded that the relationship between the nature of the temperature reaction in monkeys and dogs and the radiation dose, within limits of 6,500-30,000 r, differs in that in the former, in response to massive irradiation, a deep hypothermia develops, and in the latter, a phasic alternation of hypothermia and hyperthermia occurs. P.V.E.

N64-20946 Joint Publications Research Service, Washington, D.C.

SERUM PROPHYLAXIS AND THERAPY OF BACTERIAL INTOXICATIONS IN IRRADIATED ANIMALS

D. R. Kaulen and T. I. Bulatova *In its* Studies in Med. Radiol. 4 May 1964 p 28-34 refs (See N64-20943 14-16) OTS: $1.50

Investigations were undertaken to study: (1) the effectiveness of seroprophylaxis and serotherapy of bacterial toxicoses in irradiated animals; and (2) the effect of bone-marrow transplantation on the seroprophylaxis of diphtheria intoxication in animals irradiated with a lethal dose. Conclusions reached as a result of the studies were: (1) The effectiveness of seroprophylaxis of botulism intoxication is reduced in accordance with the radiation dose and route of administration of the toxin by 1.5 to 4 times. The greatest disorder is observed after oral administration of the toxin. (2) The effectiveness of serotherapy is reduced even further, by 1,070 times after intravenous, and by 28 times after oral administration of the toxin. (3) Reduction of the effectiveness of seroprophylaxis and serotherapy can be compensated by increasing the quantity of antitoxin administered. (4) Transplantation of bone marrow increases the strength of passive immunity, but this increase is small (by 1.4 times). The effectiveness of seroprophylaxis in bone-marrow-treated animals 20 days after irradiation had returned to near the original level. P.V.E.

N64-20947 Joint Publications Research Service, Washington, D.C.

THE USE OF CYBERNETICS IN THE DEVELOPMENT OF RADIATION THERAPY

I. O. Kruglyakov, L. D. Lindenbraten, and Ye. A. Likhtenshteyn *In its* Studies in Med. Radiol. 4 May 1964 p 35-46 (See N64-20943 14-16) OTS: $1.50

Three general aspects of the problem are discussed: (1) the need for cybernetics; (2) the possibility and forms of utilization, particularly the use of computers for automation of the control of the therapeutic process; and (3) measures for carrying out the problem posed. In the application of cybernetics to radiation therapy the following are considered necessary: (1) the development of theoretical problems (study of the results of the cybernetic approach to physiology, pathophysiology, and diagnostic medicine); (2) the development of standardized methods for evaluating the treatment results in different diseases and for quantitatively determining radiation reactions and radiosensitivity of tissues; (3) solution of organizational problems (collection of information, establishment of standard terminology, etc.); and (4) decisive development of the group method for study of each specific patient by a group of specialists (physicians and physicists). The latter has already been included in practice. P.V.E.

N64-20948 Joint Publications Research Service, Washington, D.C.

CLASSIFICATION OF RADIATION SICKNESS

G. D. Baysogolov and A. K. Gus'kova *In its* Studies in Med. Radiol. 4 May 1964 p 47-57 refs (See N64-20943 14-16) OTS: $1.50

In the classification of both chronic and acute radiation sickness, it is necessary to distinguish the following: (1) the full-fledged clinical syndromes whose occurrence is basically conditioned by the action of whole-body external radiation or by the intake of isotopes into the body, which are rapidly and uniformly distributed through all the organs and tissues; and (2) clinical syndromes with predominant involvement of various organs and systems as the result of their selective irradiation with isotopes with a distinct organotropism and selectivity of deposition or from the action of local external penetrating radiation. In the development of chronic radiation sickness, from continuing whole-body radiation effects, and after its cessation, it is possible to distinguish the following periods: (1) formation of chronic radiation sickness or chronic radiation sickness proper; (2) recovery; and (3) the sequelae of chronic radiation sickness.

N64-21043 Joint Publications Research Service, Washington, D.C.

STRUCTURAL CHANGES IN THE VISUAL ANALYSOR OF MONKEYS AFTER EXTIRPATION OF THE CERVICAL LOBES

L. V. Koroleva 27 May 1964 8 p refs Transl. into ENGLISH from Byul. Eksperim. Biol. i Med. (Moscow), no. 12, 1963 p 97-100

(JPRS-24800; OTS-64-31347) OTS: $0.50

The visual region—Broadmann's areas 17, 18, 19 with underlying white matter—was surgically removed from hamadryas baboons at the age of 4 days, of 1 1/2 months, and of 3 years. The animals were killed after 10 months and after 1 1/2 years following surgery. The brains of the animals were stained by Nissl's and Spielmeyer's methods. Results indicate: (1) Segments of the brain remaining after surgery did not show any morphological regeneration of the extirpated occipital lobes. (2) The cortical visual fields were vertually removed from all three animals. (3) The external geniculate bodies underwent total cellular degeneration with a reduction in the number of nuclei following extirpation of the occipital lobes in an adult baboon. In the external geniculate body of baboons operated on at the age of 4 days and of 1 1/2 months, undegenerated nerve cells were preserved; the nuclei were of the same size as in the control animals. (4) The degeneration of nerve cells with replacement by proliferating glial cells was observed in the lateral and lower segment of the pulvinar of the optic thalmus. (5) The degeneration of associative pathways was traced to remnants of the visual fields, the middle temporal gyrus, the gyrus cinguli, and the hippocampal gyrus. (6) Degeneration was observed, following unilateral extirpation of the occipital lobes, in the optic tract on the same side. (7) The anterior tubers of the quadrigemina remained intact in all three animals. I.v.L.

N64-21048 Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia)

STUDIES ON THE NITROGEN METABOLISM IN FROG LIVER AFTER WHOLE-BODY IRRADIATION. II. TIME- AND DOSE-DEPENDENCE OF NITROGEN EXCRETION FROM ISOLATED FROG LIVER AFTER WHOLE-BODY IRRADIATION

M. Antonijevic and D. Lebez Dec. 1963 7 p refs

(NIJS-R-422)

The time and dose dependence of the nitrogen excretion in frog livers was studied. Pronounced differences were observed between time-course of the liver nitrogen excretion of frogs irradiated with 400 r and 650 r. With the lower dose the nitrogen excretion reached maximum value when the perfusion was started 24 hours after whole-body irradiation. Higher level of the excreted nitrogen was observed after the dose of 650 r with the maximum value obtained if the organ was isolated 10 hours after exposure. Author

N64-21049 Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia)

STUDIES ON THE NITROGEN METABOLISM IN FROG LIVER AFTER WHOLE-BODY IRRADIATION. III. EFFECT OF HISTAMINE AND CYSTEINE ON NITROGEN EXCRETION FROM ISOLATED FROG LIVER AFTER WHOLE-BODY IRRADIATION

M. Antonijevic and D. Lebez Dec. 1963 7 p refs Submitted for Publication

(NIJS-R-423)

In the isolated perfused livers of whole-body irradiated frogs with 650 r(Co^{60} source), histamine improves the nitrogen balance if injected into animals before irradiation, while nitrogen catabolism is increased if histamine is administered directly into the organ after whole-body irradiation. On the other hand, cysteine injected prior to irradiation with 400 r only slightly modifies the changes in nitrogen excretion induced by irradiation. Author

N64-21056 Nuklearni Institut Josef Stefan, Ljubljana (Yugoslavia)

STUDIES ON THE NITROGEN METABOLISM IN FROG LIVER AFTER WHOLE-BODY IRRADIATION. I. NATURE OF THE NITROGEN COMPOUNDS EXCRETED FROM THE ISOLATED LIVER OF NON-IRRADIATED AND IRRADIATED FROGS

M. Furlan, N. Antonijević, and D. Lebez Dec. 1963 13 p refs Submitted for Publication

(NIJS-R-421)

Perfused frog liver excretes increased amounts of protein and nonprotein nitrogen after whole-body irradiation of frogs. Paper chromatographic analysis showed that amino acids excreted from the irradiated and nonirradiated frog livers are qualitatively similar, though their amounts are increased with irradiation. The amino acid composition in the perfusate is very similar to the composition of the hydrolysates of frog serum and liver tissue proteins. C^{14} labeled frog serum proteins are not the main source of increased amino acid excretion in the liver after irradiation. Whole-body irradiation of frogs causes an enlargement of the livers with no significant differences in the liver composition. The mechanism of this change is discussed. Author

N64-21078 Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.

THE EFFECTS OF AMBIENT PRESSURE ON THE TOLERANCE OF MICE TO AIR BLAST

Edward G. Damon, Donald R. Richmond, and Clayton S. White Mar. 1964 33 p refs Presented at the Symp. on Biol. Effects of Blast and Shock, Albuquerque, N. Mex., 20 Apr. 1963

(Contract DA-49-146-XZ-055)

(DASA-1483; AD-600551)

Mice were exposed to overpressures of long duration in the expansion chamber of an air-driven shock tube inside which the initial, preblast pressures were varied over sixfold. When the animals were held at the initial pressure for 1 hour following the blast, before being returned to the ambient pressure of the laboratory, tolerance values, expressed as LD_{50}–1-hour gage pressures, increased fourfold; they were 20.3, 31.0, 44.5, 55.4, and 91.8 psi for initial pressures of 7, 12, 18, 24, and 42 psia, respectively. When animals were returned to ambient level soon after blast exposure, the LD_{50} pressures were lower than the above values for initial pressures greater than ambient, and higher for initial pressures lower than ambient. The feasibility of scaling biological blast effects as a function of altitude was discussed, and one approach suggested by available empirical data was regarded as a promising, but tentative, procedure. Author

N64-21081 Illinois U., Urbana Aviation Psychology Lab.

EXPERIMENTAL STUDIES OF HUMAN VIGILANCE Final Report

Jack A. Adams Hanscom Field, Bedford, Mass., Electron. Systems Div., Feb. 1963 43 p refs

(Contract AF 19(604)-5705)

(ESD-TDR-63-320; AD-408279)

A series of experiments was conducted on human vigilance or the characteristics of long-term human attentiveness for the occasional occurrences of signals that are to be detected and reported. Emphasis was given complex visual displays with multiple stimulus sources and alpha-numeric signals of the general class found in semiautomatic man–machine systems. Two major devices were developed for the laboratory study of vigilance, and periods of continuous watching were from 2.5 to 3 hours. Some experiments tested the arousal hypothesis, which holds that alertness depends on the level of environmental or internal response-produced stimulation associated with the task. Other experiments studied the effects of temporal and spatial uncertainty of signal occurrence, the effects of repeated daily sessions, and a method for training vigilance behavior to effect a relatively stable improvement in visual monitoring. A review of the literature was also made. Author

N64-21094 School of Aerospace Medicine, Brooks AFB, Tex.

EFFECTS OF HIGH CONCENTRATIONS OF CARBON DIOXIDE AND DIET ON URINARY EXCRETION OF STEROIDS AND CATECHOLAMINES

Frode Ulvedal, R. G. Cutler, and B. E. Welch Aug. 1963 16 p refs

(SAM-TDR-63-63; AD-419149)

Air Force pilots were exposed to inspired tracheal P_{CO_2} of 21 mm Hg (BTPS) at 700 mm Hg and 200 mm Hg cabin pressure. Each exposure was of 4 days' duration and was preceded in each case by a control period of low CO_2 also of 4 days' duration at the equivalent cabin pressures. During the entire experiment, including pre- and postexperiment control periods, the subjects were given a special liquid diet. The effects of CO_2 and diet on the endocrine functions were studied by determining the urinary excretion of epinephrine, norepinephrine, 17-OHCS, and corticosterone-like hormones. The CO_2, both at ground and at simulated altitude, increased the excretion of epinephrine, norepinephrine, and corticosterone-like hormones. CO_2 at simulated altitude had a stronger effect than at ground level. The special liquid diet caused increased excretion of epinephrine; the excretion of the other three hormone groups decreased. Author

N64-21101 School of Aerospace Medicine, Brooks AFB, Tex.

CORTICOSTEROIDS IN HUMAN PAROTID FLUID FOLLOWING ORAL HYDROCORTISONE DOSAGE

Ira L. Shannon and Fred H. Katz Apr. 1963 7 p refs

(SAM-TDR-63-12; AD-403380)

A single 20-minute parotid fluid sample was collected prior to, and six 20-minute samples were collected subsequent to the oral administration of 50 mg of hydrocortisone to 30 healthy young adult males. Blood was drawn before dosage and 2 hours thereafter. The following conclusions were drawn: The serum-free 17-OHCS increase after dosage was highly significant. Hydrocortisone did not exert a significant effect on parotid fluid flow rate. A highly significant increase in parotid fluid-free 17-OHCS levels was found in the 40- to 60-minute sample. A significant response was elicited in all subjects within 2 hours. Author

N64-21122 Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
IMPROVEMENT OF THE HUMAN OPERATOR'S TRACKING PERFORMANCE BY MEANS OF OPTIMUM FILTERING AND PREDICTION
W. W. Wierwille 7 Jan. 1963 19 p refs

Optimum filtering is applied to man-machine tracking control systems so as to improve their performance in tracking random waveforms. Two different design approaches are developed. In the first, the predicted input is properly displayed for interpretation by the human operator, who is then allowed to track in a manner that makes maximum use of his higher-order abilities. In the second approach, it is shown that a previously designed tracking control system can be optimized by using a series filter. It is found that the use of the series filter avoids, to a great extent, the problems of the human's changing transfer function, thus allowing proper application of the optimum filtering theory. The most fundamental idea contained in this paper is that of using optimum prediction and filtering to overcome timelags, rise times, and nonminimum phase characteristics in man-machine systems. Author

N64-21125 Joint Publications Research Service, Washington, D.C.
INFORMATION PROCESSES IN THE LIGHT OF BIOCYBERNETICS
S. N. Braynes and A. I. Suslov 28 May 1964 12 p refs Transl. into ENGLISH from Eksperim. Khirur. i Anesteziol., (Moscow), v. 9, no. 2, Mar.-Apr. 1964 p 13-18
(JPRS-24816; OTS-64-31355) OTS: $0.50

A hypothesis for one of the possible mechanisms of elementary information processes in living organisms is presented. According to this hypothesis, transmission of information in biological systems is based on interaction between macromolecular structures and the electromagnetic field. Problems of transmission and encoding of information on the level of biological macromolecules are being investigated by modern molecular biology. Evidence that transmission and processing result from the collective interaction of molecular complexes is presented. Such interaction is divided into elementary acts of transmission and processing of information for a more detailed analysis of control processes. R.T.K.

N64-21215 California U., Los Angeles. School of Medicine
EXPERIMENTAL BASIS OF QUANTITATIVE RADIORENOGRAPHY FOR EVALUATING RENAL ISCHEMIA
Earl K. Dore, G. V. Taplin, D. E. Johnson, and A. T. Crockett May 1964 36 p refs
(Contract AT(04-1)-GEN-12)
(UCLA-12-523)

A quantitative expression of the slopes of a renogram's second segments is shown experimentally to be a reliable measure of fractional renal blood flow. Most patients with unilateral renal artery occlusive disease and hypertension have blood flow values to the involved kidney that are clearly below the normal range. A critical degree of renal artery constriction must be exceeded before blood flow falls or renogram abnormalities appear. When renal artery constrictive disease is bilateral, fractional flow to each kidney may be normal even though both kidneys are definitely ischemic. To quantitate ischemia, a separate estimate of total flow is required. Radioassay of the renogram test agent (iodohippurate I^{131}) in the urine collected exactly 15 minutes after injection is a simple way to obtain this information. Author

N64-21220 Dunlap and Associates, Inc., Santa Monica, Calif. Western Div.
PROFICIENCY TESTS FOR MISSILE TECHNICIANS MAINTAINING THE TELEMETRY GROUND STATION EQUIPMENT AN/SKH-1 AND AN/UKR-10
Clyde A. Brictson Feb. 1964 31 p refs
(Contract Nonr-2978(00))
(ND-64-36; AD-431894)

The procedures used to develop an advanced telemetry performance test for missile technicians are described. Fleet fault data collection and analysis procedures are discussed in terms of providing a basis for test simulation of representative equipment faults. The test is designed to allow diagnostic appraisal of the technician's ability to detect chassis malfunctions during preventive maintenance tasks and provides a systematic step-by-step assessment of fault isolation and correction procedures. The test is integrated with a previously developed performance test for administrative compatibility and flexibility. Author

N64-21282 Joint Publications Research Service, Washington, D.C.
CAUSE OF THE DECREASE IN THE NATURAL RESISTANCE OF IRRADIATED ANIMALS TO LIVE BRUCELLOSIS VACCINE
Z. V. Shevtsova 3 Jun. 1964 10 p refs Transl. into ENGLISH from Zh. Microbiol., Epidemiol., i Immunobiol. Moscow, v. 41, no. 4, Apr. 1964 p 100-105
(JPRS-24896; OTS-64-31389) OTS: $0.50

The factors that play a leading role in the decrease observed in the resistance of irradiated animals to the vaccine strain of Brucella were investigated. An increase in mortality was observed when irradiated animals were given a live or heat-killed vaccine culture of Brucella and/or the endotoxin extracted from it. The extent to which the animals were infected with Brucella of the vaccine strain did not increase with time, and the residual virulence of the microbes was not intensified. An increase in sensitivity to Brucella endotoxin was found to play the leading role in reducing the resistance of irradiated animals to vaccine strain *Br. abortus* No. 19-BA. R.T.K.

N64-21285 Joint Publications Research Service, Washington, D.C.
COURSE OF ASEPTIC INFAMMATION OF THE CORNEA UNDER THE INFLUENCE OF β-PARTICLES FROM RADIOACTIVE THALLIUM (Tl^{204})
S. D. Denisyuk 4 Jun. 1964 10 p refs Transl. into ENGLISH from Med. Radiol. (Moscow), v. 9, no. 4, Apr. 1964 p 41-46
(JPRS-24936; OTS-64-31409) OTS: $0.50

The purpose of the investigation was to study the effectiveness of the action of various dosages of beta radiation from Tl^{204} on the course of aseptic inflammation of the rabbit cornea. It was concluded that: (1) The use of small doses of Tl^{204} radiation is an effective method of treating aseptic inflammation of the rabbit cornea as induced by injection of an emulsion of gelatine with turpentine into the cornea. (2) Irradiation in single doses of 50 and 75 rad at intervals of 48 hours yields better results than daily irradiation in single doses of 25 rad. The total dose in 50-rad irradiation is the least effective, although the duration of the healing period is somewhat greater for this method than in irradiation with individual doses of 75 rad. (3) Irradiation of the cornea with Tl^{204} has no influence on the qualitative and quantitative composition of the

blood within the individual and the total dose limits used. (4) The curtailment of the period of emigration of leucocytes and cast off epithelium under the influence of irradiation indicates the anti-inflammatory action of Tl^{204} N.E.A.

N64-21288 Joint Publications Research Service, Washington, D.C.
STRESS AND FATIGUE UNDER CONDITIONS OF ISOLATION FROM EXTERNAL STIMULI
F.D. Gorbov, V. I. Myasnikov, and V. I. Yasdovskiy 5 Jun. 1964 12 p refs Transl. into ENGLISH from Zh. Vysshei Nervnoi Deyatel'nosti (Moscow), v. 13, no. 4, 1963 p 585-592
(JPRS-24961; OTS-64-31422) OTS: $0.50

Experiments were conducted in which a man was confined to a small, especially equipped chamber for 10 to 15 days. Various sequences of tests to determine causes and degree of stress and fatigue were administered. These investigations showed that extreme restriction of general afferentation exercises a substantial influence on the subjects. The neuropsychological functional shifts were dissimilar at different stages of the experiment. Complex recording of psychological and physiological indicators enables determination of qualitative peculiarities of these shifts and, in particular, determination and differentiation of states of stress and fatigue. Monotony of the environment, lack of external impressions, and solitude emerged as factors of independent significance as conditions and causes of development of stress and fatigue. This indicates not only the necessity but also the possibility of preventing these states, on the basis of rational stimulation for the optimal interaction of afferent systems. D.E.W.

N64-21289 Joint Publications Research Service, Washington, D.C.
BIONICS, ITS METHODS AND RESULTS
G. B. Linkovskiy and S. I. Smyglyy 5 Jun. 1964 12 p Transl. into ENGLISH from Priroda (Moscow), no. 3, 1964 p 52-58
(JPRS-24971; OTS-64-31428) OTS: $0.50

The scientific discipline of biological cybernetics is called bionics. Bionics is concerned with studying biological processes for the purpose of using the information to improve old techniques and to devise new techniques. The following topics are discussed: (1) the growing realignment of biology and technology; (2) biological methods of orientation and their engineering models; (3) study of animal sense organs; (4) the brain and its technical models; (5) reliability of the performance of the main brain elements; and (6) the future of bionics in biology and technology. R.T.K.

N64-21311 Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.
THE DESIGN AND FABRICATION OF A MASK AND HELMET FOR CHIMPANZEE RESPIRATORY RESEARCH
Thomas L. Gleason III, Edward C. Dittmer, and Robert Mc Guire Wright-Patterson AFB Mar. 1964 34 p refs
(ARL-TDR-64-3; AD-433642)

This report describes the successful development of a mask and helmet that can be used to measure chimpanzee respiratory parameters for basic physiological and environmental research. A short description of the problems associated with adapting a chimpanzee to the mask and helmet are noted. Author

N64-21312 Institute for Research, State College, Pa. Div. of Mathematical Psychology
MICROSTRUCTURE OF GUESS PROCESSES: PART C Report No. 7
Masanao Toda Bedford, Mass., Electronic Systems Div. [1963] 51 p refs Presented at Harvard Statistics Colloq., 1962
(Contract AF 19(628)-2968)
(ESD-TDR-63-548; AD-600474)

Trial-to-trial changes in the proportion of human subjects predicting the occurrence of one of two events in a complex sequence of binary events (probability learning) are analyzed in terms of several simple models. The direction of change predicted by linear-operator reinforcement models (Estes, Bush, and Mosteller) is wrong on about 75% of the trials. A no-learning model, a time-dependent decay model, and a cycle-dependent decay model are used to provide some insight into the nature of probability learning. Some suboptimal procedures for estimating parameters of stochastic processes are compared. The method of minimum absolute error is recommended. Author

N64-21346 Cedars of Lebanon Hospital, Los Angeles, Calif. Inst. for Medical Research
MEASUREMENT OF ISOMETRIC CONTRACTION AND EJECTION TIME BY THE VIBROCARDIOGRAM
Clarence M. Agress, Stanley Wegner, Daniel J. Bleifer, Harley M. Estrin, Kenneth Schroyer, et al Repr. from Am. J. Cardiology, v. 13, no. 3, Mar. 1964 p 340-348 refs
(Contract NsG-289)

Determination was made of the correlation between intracardiac pressure phenomena and the externally recorded vibrocardiogram in an anesthetized dog. Measurements obtained by intracardiac pressure pulses compared to those obtained by the vibrocardiogram demonstrated a mean time difference of 0.001 sec for isometric contraction and 0.004 sec for ejection. Other indirect methods of estimating isometric contraction and ejection were evaluated, and all methods contained theoretical and practical sources of error. Study of the vibrocardiogram for the measurement of these intervals indicates the practical advantages and greater accuracy of this technique. A.W.

N64-21353 Cornell U., Ithaca, N.Y.
PLANT STUDY; EFFECT OF TEMPERATURE, MOISTURE AND LIGHT ON THE COMPOSITION OF PLANTS GROWN BY USE OF ION EXCHANGE RESINS AS MEDIA Final Report, 1 Mar. 1962-1 Mar. 1963
J. E. Dawson 19 Jul. 1963 25 p refs
(RADC-TDR-63-183; AD-411119)

A technique suitable for measurement of atmospheric contamination of plants was worked out and tested. The growth media used consisted of a mixture of cation and anion resins, the composition of which was adjusted by use of the Donnan theory so as to provide a solution composition satisfactory for plant growth. Water was supplied by use of a glass wick. The test experiment involved three levels each of light, temperature, and water use. The growth period was 21 days. Plant foliage was analyzed for F, Cl, S, Cs, Li, Rb, Al, and B. The levels of contamination required for detection by this technique vary as follows: Li < Rb < F < Al < B < Cl < S. Author

N64-21373 Dunlap and Associates, Inc., Santa Monica, Calif.
PROFICIENCY TEST FOR MISSILE TECHNICIANS MAINTAINING THE AN/SKQ-1 TELEMETERING GROUND STATION EQUIPMENT, VOLUME III Technical Report
Feb. 1964 86 p refs
(Contract Nonr-2978(00))
(ND-64-37; AD-431945)

The purpose of the research was to develop a proficiency test for missile technicians maintaining the AN/SKQ-1 Telemetering Ground Station Equipment for the Tartar, Terrier, and Talos missile systems. Described are the various steps in the test development and evaluation. Subsequent sections of the report provide a background to test development, present the approach taken in developing the test, and discuss the characteristics of the final test forms. N.E.A.

N64-21381 Princeton U., N.J.
ON THE VISUAL DETECTION OF ACCELERATED MOTION
Ross D. L. Filion (Ph.D. Thesis) Sep. 1963 84 p refs
(Contract AF 49(638)-381; Grant AF-AFOSR-441-63)
(AFOSR-64-0189; AD-433109)

The absolute threshold for acceleration in the motion of a seen object was investigated. Subjects were presented with constant velocity or positively accelerated motions of the CRT (cathode ray tube) beam on an oscilloscope screen; their task was to judge whether the pip achieved a final velocity greater than or equal to its initial velocity. The main conclusions drawn were: (1) Subjects' judgments concerning the presence or absence of acceleration in a stimulus motion are based on information deriving from within the motion itself and not on external aspects. (2) Subjects apparently detect acceleration by some procedure of estimating and comparing earlier and later average velocities in the motion display. (3) Effects analogous to the velocity transposition phenomenon occur in the detection of acceleration when viewing field dimensions are changed and when spatial or temporal size of the motion path is changed. (4) The human organism's performance in dealing with the second-time derivatives of visual stimulus magnitudes is not as good as performance in dealing with first-time derivatives of the same stimulus magnitudes. R.T.K.

N64-21388 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
RADIOELECTRONICS IN BIOLOGY [RADIOELEKTRONIKA V BIOLOGII]
L. B. Kaminir 21 Jan. 1964 83 p Transl. into ENGLISH of a Russian Brochure Moscow Gos. Energ. Izd., 1962 p 1-56
(FTD-TT-63-830/1+2+4; AD-433156)

The following topics are included: (1) the recording of biopotentials—sources of biopotentials, features of amplifying the bioelectric potentials, symmetric and unsymmetric amplification circuits of bioelectric potentials, amplifiers with capacitive coupling between stages, amplifiers with resistance coupling between stages, and obtaining a high input resistance in bioelectric amplifiers; (2) voltage sources for acting on living tissues (stimulators)—basic features of stimulators and stimulator circuits; and (3) use of radio electronics in biologic analysis—scanning microscopy, scanning systems, basic units of a scanning microscope, prospects of automating biologic analysis, and automation of blood analysis. R.T.K.

N64-21433 Sawyer (A.J.) Co., Inc., Strykersville, N.Y.
CIRCULATING DEVICE FOR CLOSED CIRCUIT RESPIRATORY SYSTEM [Final Report] Apr. 1962-Nov. 1963
Charles C. Jennings Wright-Patterson AFB, Ohio, Feb. 1964 23 p refs
(Contract AF 33(657)-9019)
(AMRL-TDR-64-8; AD-600467)

This report covers one type of circulating device for use in a closed-circuit respiratory system. Circulation is required in a closed system to remove carbon dioxide, add oxygen, remove moisture, and cool recirculating gases. The device is a single-stage, centrifugal-type blower capable of discharging 12 cfm of oxygen against a back pressure of 25 in. of water. It is powered by a 28-v d.c. motor. Power supply is a silver cell battery. Flow control is maintained electrically by a rheostat. Author

N64-21480 Joint Publications Research Service, Washington, D.C.
TISSUE MECHANISM ON ADAPTATION OF ANIMALS TO A REDUCED OXYGEN CONTENT IN THE ENVIRONMENT
N. A. Verzhbinskaya 8 Nov. 1962 20 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR (Moscow), no. 3, 1962 p 430-442
(JPRS-16105) OTS: $1.60

In an investigation of the acclimatization process of animals to hypoxia, the results of a study of the rate of turnover of adenosintriphosphoric acid (ATP) in the brain in vivo and of the permeability of the hematoencephalic barrier in 11 generations of rats born, bred, and reproducing in a hypoxic medium containing 10.5- to 11-percent oxygen are presented. The period of true acclimatization was found beginning with the eighth generation of rats living in a hypoxic medium. By this period, the ability to more efficiently and economically utilize the energy of oxidative metabolism is elaborated. The increased rate of oxidative phosphorylation in the brain tissue probably occurs because of a greater conjugation of oxidation with phosphorylation. N.E.A.

N64-21481 Joint Publications Research Service, Washington, D.C.
GEOCHEMICAL ECOLOGY
V. V. Koval'skiy 8 Jun. 1964 21 p Transl. into ENGLISH from Priroda (Moscow), no. 3, 1964 p 44-51
(JPRS-24978; OTS-64-31432) OTS: $0.50

Geochemical ecology studies the interrelationships of living organisms with geochemical environmental factors. The extent of trace elements accumulation by organisms and of metabolism in organisms is determined not only by the geochemistry of the environment and the biological condition of the organism but also by the character of the food chains, or nutrition chains, and their individual links specifying the biochemical pathways taken by trace elements in the biosphere. The biological role of trace elements and their participation in intermediate metabolism are discussed. Included, also, is a schematic map of regionalization. N.E.A.

N64-21482 Joint Publications Research Service, Washington, D.C.
STUDIES IN SYNTHETIC ELECTROCARDIOLOGY
Z. L. Dolabchyan 10 Jun. 1964 37 p Transl. into ENGLISH of selected portions of the book "Sintetich. Elektrokardiologiya" Yerevan, 1963 p 339-350, 366-367, and 407-411
(JPRS-25015; OTS-64-31450) OTS: $1.00

The aim of synthetic electrocardiology is to unify and synthesize data obtained by different methods and to compile these data to obtain a general concept of the functional and anatomical condition of the heart. A rough scheme is presented that gives an appraisal of and significance of each synthetic electrocardiologic method used in determining one or another heart condition. Only the systolic portion of the cardiac cycle is considered in discussing the pathopsychological conditions of the heart. N.E.A.

N64-21501 Sharpley Labs., Inc., Fredericksburg, Va.
ELEMENTARY HYDROCARBON MICROBIOLOGY Final Report, 5 Feb. 1963–4 Mar. 1964
J. Miles Sharpley Wright-Paterson AFB, Ohio, AFSC, Apr. 1964 310 p refs
(Contract AF 33(657)-10865)
(ASD-TDR-63-752; AD-600232)

The solution to the problem of microbial deterioration of petroleum products is important because of the increased demand for higher quality materials. Because hydrocarbon microbiology is an interdisciplinary science involving both petroleum technology and microbiology, this handbook was prepared to describe practical and theoretical aspects of hydrocarbon microbiology with specific emphasis on jet fuels. Areas covered include general microbiology, identification of microorganisms found in hydrocarbon systems, nutritional studies, microbial detection techniques, corrosion detection, investigation of biocides, physical protection systems, and current research efforts. Author

N64-21523 Air Force Special Weapons Center, Kirtland AFB, N. Mex. Research Directorate
PASSIVE DOSIMETRY ANALYSIS TECHNIQUES
Richard Griffith, Harry Murphy, and Donald Wood Jan. 1964 35 p refs
(AFSWC-TDR-62-107; AD-432686)

This report summarizes the techniques required to analyze standard neutron foil and gamma dosimetry. Levels of accuracy and the conditions under which they can be obtained are discussed. Techniques involve total gamma dose measurement, total neutron flux measurement, and determination of a six-group neutron-energy spectrum. Author

N64-21533 Institute for Research, State College, Pa.
LOGIC OF SYSTEMS. INTRODUCTION TO THE FORMAL THEORY OF STRUCTURE
Masanao Toda and Emir H. Shuford, Jr. Bedford, Mass., L. G. Hanscom Field, Electron. Systems Div., Jan. 1964 85 p
(Contract AF 19(628)-2968; Grants NSF GS-114; NSF G-24024)
(ESD-TDR-64-193; AD-432879) OTS: $8.10

Structure and purpose are two key aspects in the analysis and synthesis of complex systems. A full-fledged science of behavior must be based on a well-articulated formal theory of structure and purpose. Some of the basic notions in the formal theory of structure are introduced. Later papers will extend the theory of structure, introduce the formal theory of purpose, and investigate the relation between structure and purpose. Author

N64-21544 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
A MINIATURE RADIOTELEMETRIC APPARATUS FOR RECORDING PHYSIOLOGICAL FUNCTIONS
L. P. Shuvatov 26 Feb. 1964 10 p Transl. into ENGLISH from Elektron. V Med. (Moscow), 1960 p 177–182
(FTD-TT-63-1029/1+2+4; AD-433186)

The radio transmitting device of the apparatus consists of miniature sensors that transform into electrical signals the nonelectrical physiological quantities to be measured. The electrical signals control the operation of a miniature radio receiver weighing 50 to 60 g in the case of single channel recording and up to 500 g in that of multichannel recording. The radio receiving device consists of an antenna, a receiver with automatic frequency and volume control, a selective-amplifier unit for multichannel recording, and an oscillograph. The system operates in a range of 40 mc. Descriptions are given of the use of single channel systems in recording breathing, pulse rate, movement of the extremities, body temperature, heart tones, the bioelectric potentials of the brain, and the oxygen saturation of the blood. The multichannel apparatus is capable of recording up to six of these functions simultaneously. A.W.

N64-21553 Illinois U., Urbana
CARDIOVASCULAR EFFECTS OF REFEEDING STRESS FOLLOWING SATURATION. XII. CONTINUATION OF LONG-TERM STARVATION AND REFEEDING EPISODES, FINAL EPISODES AND POST MORTEM RESULTS
G. S. Smith, B. Connor Johson, and R. L. Huston Fort Wainwright, Alaska, Arctic Aeromed. Lab., Oct. 1963 17 p refs
(Contract AF 41(657)-359)
(TM-62-6; AD-434116)

The responses of young adult swine to a long-term episode of starvation and refeeding are discussed. The animals received an initial feeding of glucose plus thiamine and then were given a diet high in glucose content, with or without supplemental thiamine. Observations were then made of the blood pressures, heart and respiratory rates, and electrocardiograms of the animals when subjected to starvation and refeeding for even longer periods of time than previously. The same observations of the animals were made during a prolonged period of weight maintenance, after repeated episodes of starvation and refeeding. The entire project sought to determine which, if any, are the principal factors in the diet that may induce and/or aggravate cardiovascular stress during refeeding after starvation. A.W.

N64-21554 Northwestern Technological Inst., Evanston, Ill.
COMBUSTION OF HUMAN WASTE AND PRODUCT RECOVERY
J. E. Quon, W. O. Pipes, and J. A. Logan Fort Wainwright, Alaska, Arctic Aeromedical Lab., Oct. 1963 10 p
(Contract AF 41(657)-383)
(TN-62-16; AD-434115)

Study of the kinetics of combustion of volatilized wastes was continued. A new method of CO_2 analysis was tried. The new method employs the chemical reaction: $Ba(OH)_2 + CO_2 = Ba\ CO_3 + H_2O$. The amount of $Ba(OH)_2$ which reacts with CO_2 is determined by back filtration with oxalic acid, using phenolphthalein as the indicator. Additional information on the relationship between residual weight and oxygen supply, and between residual carbon and oxygen supply, was obtained with the volatilization chamber operated at 200° C. The differences in solubility of the residue after ignition in a muffle furnace and in the volatilization chamber were investigated. A series of experiments to determine the growth characteristics of *Chlorella* on the residue was undertaken. In particular, the ratio of the concentration of urea to residue at which some nutrient in the ash became limiting was determined. P.V.E.

N64-21591 Brookhaven National Lab., Upton, N.Y.
THE BIOLOGY OF AGING Brookhaven Lecture Series No. 34
Howard J. Curtis 18 Mar. 1964 18 p refs
(Sponsored by AEC)
(BNL-854(T-340)).

Ionizing radiation accelerates the aging process and has been used as a tool to study the biological mechanisms of aging. Aging is a slow deterioration with time that manifests itself by an increased susceptibility of the organism to all kinds of disease. Of the many theories of aging, the wear and

itself by an increased susceptibility of the organism to all kinds of disease. Of the many theories of aging, the wear and tear theory and the somatic mutation theory seemed most promising. A series of experiments has shown that stress per se is not a factor in aging. A method has been developed for measuring somatic mutations in mice, and it was shown that in all cases tested so far there is a quantitative correlation between aging and the development of somatic mutations. The simple somatic mutation theory of aging must be modified to account for the long delay between the production of a mutation and its effect on shortening life expectancy. This modified theory correlates many phenomena known to be associated with aging. Author

N64-21595 School of Aerospace Medicine, Brooks AFB, Tex.
MICROBIOLOGIC STUDIES OF THE TWO-MAN SPACE CABIN SIMULATOR: INTERCHANGE OF ORAL AND INTESTINAL BACTERIA
James E. Moyer and Y. Z. Lewis Mar. 1964 14 p refs
(SAM-TDR-64-3; AD-439097)

Studies were initiated to gain an understanding of the degree of microbic interchange to be expected between individuals under conditions of close occupancy, as would occur during space travel. Experiments were performed on subjects confined within the 2-man space cabin simulator. Results from 11 experiments, lasting from 14 to 30 days, are presented. Oral and intestinal surveys were conducted on each individual prior to, during, and following confinement. "Marker" organisms, initially harbored by only one of the individuals, were used to establish evidence of microbic interchange. Implications of these findings, as related to future space flights, are discussed. Author

N64-21597 Minnesota U., Minneapolis
THORACIC CAGE IMPEDANCE MEASUREMENTS: IMPEDANCE PLETHYSMOGRAPHIC DETERMINATION OF CARDIAC OUTPUT (A COMPARATIVE STUDY)
Edwin Kinnen, William Kubicek, and R. Patterson Brooks AFB, Tex., School of Aerospace Med. Mar. 1964 12 p refs
(Contract AF 41(657)-403)
(SAM-TDR-64-15; AD-439088)

Two band electrodes of tinned copper braid shielding 1-cm wide were placed around the neck and thorax 2 cm below the xiphisternal joint and connected to an electrical bridge circuit excited at 100 kc. The recorded change of impedance over a cardiac cycle was related proportionally to a nominal ventricular stroke volume by the ratio of thorax volume to the average measured impedance. A value of cardiac output, determined from the product of this ventricular stroke volume and the pulse rate, was determined for various subject body types and used to compute the cardiac index and cardiac output per unit body mass. The data were representative of the data reported in the literature. The correlation of cardiac output values, determined from the impedance product, with oxygen consumption rates was found to be 0.962. Author

N64-21642 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ABSORBED DOSES OF COSMIC RADIATION RECEIVED BY A. G. NIKOLAYEV AND P. R. POPOVICH DURING THEIR TWIN ORBITAL FLIGHT
I. B. Keirim-Markus, N. A. Sergeyeva, and L. N. Uspenskiy *In its* Cosmic Res. 29 Oct. 1963 p 321-325 refs (See N64-21626 15-01)

An account is given of the results of the measurements of cosmic radiation tissue doses during the twin flight, which

An account is given of the results of the measurements of cosmic radiation tissue doses during the twin flight, which were carried out by personal dosimeters placed in the flying suits of the cosmonauts. The average tissue dose rate was 16 mrad/day and was appreciably greater than during the flight of G. S. Titov, whereas the bremsstrahlung-dose rate was less. An estimate of the upper limit of the neutron flux in the cabin of the space vehicle is given. Author

N64-21643 Air Force Systems Command, Wright-Patter- AFB, Ohio Foreign Technology Div.
EFFECT OF THE SPACE FLIGHT CONDITIONS IN VOSTOK-3 ON SEEDS OF HIGHER PLANTS
L. K. Gordon, N. L. Delone, V. V. Antipov, and V. G. Vysotskiy *In its* Cosmic Res. 29 Oct. 1963 p 326-331 refs (See N64-21626 15-01)

Evidence is cited that shows that the conditions of space flight affect the viability of certain higher plants, causing stimulation or inhibition of germination. Beans and pine demonstrated a tendency toward an increase in the number of chromosomal rearrangements. Author

N64-21644 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
A FURTHER STUDY OF THE EFFECT OF SPACE FLIGHT CONDITIONS ON THE CHROMOSOMES OF THE PRIMARY ROOTLETS OF GERMS IN PEA AND WHEAT SEEDS
V. V. Khvostova, S. A. Gostimskiy, V. S. Mozhayeva, and L. V. Nevzgodina *In its* Cosmic Res. 29 Oct. 1963 p 332-341 refs (See N64-21626 15-01)

The effect of space-flight conditions on the chromosomes of peas and wheat, the seeds of which were on the Vostok-3 and Vostok-4, was studied. Also studied was the effect of vibrations and high-energy protons in order to reveal what factors act during a space flight. Under space-flight conditions a small but statistically significant increase in the percent of chromosomal rearrangements is observed in the rootlet cells of the germs of air-dried wheat and pea seeds. The increase in the percent of rearrangements does not depend on the flight duration. Author

N64-21645 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
A CASE OF ACUTE RADIATION SICKNESS IN MAN
O. G. Alekseyeva, A. F. Bibikova, N. A. Vyalove, A. Ye. Ivanov, N. A. Krayevskiy et al 1 Oct. 1963 167 p refs Transl. into ENGLISH of the book "Sluchay Ostroy Lucnevoy Bolezni u Cheloveka" Moscow, Gos. Iz. Med. Lit., 1962 p 1-150
(FTD-TT-63-558/1+2; AD-422964)

Described is an extremely severe case of acute radiation sickness, having a lethal outcome, that was observed and studied in great detail. The following data are presented on the history of the disease: (1) clinical data; (2) clinical course of the disease; (3) hematological changes; (4) changes in biochemical indices; (5) state of natural immunity and autoflora; (6) pathologoanatomical data; (7) autopsy data; (8) microscopic investigation; and (9) a discussion of the pathologoanatomical data. N.E.A.

N64-21662 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ABOUT AMABIOSIS IN THOUSAND YEAR OLD PERMAFROST
A. Ye. Kriss and N. A. Grave 31 Jan. 1964 9 p refs Transl. into ENGLISH from Mikrobiologiya (Moscow), v. 13, No. 5, 1944 p 251-255
(FTD-TT-63-926/1+2; AD-433189)

Microbiological investigations were conducted to determine the presence of a bacterial population in the monolith of mineral ice, i. e., to explain the possibility of revivifying microorganisms. Results indicate the absence, in the monolith of mineral ice, of microorganisms capable of reviving vital activity after tens of thousands of years of remaining in the frozen state. The microflora, observed in the outer parts of the ice, were apparently brought in at the time of transportation or during the taking of the monolith. I.v.L.

N64-21673 Martin Co., Denver, Colo.
TOXICANT ENTRAINMENT TEST —CLOTHING OUTFIT, ROCKET FUEL HANDLERS A/P 22P-1
R. G. Hanson Jan. 1964 12 p
(Contract AF 04(647)-576)
(AD-431540)

The objective of this test was to determine the danger to personnel wearing torn protective clothing while subjected to vaporous propellants. Only $NO_2-N_2O_4$ vapors were used in the test that was conducted in a test chamber 8 × 8 × 8 ft. The reading of the two ASI sensors was taken at time 0. Under normal operation the suit is pressurized to 0.5 in. of water pressure from the (environmental control units) airflow in conjunction with the suit pressure relief valves. When the suit is torn, it deflates and the airflow escapes through the hole. The test shows that NO_2-N_2O_4 will enter the suit at such a high rate that the wearer must remove it immediately. The closer a tear occurs to the recirculation inlet of the ECU, the faster the concentration builds up in the helmet. A.W.

N64-21680 California U., Berkeley Electronics Research Lab.
BIOLOGICAL USES OF NONIONIZING RADIATION Annual Scientific Report, 1 Sep. 1962–31 Aug. 1963
C. Susskind and P. O. Vogelhut 31 Oct. 1963 30 p refs
(Contract Nonr-222(92))
(Rept.-63-27; AD-433659)

Hall effect in water and ice, protonic semiconductors, and electromagnetic effects on the nervous system are discussed. Both theoretical and experimental investigations were undertaken. Hall-effect measurements by the Faraday-rotation method proved to be unsatisfactory, but measurements by other methods are being pursued. Study of protonic semiconductor led to the development of a rectifying diode junction with interesting properties. The method of accurate and rapid dielectric-constant measurements developed during a previous contract period was applied to measurements of changes in the electrical properties of nerves during transmission of action potentials. Author

N64-21698 Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia)
DETERMINATION OF RUBIDIUM IN AGRICULTURALLY IMPORTANT MATERIALS THROUGH ATOMIC ABSORPTION-FLAME PHOTOMETRY [RUBIDIUMBESTIMMUNG IN AGRIKULTURWICHTIGEN MATERIALEN DURCH ATOMABSORPTIONS-FLAMMEN PHOTOMETRIE]
J. Stupar Jan. 1964 13 p refs In GERMAN Submitted for Publication
(NIJS-R-425)

Flame photometry was employed as an exact and rapid method for the determination of rubidium in plants and soil extracts. The method is practically free of cation disturbances (except in the case of Cs), whereas H_3PO_4, HCl, and $HClO_4$ cause a rather large reduction in absorption. The light emission of the flame, which originates mainly from the potassium-767 mμ line, can be decreased by a lens. Due to the high salt concentration and the presence of H_3PO_4 and H_2SO_4 in the investigated solutions, corresponding standard solutions must be used. Transl. by I.v.L.

N64-21727 Yeshiva U., New York, N.Y. Albert Einstein Coll. of Medicine
IS REAFFERENCE NECESSARY FOR VISUAL ADAPTATION?
Sidney Weinstein, Eugene A. Sersen, Larry Fisher, and Marvin Weisinger Repr. from Perceptual and Motor Skills, v. 18, 1964 p 641–648 refs
(Grant NsG-489)

Two studies were performed to determine the necessity of reafference (stimulation due to self-induced movement) in the production of adaptation to prismatic displacement. In the first experiment 48 Ss exposed to laterally displacing prisms, were equally divided into four groups comprising combinations of each of the two following variables: self-induced versus passive movement, and self-directed versus externally directed motion. These groups were nondifferential in the magnitude of positive adaptation, although the total population adapted positively and significantly to the prisms. In the second experiment 17 Ss were tested before and after exposure to the same prisms in a situation that provided informational feedback regarding error and that eliminated self-produced movement. The group demonstrated significant positive adaptation. It is concluded that reafference is not necessary for adaptation and that informational feedback is, at least, sufficient and may be necessary for adaptation. Author

N64-21729 Joint Publications Research Service, Washington, D.C.
RESEARCH ON RADIATION SICKNESS AND PROTECTIVE MEASURES
A. M. Stashkov, V. P. Korotkova, Yu. Ya. Saydakovskiy, and A. F. Mosin 28 May 1964 19 p refs Transl. into ENGLISH of 3 articles from Farmakol. i Toksikol. (Moscow), v. 27, no. 1, 1964
(JPRS-24817; OTS-64-31356) OTS: $0.50

The following areas of research are discussed: (1) radioprotective properties of neurotropic pharmacological agents of the antifeine group—comparison of certain characteristics of derivative diamides of imidazoldicarbonic acids during general X-ray irradiation of animals with lethal doses; (2) the effect of aminasine, promedol, and dimedrol on the duration of barbamyl-induced sleep in healthy animals and under conditions of experimentally-produced radiation sickness; and (3) radioprotective properties of izotiuronic derivatives of pyridoxine. P.V.E.

N64-21733 Brookhaven National Lab., Upton, N.Y.
TRACE METALS: ESSENTIAL OR DETRIMENTAL TO LIFE
George C. Cotzias 10 Apr. 1964 20 p refs *Its* Lecture Series No. 26
(Sponsored by AEC)
(BNL-828-(T-323)) OTS: $0.50

The effects of excess trace elements in the human body show marked similarities to spontaneous extrapyramidal diseases such as Wilson's Disease and Parkinsonism. The mechanisms by which derangement of homeostasis can occur can be explained by the simple mechanisms in manganese poisoning

or by the complex mechanism in Wilson's Disease, where normal dietary copper is concentrated within the body leading to copper poisoning. Experiments are described in which radioactive manganese is used to determine the behavior of trace elements in plasma. Experiments of drug action and trace elements led to a theory attributing the pharmacological effects of the drug to free-radical formation. Free-radical reactions with melanin have been studied, and since the loss of melanin from the substantis nigra of the brain in Parkinsonism cases has been established, further study of melanocytes and trace elements is suggested. D.S.G.

N64-21741 Army, Personnel Research Office Washington, D.C.

PERFORMANCE OF SINGLE VS MULTIPLE VOICE RADIO TRANSCRIBERS WORKING UNDER THREE SPEECH TO NOISE RATIOS

A. E. Castelnovo, J. G. Tiedemann, and D. A. Dobbins Sep. 1963 33 p refs

(USAPRO-TRN-135; AD-432088)

Effort to improve work methods employed in the Army's monitor systems is critical to the assessment of human performance within the system and to the determination of system reliability. The present study reports on one segment of the research effort—improvement of work methods employed in producing a transcript. Three work methods, differing in the number of transcribers contributing to the final product, were compared with respect to accuracy and completeness of the resulting transcription. These methods were tested under three levels of noise that yielded high, medium, and low intelligibility under standard conditions. Data obtained were interpreted by analysis of variance technique. A small but consistent difference in favor of multiple transcriber work methods was found to exist. Differences were statistically significant only at the medium noise level. A secondary finding of potential value was that repeated exposures to a message resulted in some increase in accuracy at low and medium noise levels; repeated exposures at the high noise level were conducive to error. Author

N64-21783 Joint Publications Research Service, Washington, D.C.

METHODS OF SIMULTANEOUS STUDY OF THE BLINKING CONDITIONED REFLEXES AND THE FUNCTIONAL STATE OF THE CARDIOVASCULAR SYSTEM IN A HUMAN

F. M. Lebedev and M. G. Kheyfets 5 Jun. 1964 8 p refs Transl. into ENGLISH from Zh. Vyssh. Nervn. Deyat. (Moscow), v. XIV, no. 2, Apr. 1964 p 346–368

(JPRS-24967; OTS-64-31425) OTS: $0.50

A method for synchronously studying the state of the central nervous system and the human blood-circulation system under clinical conditions is presented. A setup for simultaneous study of the eyelid conditional reflexes and the functional state of the human cardiovascular system was developed; the arrangement of the setup is described. A demonstrated combination of cardiocurves and sphygmographic curves enabled the determination of the frequency and rhythm of heart contractions, the duration of electrical and mechanical systoles, the duration of various phases of the systole of the left ventricle, the diffusion rate of the pulse wave through the vessels of varying caliber, as well as an evaluation of pulse volume. N.E.A.

N64-21803 Minnesota U., Minneapolis

THORACIC CAGE IMPEDANCE MEASUREMENTS. TISSUE RESISTIVITY IN VIVO AND TRANSTHORACIC IMPEDANCE AT 100 kc

Edwin Kinnen, William Kubicek, P. Hill, and G. Turton Brooks AFB, Tex., School of Aerospace Med., Mar. 1964 18 p refs

(Contract AF 41(657)-403)

(SAM-TDR-64-5; AD-439353)

Average volume resistivities for thoracic tissues at an exciting frequency of 100 kc are required for studies of the current flux paths in transthoracic impedance plethysmography. By using a uniquely designed probe and anesthetized dogs, an average tissue resistivity was found for skeletal muscle to be approximately 400 ohm cm; heart muscle, 450 ohm cm; lung tissue, 1,200 to 1,500 ohm cm; kidney and liver, 600 ohm cm; fat, 1,000 to 2,000 ohm cm; and for whole canine blood, 150 ohm cm at a hematocrit of 45. With the exception of whole blood, all values varied significantly between dogs and between individual readings. The values for lung and liver tissues and for fat were noted to have particularly large variations between readings and between animals. Canine skeletal muscle tissue had a linear electrical resistivity characteristic for excitation current densities up to 80 ma./cm^2. Representative normal, human skin on the biceps was shown to contribute approximately $4.5 \times 10^{-3} \times \epsilon^{i50°}$ mhos/cm^2 of electrode surface area in series with the transthoracic impedance, with possible modifications required for electrode geometry and electrode paste. Author

N64-21816 Stanford U., Calif. School of Medicine

EFFECT OF CHRONIC HYPOXIA UPON THE CIRCULATION Annual Progress Report, Mar. 1, 1963–Feb. 29, 1964

Herbert N. Hultgren 10 Mar. 1964 7 p refs

(Contract DA-49-193-MD-2274)

(AD-433546)

Reported are two cases of high-altitude pulmonary edema. An analysis of treatment methods of the disease revealed that 100% oxygen by face mask is preferable. Control studies at sea level are being performed on normal subjects to compare with similar studies on high-altitude-acclimatized natives. The circulatory effect of severe hypoxia and of exercise during hypoxia is being studied. Post mortem perfusion studies of the coronary vascular bed in dogs from sea level and high altitude have been compared. The results indicate that the flow capacity of the coronary vascular bed at high altitude is no larger than at sea level and that, presumably, adaptation to high altitude does not involve an increase in the flow capacity of the coronary bed. N.E.A.

N64-21826 Joint Publications Research Service, Washington, D.C.

SYNCHRONIZATION OF MOTOR UNITS AND RELATED MODEL REPRESENTATIONS

I. M. Gel'fand, V. S. Gurfinkel', Ya. M. Kots, M. L. Tsetlin, and M. L. Shik 14 May 1964 29 p refs Transl. into ENGLISH from Biofizika (Moscow), v. 8, no. 4, 1963 p 475–486

(JPRS-24606; OTS-64-31260) OTS: $0.75

An investigation was conducted in order to explain the operating condition of muscles at work when assigned a task to maintain a definite position. An attempt was made to explain the results by establishing certain model representations. The experimental part of the work consisted of recording the activity of individual motor units, both in healthy persons as well as in those affected with Parkinsonism. The experiments show that in a normal person, motor units work asynchronously as though they were almost completely independent. A detailed analysis of this finding is included. R.T.K.

N64-21837 Tennessee Valley Authority, Oak Ridge

RADIOLOGICAL HEALTH MANUAL FOR THE EXPERIMENTAL GAS-COOLED REACTOR. RADIATION PROTECTION STANDARDS AND REGULATIONS

O. M. Derryberry and W. R. Cooper 26 Mar. 1964 155 p
(Contracts TV-21280A; AT(40-1)-2742)
(EGCR-4) OTS: $2.75

The following are discussed: (1) administration—Experimental Gas-Cooled Reactor radiological health policy, indoctrination and training in radiological protection, and plant safeguards review; (2) radiation protection guides—radiation and contamination standards; (3) radiation and contamination control; (4) radioactive source and waste management; (5) medical services; (6) emergencies and unusual incidents; (7) definitions, symbols, abbreviations, units, and equivalents; (8) Experimental Gas-Cooled Reactor radiation detection instruments; (9) zoned areas for radiation hazard and exposure control; (10) shipments of spent fuel, irradiated specimens, and source and special nuclear materials to off-area locations; and (11) use of respiratory protective equipment. R.T.K.

N64-21840 General Electric Co., Cincinnati, Ohio Flight Propulsion Div.
INVESTIGATION OF THE NOISE ASPECTS OF CARRIER DECK JET ENGINE OPERATION, AND EFFECTS OF NOISE SUPPRESSION ON AIRCRAFT MISSION PERFORMANCE. VOLUME I: EFFECTS OF NOISE FROM CARRIER DECK JET ENGINE OPERATION ON HEARING, SPEECH INTERFERENCE AND SONIC FATIGUE
R. J. Wells, M. W. Schulz, and R. B. Tatge 31 Jan. 1964 129 p refs
(Contract NOw-62-0887-D; Phase II)
(AD-432086)

This report is part of a study undertaken to better define the parameters relative to the problem of an in-flight noise suppressor for carrier-based jet aircraft. This report is based almost entirely on literature reviews and on discussions held with research workers. The effect of noise on people and on structures is discussed. R.T.K.

N64-21844 General Electric Co., Schenectady, N.Y. Knolls Atomic Power Lab.
BIBLIOGRAPHY ON COMPRESSED AIR SYSTEMS—SAFETY CONSIDERATIONS (SELECTED REFERENCES)
Helyn Walton, comp. Oct. 1963 14 p refs
(KAPL-M-TL-1)

N64-21850 Joint Publications Research Service, Washington, D.C.
VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR (HERALD OF THE ACADEMY OF MEDICAL SCIENCES USSR), Vol. XVIII, No. 12, 1963
29 Apr. 1964 136 p refs Transl. into ENGLISH of p 3-97
(JPRS-24398; OTS-64-31179) OTS: $2.75

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5. THE SIGNIFICANCE OF HEREDITY AND ENVIRONMENT IN THE DEVELOPMENT OF ESSENTIAL HYPERTENSION AND DISORDERS OF LIPID METABOLISM I. A. Ryvkin and L. N. Ignatova p 41-47 refs
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8. CHANGE IN THE CELLULAR GENETIC STRUCTURES UNDER THE INFLUENCE OF 5-BROMOURACIL A. G. Skavronskaya p 74-87 refs
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12. SOME SPECIFIC ASPECTS OF THE TRANSPLANTATION PROBLEM I. D. Kirpatovskiy and V. V. Shuvayev p 121-124
13. SYSTEMATIC INDEX OF ARTICLES PUBLISHED IN THE J. VESTN. AKAD. MED. NAUK SSSR IN 1963 p 125-132

N64-21851 Joint Publications Research Service, Washington, D.C.
VESTNIK OF USSR ACADEMY OF MEDICAL SCIENCES, NO. 1, 1964
18 May 1964 141 p refs Transl. into ENGLISH of Vestnik Akad. Med. Nauk. SSR (Moscow), v. 19, no. 1, 1964 p 3-96
(JPRS-24638; OTS-64-31277) OTS: $2.75

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5. TOWARD A DEFINITION OF THE CONCEPT "LIFE" V. M. Zhdanov p 35-44
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10. THE RELATIONSHIP OF THE MUTAGENIC EFFECT OF 2-CHLOROALKYLAMINES AND THE STRUCTURE OF THEIR FUNCTIONAL GROUPS AND RADICALS S. I. Alikhanyan and M. G. Oganesya p 100-118
11. ALL-UNION CONFERENCE OF GERONTOLOGISTS P. D. Marchuk p 119-125
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N64-21866 Joint Publications Research Service, Washington, D.C.
SPACE BIOLOGY AND MEDICINE
V. I. Yazdovskiy 4 Jun. 1964 51 p Transl. into ENGLISH from the Monograph "Biologiya i Kosmos (Problemy Kosmicheskoy Biologii i Meditsiny)" Moscow, Znaniye Publishing House, ser. VIII, no. 1-2, 1964 p 36-79
(JPRS-24943; OTS-64-31414) OTS: $1.25

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1. FIRST EXPERIMENTS p 2-12 (See N64-21867 15-16)
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4. AFTER A LONG DISTANCE—A LONG DISTANCE p 42-49 (See N64-21870 15-29)

N64-21867 Joint Publications Research Service, Washington, D.C.
FIRST EXPERIMENTS
V. I. Yazdovskiy *In its* Space Biol. and Medicine 1964 p 2-12 (See N64-21866 15-16) OTS: $1.25

Original experiments in the medical-biological problems of space exploration are discussed. Space-capsule simulation, extreme gravity tests, development of space suits, and recovery from high-altitude rocket flights are included in the discussion. P.V.E.

N64-21868 Joint Publications Research Service, Washington, D.C.
NEW HEIGHTS — NEW CONQUESTS
V. I. Yazdovskiy *In its* Space Biol. and Medicine 1964 p 13-22 (See N64-21866 15-16) OTS: $1.25

A brief discussion is presented of the initial experiments carried out during the launching and orbiting of the first satellites to carry living organisms (dogs, mice, flowers, seeds, fungi, etc.). P.V.E.

N64-21869 Joint Publications Research Service, Washington, D.C.
TOWARD A DREAM
V. I. Yazdovskiy *In its* Space Biol. and Medicine 1964 p 23-41 (See N64-21866 15-16) OTS: $1.25

The choosing and training of astronauts for the first space flight are discussed. Also included is a brief narrative of the highlights of the first space flight, along with a discussion of some of the astronauts' reactions both during and after the flight. P.V.E.

N64-21920 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
EXPERIENCE WITH THE PHYSICAL STRESSES OF REGULAR WEATHER-OBSERVATION FLIGHTS AT 5000 METERS AND THEIR REDUCTION THROUGH USE OF A PRESSURIZED SUIT
P. Klanke 14 Feb. 1963 15 p Transl. into ENGLISH from Luftfahrtmed. Abh. (Leipzig), v. II, no. 3-4, 1938 p 182-189
(FTD-TT-62-1424/1+3+4; AD-299617)

Work carried out in developing aircraft pressure suits is discussed. Physical stresses that are to be alleviated through the use of the suits are also discussed. P.V.E.

N64-21928 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
BIOLOGICAL RADIO COMMUNICATION
B. Kazhinskiy 1 Mar. 1963 14 p Transl. into ENGLISH from Rabochaya Gazeta (USSR), 13, 15, & 16 May 1962 p 4
(FTD-TT-62-1876/1; AD-400553)

This article briefly reviews evidence of extrasensory perception, including human communication with animals. The current Russian interest in psychic phenomena is reflected. Most of the cases cited took place in the Soviet Union, although a current American experiment was mentioned. G.D.B.

N64-21938 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
STRESS AND FATIGUE UNDER ISOLATED CONDITIONS
F. D. Gorbov, V. I. Myasnikov, and B. I. Yazdovskiy 18 Mar. 1964 13 p refs Transl. into ENGLISH from Zh. Vysshei Nervnoi Deyatel'nosti (Moscow), v. 8, no. 4, 1963 p 585-592
(FTD-TT-63-1015/1+2+4; AD-435502)

Tests were conducted on men, each subject staying for various continuous periods (10 to 15 days), in the limited and closed space of a specially outfitted chamber. The experimental conditions were those of solitude, lack of two-way speech communication, and almost complete isolation from exernal sources of light, sound, and other stimulation. Beginning with the sixth to eighth days of the tests, the subjects experienced fatigue. A need for conversation, for direct contact with observer, was noted. During this time, there were periods lasting 20 to 30 min in which the subjects sat, outwardly indifferent, doing nothing. At this time, sufficiently indicative shifts were revealed in the level and period of alpha-rhythm exaltation after light stimulus. From the second day of the test, the alpha-rhythm amplitude began to decrease; on the sixth day, under isolated conditions, it was 25μv to 30μv and remained at that level to the end of the test. On the seventh day, the exaltation period had risen to 20 sec and was broken only by the next stimulus. Study of the motor response showed that the latent period had increased an average of 120 msec by the end of the experiment. P.V.E.

N64-21941 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
PHYSIOLOGICAL REACTIONS OF THE HUMAN ORGANISM DURING THE ACTION OF ACCELERATIONS, MAXIMUM IN TIME AND INTENSITY, DIRECTED ALONG THE SPINE-BREAST AXIS
A. A. Barer, G. A. Golov et al 10 Dec. 1963 12 p refs Transl. into ENGLISH from Byull. Eksptl. Biol. i Med. (Moscow), no. 7 1963 p 24-29
(FTD-TT-63-1095/1+2; AD-426900)

Physiological reactions of the circulatory system, respiratory system, coordinations of movements, bioelectrical activity of the brain, and bioelectrical activity of different groups of skeletal muscles are discussed. Experiments were conducted using a large radius centrifuge. The first acceleration was 4 g. The average limit of endurance for 6 g was 653 seconds; for 8 g, 186 seconds; for 10 g, 58 seconds; for 12 g, 28 seconds; for 14 g, 18 seconds; and for 15 g, 10 seconds. I.v.L.

N64-21945 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THE ROLE OF THE HUMAN FACTOR IN CONTROL SYSTEMS
Janusz Morawski 23 Aug. 1963 70 p refs Transl. into ENGLISH from Arch. Budowy Maszyn (Warsaw), v. 8, no. 4, 1961 p 369-409
(FTD-TT-63-331/1+2; AD-421191)

This is a mechanistic view of the man–machine relationship. The emphasis is on the role of man as operator, regulator, and controller of automated systems, and an attempt is made to categorize which functions are best performed by man and which by machine. The goal of human-engineering studies its to enable man to be used more effectively and to free him from mechanical routines best accomplished by machines. Common denominators are ascribed to both man and machine; these are analyzed with the idea of selecting the better performer for a given task, either singly or in cooperation. G.D.B.

N64-21973 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
SPACESUITS
Yu. Savitskiy 26 Mar. 1964 13 p refs Transl. into ENGLISH from Nauka i Zhisn' (Moscow), no. 12, 1963 p 40–44
(FTD-TT-64-134/1+2+4; AD-435997)

The present and the future functions of spacesuits and the future changes in spacesuits are discussed. Specifically considered are breathing and ventilation in spacesuits and problems of pressure and decompression on the spacesuits. Discussed also is the design of a "spacesuit-house." N.E.A.

N64-22042 Flight Safety Foundation, Inc., New York, N.Y.
AIR SAFETY: A STUDY OF ETHICS, ECONOMICS AND ATTITUDES
Jerome Lederer, Robert N. Buck, Najeeb E. Halaby (FAA), Robert T. Murphy (CAB), Maynard L. Pennell (Boeing Co.) et al 1964 40 p refs *In* Connecticut General Flight Forum, Winter–Spring 1964

Background necessary for an understanding of air safety problems is presented; important questions of policy, especially those deriving from manmade problems, are also discussed. Explored are the difficulty of measuring air safety, the current levels of safety, the inadequacy of statistics as a means of convincing the public that air transportation is within normal living risk range, and many other problems created by a fact peculiar to air transportation—the catastrophic nature of its accidents. Emphasis is placed on problems created by the social, political, and economic climate in which aviation is required to operate. P.V.E.

N64-22049 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ON THE RADIOACTIVE CONTAMINATION OF THE BIOSPHERE AND MEASURES OF COMBATTING THESE CONTAMINATIONS
N. V. Timofeyev-Resovskiy 13 Aug. 1963 17 p refs Transl. into ENGLISH from Tr. Inst. Biol. (Sverdlovsk), no. 22, 1962 p 7–16
(FTD-TT-63-664/1; AD-416753)

All of the numerous possibilities of radioactive contamination of the biosphere can be divided into two basic groups: (1) local contamination; and (2) broad contamination. The first group includes those cases in which radioactive dust particles and radioactive contaminated waters cause local contamination of specific territories and water reservoirs. The second group includes radioactive contamination due to the testing of atomic and thermonuclear weapons. In this case, maximum concentration is in the biomass and surface layer of the soil. Suggested methods for combating these contaminations include these measures: (1) to reduce to a maximum the possibility of the formation of radioactive dust in the center of contamination (e.g., thorough plowing and full turnover of the plowed ground); (2) to prevent the escape of radioisotopes from concentration centers by runoff water (e.g., by building settling brooks for contaminations flowing through brooks and small rivers); (3) to reduce to a minimum the paths of the biological migration of radioisotopes from contaminated centers (e.g., by creating narrow desert areas, several meters wide around points of maximum concentration and by preventing the migration of animals); and (4) to discontinue the use, especially of food and feed, of the entire bioproduction from contaminated areas and water reservoirs. I.v.L.

N64-22061 Yeshiva U., New York, N.Y. Albert Einstein Coll. of Medicine
AN ATTEMPT TO REPLICATE A STUDY OF DISARRANGED EYE-HAND COORDINATION
Sidney Weinstein, Eugene A. Sersen, and Deanna S. Weinstein Repr. from Perceptual and Motor Skills, v. 18, 1964 p 629–632 refs
(Grants NsG-489; VRA-RD-427; NINDB-NB-03356)

Three groups of 15 subjects each were tested for disarranged eye–hand coordination in the distance dimension. All groups were tested using a bipartite box that permitted lighting only the upper or lower chambers. The subject was required to place a dot at the location of a virtual image of a target without seeing his hand. After making 30 such dots he was exposed to one of three conditions, after which he repeated the pre-exposure test. The three conditions were: (1) constrained self-produced hand movement with 7.6 cm. displacement, (2) free hand movement with 7.6 cm. displacement, (3) free hand movement without displacement (control). The results indicated a predominant proportion of individuals with negative adaptation in all groups. The two groups with reafference (stimulation through self-induced movement) and displacement did not differ significantly from the control group in the magnitude or the direction of adaptation. The results could not be predicted from reference to theory and do not conform to the results of Held and Schlank, in which positive adaptation was obtained in a similar mirror-displacing situation. Author

N64-22071 National Aeronautics and Space Administration, Ames Research Center, Moffet Field, Calif.
LIMITATIONS IN THE USE OF CARBON-LABELED AND TRITIUM-LABELED THYMIDINE IN CELL CULTURE STUDIES
Robert B. Painter, Ruth M. Drew (Brookhaven Natl. Lab.), and Ronald E. Rasmussen Repr. from Radiation Research, v. 21, no. 3, Mar. 1964 p 355–366 refs Work Performed in Cooperation with Brookhaven Natl. Lab.
(Supported by AEC)
(NASA-RP-196)

Experiments have been performed with C^{14}-thymidine or labeled thymidine added to HeLaS3 cell cultures growing in Eagle's medium. The results are as follows: (1) Thymidine in the culture causes a concentration-dependent inhibition of growth, with effects being significant at levels as low as 10μg/ml. (2) Thymidine in the medium reduces the incorporation of H^3-uridine into both DNA and RNA; the effect on incorporation into RNA is unexpectedly large. (3) Other nucleosides, added singly or together to the medium, cause effects similar to those induced by thymidine. Thirty-minute incubations with tritiated thymidine, at concentrations from 0.02μg/ml to 2.5μg/ml, and at two specific activities, did not affect the production of colonies of the HeLaS3 cultures. N.E.A.

N64-22073 National Academy of Sciences—National Research Council, Washington, D.C. Space Science Board
WORKING GROUP ON GASEOUS ENVIRONMENT FOR MANNED SPACECRAFT Summary Report, Oct. 1963
Jan. 1964 62 p refs

This report describes the results of discussions of the physiological criteria that are important in the selection of the cabin atmosphere in manned spacecraft and discussions experimental procedures, and investigations that should both precede and accompany preparations for the further development of manned space flight. Author

N64-22075
PASSENGER TOLERANCE TO TRANSVERSE ACCELERATION AND DECELERATION FORCES (EYE-BALLS IN; EYE-BALLS OUT)
R. J. Del Vecchio 21 Feb. 1963 4 p

An investigation of the tolerance of a passenger to acceleration or deacceleration (using a lap belt and shoulder harness for restraint) is discussed. The investigation used as subjects young flying personnel. Conclusions are as follows: (1) Lap belts and shoulder harnesses are absolutely necessary for body restraint and tolerance to gravity forces. (2) Restraint-system tension depends upon the physical stature and conditioning of the passenger. (3) Young, healthy men and women can tolerate up to 5.5 g for a time duration of 4 minutes. (4) It is practically impossible to state a universal g tolerance for all types of passengers under all statures and physical conditions. P.V.E.

N64-22077 St. Louis U., Mo.
RENEWAL OF INTESTINAL EPITHELIUM IN THE FRESH WATER TURTLE, *CHRYSEMYS PICTA*
Mary Alan Wurth and X. J. Musacchia Repr. from Anat. Record, v. 148, no. 3, Mar. 1964 p 427–439 refs
(Grant NSG-271-62)

In the intestinal epithelium of *Chrysemys picta*, cellular proliferation was observed to occur in the layer of cells adjacent to the basement membrane. Mitosis occurred throughout the epithelium at a fairly low rate (mitotic index 0.0016). In the upper intestine fewer labeled cells were found in the apical one-third of a villusfold than in either the mid or the basal one-third. The time required to renew the intestinal epithelium was estimated to be about 8 weeks in winter turtles maintained at 20° to 24° C. Cell loss from the system appeared to be due to a randomly located movement of cells lumenward from the basement membrane. Mitotic activity in cold torpid turtles (11° C ambient temperature) appeared to be completely suppressed, as shown by a lack of incorporation of tritiated thymidine and an absence of mitotic figures in the intestinal epithelium. Author

N64-22094 Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.
DEVELOPMENT OF A COMPLEX MULTIPLE SCHEDULE IN THE CHIMPANZEE
Richard E. Belleville, Frederick H. Rohles, Marvin E. Grunzke, and Fogle C. Clark Repr. from J. Exptl. Analysis of Behavior, v. 6, no. 4, Oct. 1963 p 549–556 refs
(Proj. Mercury)
(NASA-RP-188)

The development of chimpanzee behavior on a four-component, three-lever multiple schedule is described. Component schedules included the Sidman avoidance procedure with a concurrent discriminated avoidance schedule on a second lever, fixed ratio performance for food, differential reinforcement of low rate for water requiring a dual response chain, and a symbol discrimination task for continuous food reinforcement using three levers. The avoidance component of this schedule was employed during the January 31, 1961, suborbital space flight of the chimpanzee Ham. On November 29, 1961, the chimpanzee Enos performed on the multiple schedule during three orbits around the earth in a Mercury capsule. Author

N64-22095 Federal Electric Corp., Paramus, N.J.
BACKGROUND AND SYNOPSIS OF THE CORRECTIVE MAINTENANCE BURDEN PREDICTION PROCEDURE
31 Jan. 1964 18 p
(Contract Nonr-3821(00))
(Rept.-64-34; AD-433165)

The Corrective Maintenance Burden Prediction Procedure (CMBPP) provides a means for determining the maintenance time by the skill level required to perform electronic corrective maintenance on an equipment or a system. The basic steps that an analyst would go through in using the CMBPP are outlined. Inherent characteristics of the procedure are listed: (1) It is applicable in early equipment-design stages when design changes, which may have to be made to reduce the manpower and training burden in terms of numbers of personnel and levels of training, are less costly and easier to make. (2) It provides a positive means for reducing maintenance manpower and training requirements. (3) It provides a relatively simplified technique that can be effectively implemented. (4) It is adaptable to automatic-data-processing techniques. P.V.E.

N64-22133 Aeronautical Research Labs., Melbourne (Australia)
AIRLINE PILOTS' EYE MOVEMENTS DURING TAKEOFF AND LANDING IN VISUAL METEOROLOGICAL CONDITIONS
D. Lennox Aug. 1963 20 p
(ARL/HE-15)

To obtain information on the visual behavior of pilots during takeoff and landing in visual meteorological conditions in daylight, a cine record of pilots' eye movements was made on Electra and Boeing 707 aircraft on normal passenger-carrying flights. Interest was directed initially to the analysis of periods of attention, the in-to-out ratio of attention and the general scanning pattern. The greater amount of attention and the longer glances were directed to the instruments during takeoff, but to external visual cues during landing. Different pilots followed different visual scanning patterns, although individuals tended to conform to the same pattern on different occasions. The scanning patterns of Electra and Boeing pilots were similar, but the Electra patterns showed more variance, probably because the runway performance of the aircraft was less critical. The Boeing data show that scanning patterns were affected when operating into and out of an unfamiliar airfield with inhospitable surrounding terrain; the Electra data showed no differences between three familiar capital city airports with clear aproaches. Author

N64-22141 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
NEW FREELY LIVING NITROGEN FIXING MICROORGANISMS
N. P. L'vov 15 Nov. 1963 23 p refs Transl. into ENGLISH from Izv. Akad. Nauk, SSSR, Ser. Biol. (USSR), no. 2, 1963 p 270–282
(FTD-TT-63-1010/1; AD-425497)

By using the isotopic method in the study of nitrogen fixation, the nitrogen fixing activity of extremely small microorganisms can be detected. The ability to fix molecular atmospheric nitrogen was established and is described for representatives of all photosynthetic-bacteria families, bacteria of the *Pseudomonas* and *Achromobacter* group, mycobacteria, *proactinomycetes* and *actinomycetes*, *Bacillus polymyxa*, *Aerobacter aerogenes*, sulfate reducing bacteria of the *Desulfovibrio* type, methanobacteria, and a series of unidentified bacteria and several types of yeast. All new nitrogen fixing microorganisms are believed to have an adaptive fermentation system for nitrogen fixation. R.T.K.

N64-22142 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
INVESTIGATION OF CATECHOLAMINES IN VARIOUS ORGANS OF DOGS UNDER CONDITIONS OF DEEP HYPOTHERMIA
Ye. P. Stepanyan, V. A. Bukharin, and M. A. Chernyavskaya 26 Dec. 1963 11 p refs Transl. into ENGLISH from Bull. Eksperim. Biol. Med. (USSR), no. 9, 1963 p 56–60
(FTD-TT-63-1096/1+2; AD-428724)

An investigation of the catecholamines in various organs of dogs under deep hypothermia showed that the level of catecholamines in the blood sharply diminished at the maximum cooling temperature of the organism, and especially after stopping the circulation for 15 minutes. Followup on the reperfusion of the cooled blood after a 15-minute stoppage revealed a slight increase in the catecholamines in the blood. The subsequent warming up to the normal temperature of the body brought about an increase in the level of catecholamines by 40 percent. Graphs are presented for changes in the content of catecholamines in the suprarenal glands, in heart muscles, and in the brain. N.E.A.

N64-22143 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THE MAXIMUM PRINCIPLE IN THE THEORY OF OPTIMAL CONTROL PROCESSES
V. G. Boltyanskiy, R. V. Gamkrelidze et al 18 Mar. 1963 25 p refs Transl. into ENGLISH from the Book "Printsip Maksimuma v Teorii Optimal'nykh Protsessov Upravleniya" Moscow, v. 2, 1961 p 457–470
(FTD-TT-62-1746/1+2+4; AD-299854)

In this report, a statement of the general optimal problem is presented, and the basic results obtained by previous authors are formulated mathematically. N.E.A.

N64-22160 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ELECTRONICS AND INDUSTRIAL SAFETY
P. M. Konin, V. A. Franke et al 25 Mar. 1964 13 p Transl. into ENGLISH from Elektron. v Med. (Moscow), Gosenergoizdat, 1960 p 383–392
(FTD-TT-63-1200/1+4; AD-600581)

Discussed is the application of electronics in the field of industrial safety in order to develop devices for eliminating injuries that might occur when operating various machines. The following areas of electronics as applied to industrial safety are discussed: (1) measuring the intensity of electromagnetic fields of low, high, and ultrahigh frequencies; (2) making instruments that will assure safety while operating electrical equipment; (3) measuring static-electricity potential; (4) measuring noise level and analyzing its frequency; (5) measuring illumination; (6) computing the dust content in the air and analyzing dust dispersion; (7) analyzing the content of harmful admixtures in the air, such as vapors and gases; and (8) measuring radioactive intensity and X-radiation. N.E.A.

N64-22168 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
PHYSIOLOGICAL JOURNAL OF THE USSR (SELECTED ARTICLES)
14 Feb. 1963 33 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 48, no. 4, 1963 p 436–443, 455–463
(FTD-TT-62-1176/1+2+4; AD-297570)
CONTENTS:

1. PHYSIOLOGICAL MECHANISMS OF CHEMICAL THERMOREGULATIONS K. P. Ivanov p 1–14 refs (See N64-22169 15-16)
2. FUNCTIONAL CHANGES IN AN ORGANISM AS A RESULT OF BREATHING A HIGH OXYGEN-LOW CARBON DIOXIDE GAS MIXTURE FOR MANY HOURS AT REST AND DURING EXERCISE S. A. Brandis and V. N. Pilovitskaya p 15–30 refs (See N64-22170 15-16)

N64-22169 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
PHYSIOLOGICAL MECHANISMS OF CHEMICAL THERMOREGULATIONS
K. P. Ivanov *In its* Physiol. J. of the USSR (Selected Articles) 14 Feb. 1963 p 1–14 refs (See N64-22168 15-16)

To investigate increase in the general gas exchange of animals during their cooling, experiments were conducted to determine directly the oxygen requirement of animal muscles in situ at different body temperatures. On cooling, the rabbits with the occurrence of thermoregulation tonus in their skeletal muscles had the oxygen consumption by their muscles increased by as much as 150% or more from the initial level. On deeper cooling and the occurrence of shivering, the oxygen consumption by muscles increased by as much as 200% to 400% or more. After cutting the spinal cord at the thoracic division or the somatic nerves innervating the given muscles, thermoregulation tonus and shivering did not occur when the unanesthetized animals were cooled. The corresponding reactions of gas exchange of the investigated muscles also disappeared. It is concluded that an effective increase in heat production in the skeletal muscles during chemical thermoregulation even with complete apparent rest of the organism and in the absence of shivering can occur only if motor innervation is preserved. P.V.E.

N64-22170 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
FUNCTIONAL CHANGES IN AN ORGANISM AS A RESULT OF BREATHING A HIGH OXYGEN-LOW CARBON DIOXIDE GAS MIXTURE FOR MANY HOURS AT REST AND DURING EXERCISE
S. A. Brandis and V. N. Pilovitskaya *In its* Physiol. J. of the USSR (Selected Articles) 14 Feb. 1963 p 15–30 refs (See N64-22168 15-16)

The following conclusions were reached: (1) On inspiration of 2% concentrations of CO_2, a significant increase (26%) of pulmonary ventilation was observed in the test subjects while at rest. When the subjects exercised, a significant increase of ventilation was noticed at a 1% concentration (8.4%) and at the 2% concentration the increment average was 28.8%. (2) An increase in the oxygen content in the inspired gas mixture produced an increase in the sensitivity of external respiration to the inspired carbon dioxide. (3) Prolonged inspiration of high CO_2 concentration (0.25% to 2%) leads to a noticeable drop of gaseous and tissue exchange, which is more pronounced under conditions of hyperoxia. (4) During many hours breathing in a respirator, particularly while performing physical work, the average CO_2 content in the inspired gas mixture should not exceed 0.25%. The maximal tolerable passage of CO_2 with an oxygen concentration up to 50% in the breathing system of the respirator can be 2%. At high oxygen concentration in the gas mixture in the respirator, the passage of CO_2 should not exceed 1%. P.V.E.

N64-22180 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
METHOD OF VENTILATION OF CLOTHING OF CREW MEMBERS OF AIRCRAFT

A. A. Stasyuk, Ya. G. Rubashkin, and Yu. M. Petrov 15 Aug. 1963 5 p Transl. into ENGLISH from Soviet Patent no. 142157, 14 Feb. 1961 p 1-4
(FTD-TT-63-774/1+2; AD-417578)

A method of ventilating the clothing of members of aircraft crews making use of drop in pressure is described. This method is distinguished from previous methods in that the air is drawn through the clothing along air ducts connecting the clothing with the hermetically sealed cabin and air ducts connecting the clothing with the surrounding space outside the aircraft. N.E.A.

N64-22182 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
PROBLEMS OF CYBERNETICS IN MEDICINE
A. D. Voskresenskiy and A. I. Prokhorov 17 Dec. 1963 29 p refs Transl. into ENGLISH from Kibernetiku Na Sluzhbu Kommunizmu, Sbornik Statey Gosenergoizdat (Moscow-Leningrad), v. 1, 1961 p 126-140
(FTD-TT-63-521/1+4; AD-430544)

The purpose of the cybernetic approach to the investigation of processes of regulation of vital bodily functions is to explain the structure of the control system, its dynamic characteristics, individual variants of the dynamics of control-system functions, and possible disturbances in the system for the control of functions. The prospects of using electronic computers for processing diagnostic information, and automatic control of physiological systems are also discussed. P.V.E.

N64-22203 Israel Society for Scientific Translations, Ltd., Jerusalem
EXCITATORY AND INHIBITORY STATES OF THE BRAIN
B. N. Klosovskii and E. N. Kosmarskaya 1963 465 p refs Tranl. into ENGLISH of "Deyatel'noe i Tormoznoe Sostoyanie Mozga" Moscow, Medgiz, 1961
(Sponsored by NSF)
(IPST-990; OTS-63-11176) OTS: $4.50

CONTENTS:

1. THE MODERN THEORY OF THE NERVE CELL p 3-48
2. PRINCIPLES OF ORGANIZATION AND DEVELOPMENT OF THE VASCULAR SYSTEM OF THE BRAIN p 49-93
3. THE RELATION OF NEURONS AND OF SEPARATELY SITUATED SYNAPSES (NEUROPIL) TO CAPILLARIES p 94-118
4. THE ARTERIAL AND VENOUS SYSTEMS ON THE SURFACE OF THE BRAIN AS AN EXPRESSION OF CHANGES IN THE VASCULAR SUPPLY OF NERVE CELLS (BRAIN SUBSTANCE) p 119-125
5. THE CEREBROSPINAL FLUID p 126-146
6. THE INTERRUPTED SEQUENCE OF DRUG-INDUCED AND NATURAL SLEEP p 147-169
7. CHANGES IN NERVE CELLS OF THE BRAIN DURING DRUG-INDUCED SLEEP INHIBITION p 170-190
8. CHANGES IN THE VASCULAR-CAPILLARY NETWORK OF THE CEREBRAL CORTEX DURING SLEEP INHIBITION p 191-199
9. THE QUALITY OF BLOOD IN THE CEREBRAL HEMISPHERE DURING SLEEP INHIBITION p 200-203
10. CHANGES IN ASTROCYTES AND OLIGODENDROGLIA DURING SLEEP INHIBITION p 204-209
11. CHANGES IN THE TEMPERATURE OF THE BRAIN AND OF THE BODY DURING SLEEP INHIBITION p 208-227
12. CHANGES IN THE CEREBROSPINAL FLUID DURING DRUG-INDUCED SLEEP INHIBITION p 228-236
13. CHANGES IN NERVE CELLS DURING SLEEP INHIBITION IN CATS CAUSED BY SIMULTANEOUS ABOLITION OF VISUAL, AUDITORY, OLFACTORY AND VESTIBULAR RECEPTORS p 237-249
14. STRUCTURE OF NERVE CELLS IN THE BRAIN OF NORMAL ANIMALS p 250-256
15. STRUCTURAL ALTERATIONS IN NERVE CELLS, CHARACTERISTICS OF SLEEP-INDUCED INHIBITION, DURING ONTOGENESIS p 257-264
16. NEURONAL RESPONSE TO STIMULATION p 265-302
17. THE RESPONSE OF NERVE CELLS TO ABOLISHMENT OF THE CURRENT OF IMPULSES COMING FROM THEIR PERIPHERAL RECEPTORS p 303-366
18. THE RELATION BETWEEN "SHRUNKEN" NERVE CELLS IN THE BRAIN AND NERVE CELLS IN THE STATE OF DEEP SLEEP p 367-379
19. ANATOMIC-PHYSIOLOGICAL CONCEPTS OF THE NERVE CELL p 380-396
20. THE PROBLEM OF STRUCTURE OF THE BRAIN p 397-414
21. CONCLUSIONS p 415-419

N64-22218 Flying Personnel Research Committee (Gt. Brit.)
PULMONARY GAS EXCHANGE DURING POSITIVE ACCELERATION
D. H. Glaister (RAF Inst. of Aviation Med.) London, Air Min., Apr. 1963 17 p refs
(FPRC-1212)

Pulmonary gas exchange and lung function were studied in man subjected to positive (tailward, + G_z) acceleration in the sitting position. During runs at 2 to 3g lasting 1/2 to 5 minutes, the oxygen uptake fails to rise, or may even fall, despite the fact that an oxygen debt is being built up, which is only repaid on return to 1g. The oxygen debt is increased by increasing either the duration or the severity of acceleration, and is slightly decreased when an anti-g suit is worn. Breathing 100% oxygen has no effect on the development of the debt, which may reach 500 to 600 ml without an increase in oxygen uptake during the period of acceleration. Moderately severe exercise must be performed during acceleration before the oxygen uptake is raised at 2 to 3g, and following such a run the oxygen debt may reach 740 ml. Marked inequalities in ventilation and perfusion are inferred from the pattern of carbon dioxide excretion during tidal and prolonged expirations at 3g, and the effect of these on the reserves of oxygen and carbon dioxide in blood and tissues is discussed. Author

N64-22232 Israel Program for Scientific Translations, Ltd., Jerusalem
THE MOTOR ANALYSOR, EXPERIMENTAL STUDIES
L. S. Gambaryan 1963 174 p refs Transl. into ENGLISH of "Voprosy Fiziologii Dvigatel'nogo Analizatora. Eksperimental'noe Issledovanie" Moscow, Medgiz, 1962
(Sponsored by NSF)
(IPST-1014; OTS-63-11174) OTS: $1.75

A study of the physiological basis of acquired motor acts is discussed. The investigations were accomplished through the method of conditioned reflexes combined with morphological and electrophysiological analysis. The study was concerned with explaining and/or investigating the following: (1) conditioned motor reflexes; (2) conditioned reflexes in dogs with damaged posterior spinal-cord columns; (3) additional pathways of proprioceptive signaling; (4) functional significance of

additional pathways of proprioceptive signaling; (5) motor reactions after the destruction of cortical and spinal parts of the motor analyzer; and (6) acquired motor reactions after damage to the cerebellum and posterior spinal-cord columns. P.V.E.

N64-22240 Atlantic Research Corp., Alexandria, Va.
THE EVALUATION AND CONTROL OF TOXICITY HAZARDS IN SOLID PROPELLANT OPERATIONS
Kenneth D. Johnson Jan. 1963 27 p Presented at the Solid Propellant Rocket Conf., ARS, Philadelphia, 20 Jan.—1 Feb. 1963
(ARS Paper-2766-63)

The risks of injury by toxic releases to the atmosphere from propellant operations depend upon physiological, physicochemical, and meteorological factors, as well as the composition of the propellant. The estimation of these statistical risks from an evaluation of these factors is discussed. Minimization of the risks through containment of toxic exhaust products, scheduling of operations during periods of meteorology favorable for rapid atmospheric dilution of toxic emissions, and by operation at highly isolated sites is discussed in principle and illustrated by example. Author

N64-22241 Innsbruck U. (Austria) Institut für Experimentelle Psychologie
COLOR DISCRIMINATION WITHOUT CHROMATIC VISION Quarterly Technical Status Report, 1 Jan.–31 Mar. 1964
Anton Hajos Mar. 1964 14 p
(Contract DA-91-591-EUC-2917)
(QTSR-3)

The problem of interaction in the visual system is being investigated experimentally to determine the nature and extent of interocular transfer. The visual disturbances produced by wearing for a long time either a monocular 16° prismatic spectacle with the other eye completely occluded, or squint glasses consisting of two 12° crown glass prisms worn with the base to the temporal side are summarized as follows: (1) The aftereffects of rainbow-fringes seen by the prism eye do not transfer to the other eye. (2) Changes in the chromatic response characteristics of the transfer (occluded) eye are evident in the short wavelength (blue) rainbow-fringe, but these must be regarded as control effects. (3) The aftereffects of curvature and of visual direction displacement are completely transferred. M.P.G.

N64-22258 Joint Publications Research Service, Washington, D.C.
MAN IN SPACE FLIGHT
V. I. Yazdovskiy 16 Aug. 1963 19 p Transl. into ENGLISH of an Article from the Book "Nauka i Chelovechestvo" Moscow, 1962 p 348–358, 408–410
(JPRS-20673; OTS-63-31545) OTS: $0.50

A human being in space encounters a large number of environmental factors he has never met on earth—the physical conditions of space, conditions in the spacecraft, and conditions resulting from prolonged flight. This article surveys some of the effects in those categories on Soviet cosmonauts. Also included is a brief history of Russian space efforts, the selection of cosmonaut candidates, and their training. Certain general scientific observations are made, based on space-flight data. G.D.B.

N64-22267 Electronic Systems Div., Bedford, Mass. Decision Sciences Lab.
OPTIMAL STRATEGIES AND HUMAN BEHAVIOR IN FUNGUS-EATER GAME 4
Jun-ichi Nakahara and Masanao Toda Feb. 1964 65 p refs
(Contracts AF 19(628)-2450; AF 19(628)-2968; Grant NSF GS-114)
(ESD-TDR-64-237; AD-600823)

Fungus-eater games yield a class of sequential decision tasks that involve both means objects and end objects in a fairly realistic fashion. The optimal strategy for the fourth fungus-eater game, which depends upon the level of fungus storage, is derived, and the behavior of humans playing this game is reported. Author

N64-22280 Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.
A METHOD FOR MAINTAINING CHIMPANZEE MEDICAL RECORDS
Richard J. Brown Apr. 1964 17 p
(ARL-TDR-64-5; AD-436729)

The methods described in this report are the results of nearly 10 years of colony operation. During this period many changes were made to tailor the health record to better fit the biomedical research program using chimpanzees. The majority of the chimpanzees were imported from the west coast of Africa. Importation of animals from other parts of the world might well necessitate research colony health record modifications. Greatly altered use of chimpanzees and nonhuman primate colony location in areas climatically diverse from the desert southwest would surely cause other changes to be made in the health records described in this report. Author

N64-22290 Armed Forces Inst., of Pathology, Washington, D.C.
DETERMINATION OF CARBOXYHEMOGLOBIN IN DECOMPOSED BODIES Final Report, Mar. 1962–Mar. 1963
Abel M. Dominguez, James R. Halstead, and Thaddeus J. Domanski Wright-Patterson AFB, Ohio, AMRL, Jul. 1963 19 p refs
(Contract MIPR (33-657)-2-RD-175)
(AMRL-TDR-63-69; AD-420631)

This study is concerned with the interpretation and the significance of carbon monoxide findings in cases associated with decomposition. The evidence presented indicates that the percentage of carboxyhemoglobin saturation value is not markedly altered during postmortem decomposition when the specimens are properly preserved and when the blood extracted from tissue is examined as soon as possible for the presence of carbon monoxide. Under the conditions studied, it appears possible to obtain carbon monoxide values, using blood extracted from tissue, in the presence of postmortem decomposition that are similar to the antemortem levels. For example, within the 4% to 12% carboxyhemoglobin-saturation range covered in this study, there was no marked increase or decrease in final percentage of carboxyhemoglobin following decomposition. Nevertheless, unreliable carboxyhemoglobin saturation values may occur, and the possible contributory factors responsible for a spurious increase in carboxyhemoglobin values are discussed along with corrective measures. A gas–solid chromatographic procedure using blood or tissue for determining carbon monoxide is presented. This procedure employs a Van Slyke apparatus for liberating gases from biological specimens, modified for introducing released gas into the gas chromatograph. Author

N64-22317 Chicago Medical School, Ill.
YOUNG'S MODULUS AND BREAKING STRENGTH OF BODY TISSUES Technical Documentary Report, Mar. 1960–31 Dec. 1962
John L. Nickerson and M. Drazic Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs., Mar. 1964 15 p refs
(Contract AF 33(616)-7053)
(AMRL-TDR-64-23; AD-601181)

The measurement of Young's modulus, the breaking strength, and the breaking index in the stretching of tissues of the dog and of humans is reported. The breaking index is defined as the ratio of breaking strength to Young's modulus. These measurements were made by static determinations of the stress-strain relationship. Some twenty-three different tissues or segments of tissue were used in these tests. The results reported have an accuracy of the order of 25%. The values reported on the few samples of human tissue studied are different only to a small degree from the values found for the tissues of the dog. The values for Young's modulus ranged from 5.7 $\times 10^6$ dynes/cm^2 for the transverse direction around the aortic arch to 110 $\times 10^6$ dynes/cm^2 for the skin of the abdomen. The values for the breaking strength ranged from 3.3 to 44.4 kg/cm^2 for the same tissues. The breaking index ranged from 0.17 for the longitudinal direction of the midesophagus to 0.71 for the longitudinal direction in the same organ. Author

N64-22328 Chicago Medical School, Ill.
A STUDY OF THE EFFECTS OF ANESTHESIA, HIGH OXYGEN AND FEEDING UPON THE RESONANT FREQUENCIES OF VISCERAL ORGANS Technical Documentary Report, Apr.–30 Sep. 1962
John L. Nickerson Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs., Apr. 1964 18 p refs
(Contract AF 33(616)-7053)
(AMRL-TDR-64-14; AD-601180)

The purpose of this study was to determine the influence of anesthesia, the breathing of 100 percent oxygen, and the effects of having a full compared with an empty stomach on the resonant frequencies of thoracic and abdominal regions of the dog. The resonant frequencies were determined from photographs made with a specially designed X-ray kymograph. In the animals studied, the visceral contents of the thorax had resonant frequencies in the range of 3.8 to 7.4 cps with a mean value of 5.1 cps. There was no significant change in resonant frequencies in going from one to another of the conditions studied. There was some slight indication of a decrease in resonant frequency in the abdominal viscera when the stomach was filled with food as compared with the other conditions where the stomach was empty. The measured values of the amplitude magnification and damping for the regions studied are also presented. Author

N64-22343 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
RESULTS OF INVESTIGATIONS OF THE EFFECT OF IONIZATION RADIATION ON THE RETINA AND CERTAIN PHOTOSENSITIVE SYSTEMS
G. G. Demirchoglyan, M. A. Allakhverdyan, A. B. Melik-Musyan, V. G. Organjanyan, R. I. Pogosyan et al 18 Mar. 1963 16 p refs Transl. into ENGLISH from Radiobiologiya (Moscow), v. 2, no. 3, 1962 p 442–449
(FTD-TT-63-163/1+2+4; AD-401743)

The following methods were used in the study of the effect of ionizing radiation on the retina: electroretinography for recording electrical potential of the eye; microelectrode technique for recording the intraretinal potentials; amperemetric determination of the content sulfhydryl group in the retina; measurement of the absorption spectra of the visual pigment of the retina; and morphologic and histosensitivity of various photosensitive systems. To study the radiosensitivity of various photosensitive systems, biological specimens that had evolutionary eye structural differences were studied. The experimental results indicated that small doses of ionizing radiation were sufficient to affect the functional properties of the retina. N.E.A.

N64-22352 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
BERYLLIUM TOXICOLOGY, SYMPTOMATOLOGY OF AFFECTIONS AND INDUSTRIAL HYGIENE
V. M. Kozlov and V. D. Turovskiy 24 Oct. 1963 161 p refs Transl. into ENGLISH of the Book "Berilliy Toksikologiya, Klinika Porazheniy, Gigiyena Truda" Moscow, Gos. Izd. Lit. v Obl. At. Nauki i Tekhn., 1961 p 3–118
(FTD-TT-63-578/1+2; AD-429101)

This book describes the problems of the toxicology of beryllium, the symptomatology of affections caused by the action of this compound, industrial hygiene for beryllium production, and the protection of the environment from contamination with production wastes. Sanitary–hygienic requirements for the designing of production areas, for the various types of equipment used, and for industrial ventilation systems are given. Author

N64-22363 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THE VALUE OF FEEDING FACTORS IN PROPHYLAXIS OF RADIATION DISEASES (SELECTED ARTICLES)
18 Feb. 1964 25 p refs Transl. into ENGLISH from Znacheniye Faktora Litaniya v Profilaktike Luchevoy Bolezni, Trudy, Inst. Eksperim i Klinich. Med., Izd. Akad. Nauk Latv. SSR, no. 28, 1962 p 83–86, 117–128
(FTD-TT-63-1064/1+2+4; AD-432122)

Two areas of research are discussed: (1) a protein-vitamin complex suitable for alimentary prophylaxis of radiation sickness and (2) effect of gamma irradiation on the thiamine and riboflavin content in the liver and brain, and of vitamin B_{12} in the rat liver, depending on the nutritional value of their diet. P.V.E.

N64-22365 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
REGIONAL HEMODYNAMICS INDICATORS AT VESTIBULAR LOADS
B. O. Nakhapetov 26 Feb. 1964 10 p refs Transl. into ENGLISH from Fiziol. Zhur., Akad. Nauk Ukr. RSR (Kiev), v. 9, no. 3, 1963 p 325–329
(FTD-TT-64-32/1+2; AD-432164)

The study of changes in regional indicators of blood circulation during vestibular stimulation at various functional states of a vestibular analyzer was investigated. Conclusions reached as a result of the investigation include the following: (1) Changes in arterial pressure during vestibular stimulation have phase characteristics, whereby the relationship of pressure rise and reduction phases are different in various vascular parts. (2) A valid dependence between the functional state of the vestibular apparatus and changes in arterial pressure after vestibular stimulation are not observed in healthy people. (3) Disruptions in vestibular–vegetative coordination are often accompanied by progressing reductions in oscillatory index, which may indicate a rise in vascular tonus. P.V.E.

N64-22372 Lockheed Missiles and Space Co., Sunnyvale, Calif.
BIONICS—A STUDY OF BIOLOGICAL RECEPTORS AND REGULATORS AND THEIR APPLICATION TO ENGINEERING DESIGN: AN ANNOTATED BIBLIOGRAPHY
Charlie M. Pierce, comp. Jun. 1963 218 p refs
(SRB-63-2; LMSC-6-90-63-66)

Bionics is a field of study that involves the chemical, electrical, or mechanical simulation of biological functions. Areas of application include automatic control systems, chemical engineering, computer design, detector design, and medicine.

The scope of this bibliography encompasses living sensory perceptors, biological control systems, and their simulation. Emphasis has been placed on auditory perception. Visual perceptors are not covered in great detail, since knowledge in this area is relatively advanced. Most of the 515 references were published between January 1958 and June 1963. The references are grouped by subject topics and arranged according to the first author. Separate indexes for corporate author, personal author, and subject are included at the end of the bibliography. Author

N64-22373 Hine Labs., Inc., San Francisco, Calif.
A STUDY OF THE MECHANISM OF ACUTE TOXIC EFFECTS OF HYDRAZINE, UDMH, MMH, AND SDMH
Francis W. Weir, Jesus H. Nemenzo, Swanson Bennett, and Frederick H. Meyers Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs., Apr. 1964 32 p refs
(Contract DA-18-108-AMC-19-A)
(AMRL-TDR-64-26; AD-601234)

Four separate mechanisms of action are suggested by differences in pharmacologic activity. SDMH has a markedly delayed toxicity, in mice, as compared to the other hydrazines. MMH manifests its MAO inhibitory activity by intensifying the response to tyramine. Hydrazine convulsions are cortical in origin, whereas UDMH, SDMH, and MMH convulsions originate in a prepontine area. Protection from convulsions and death due to hydrazine is afforded, in mice, by arginine or ornithine. Protection is provided from the effects of both UDMH and MMH, in mice, by pyridoxine and amino-oxyacetic acid. The p-chlorobenzaldehyde and p-nitrobenzaldehyde protect against the effects of UDMH, but not MMH; p-dimethylaminobenzaldehyde protects against the effects of MMH but not UDMH. Author

N64-22382 Air Force Systems Command, Wright-Patterson AFB, Ohio Aerospace Medical Research Lab.
DONNING AND DOFFING THE "PHASE B" APOLLO PROTOTYPE SPACE SUIT DURING ZERO GRAVITY
Edwin H. Sasaki Apr. 1964 13 p ref
(AMRL-TDR-64-32; AD-601250) OTS: $0.50

Time scores were recorded of a subject donning and doffing a Phase B Apollo prototype space suit inside and outside a donning bag, while in the weightless condition. The total times for each of the three donning trials were, in order, 181 sec inside the bag, 165 sec outside the bag, and 154 sec inside the bag. Difficulties encountered in donning the suit are mentioned. The total time for the one doffing trial, inside the bag, was only 95 sec. Neither the bag nor the space suit was vented or pressurized for the tests. Author

N64-22390 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
IONIZING RADIATION AND METABOLISM
L. S. Cherkasova, K. B. Fomichenko et al 11 Jul. 1963 224 p refs Transl. into ENGLISH of the book "Ioniziruyushcheye Izlucheniye i Obmen Veshchestv" Minsk, Izd. An BSSR 1962 p 1–174
(FTD-TT-62-1575/1+2; AD-417407)

CONTENTS:

1. THE MECHANISM OF THE BIOLOGICAL REACTION TO RADIATION p 4–24 refs
2. INFLUENCE OF IONIZING RADIATION ON THE CENTRAL NERVOUS SYSTEM p 25–82 refs
3. INFLUENCE OF IONIZING RADIATION ON THE ENDOCRINE SYSTEM p 83–102 refs
4. INFLUENCE OF IONIZING RADIATION ON METABOLISM IN THE LIVER p 103–131 refs
5. INFLUENCE OF IONIZING RADIATIONS ON BIOCHEMICAL CHANGES IN THE GASTROINTESTINAL TRACT p 132–141 refs
6. BIOCHEMICAL CHANGES IN THE MUSCLES UNDER THE ACTION OF IONIZING RADIATIONS p 142–168 refs

N64-22412 Cedars of Lebanon Hospital, Los Angeles, Calif.
THE COMMON ORIGIN OF PRECORDIAL VIBRATIONS
Clarence M. Agress, Stanley Wegner, Daniel J. Bleifer, Alfred Lindsey, John Van Houten et al Repr. from Am. J. Cardiology, v. 13, no. 2, Feb. 1964 p 226–231 refs
(Grant NsG-289-62)

The historical development of precordial vibration recording techniques is reviewed, and the basic electronic principles are outlined. Animal experiments were performed, in which left ventricular pressure curves were obtained simultaneously with precordial vibration tracings. An analog computer was used to derive a tracing resembling the vibrocardiogram from the pressure curve; a Krohn–Hite filter was used to obtain an apexcardiogram, a phonocardiogram, and an accelerogram from the vibrocardiogram. It was demonstrated that a record closely resembling the left ventricular pressure tracing can be obtained by integration of the vibrocardiogram. The basic relationship of the precordial vibratory tracings to pressure changes within the left ventricle was demonstrated. Author

N64-22418 Maryland U., College Park.
RATE-CHANGE EFFECTS WITH EQUAL POTENTIAL REINFORCEMENTS DURING THE "WARNING" STIMULUS
Stanley S. Pliskoff Repr. from the J. Exptl. Analysis Behavior, v. 6, no. 4, Oct. 1963 7 p refs
(Grant NsG-189-61; Contract DA-49-193-MD-2288)

Two pre-schedule-change stimuli were superimposed on the same VI baseline and were thereby equated with respect to reinforcement potential. One such stimulus preceded a transition to an extinction schedule or a VI schedule of lower reinforcement frequency while the other preceded a transition to a VI schedule of higher reinforcement frequency. Response rate during the warning stimulus was greater preceding the transition to the lower reinforcement frequency than it was preceding the transition to the higher reinforcement frequency. That difference was often evidenced by an absolute increase and decrease in rate, in conformity with previous findings on the topic. The present experiment extends previous findings in several ways, including the presentation of quantitative estimates of the effects. Author

N64-22420 Pennsylvania State U., University Park Walker Lab.
THEORETICAL STUDIES ON LIVING SYSTEMS IN THE ABSENCE OF MECHANICAL STRESS
Ernest C. Pollard [1962] 19 p refs Presented at the AAAS Meeting, Philadelphia, 1962
(Grant NsG-182-62)
(NASA-CR-56482) OTS: $1.60 ph

The wisdom of sending up relatively small systems in satellites to study the effect of weightlessness was investigated. The following conclusions were reached: (1) Small single cells should show little effect of weightlessness. (2) Cells as large as 10μ across should show some effect due to the redistribution of mitochondria or the nucleolus. (3) Systems of cells in which relatively large objects, such as ribosomes, pass from cell to cell should show gravity effects. (4) Quite extensive systems, such as cells exceeding 1 cm in length should

have increased membrane permeability at the lower end. This effect could be greatly increased if each cell had many internal membranes. (5) Experiments on weightlessness should also consider temperature as a variable. P.V.E.

N64-22425 Itek Corp., Palo Alto, Calif. Vidya Div.
AUSCULTATORY VERSUS DIRECT PRESSURE MEASUREMENTS FOR NEWTONIAN FLUIDS AND FOR BLOOD IN SIMULATED ARTERIES
A. H. Sacks, K. R. Raman, J. A. Burnell and E. G. Tickner
30 Dec. 1963 111 p refs
(Contract NAS2-1137)
(NASA-CR-56470; Vidya-119)

Experiments were performed in a large-scale simulated arterial-flow system to investigate the relationship between auscultatory and direct measurements of arterial blood pressure. Efforts were made to simulate the living system as closely as possible, and comparisons were made over a wide range of pulse rate, pulse amplitude, and mean pressure level, using as the fluid various mixtures of water and glycerol and, finally, whole blood. The results indicate that both the auscultatory systolic and diastolic pressure readings, as determined with a sphygmomanometer, are generally higher than the corresponding maximum and minimum of the oscillatory intra-arterial pressures. The process of occluding the artery for auscultation was generally found to amplify the oncoming pulse wave just proximal to (i.e., just ahead of) the pressure cuff, and to alter completely the form of the pulse wave as it passes through the cuff during the production of Korotkoff sounds. In studying the simulation of the blood fluid, it was found that whole blood behaves as a combination of a pseudoplastic and a Bingham fluid. P.V.E.

N64-22427 California U., Los Angeles Brain Research Inst.
PROLONGED EFFECTS OF LSD ON EEG RECORDS DURING DISCRIMINATIVE PERFORMANCE IN CAT; EVALUATION BY COMPUTER ANALYSIS
W. R. Adey, D. O. Walter, and T. S. Brown [1963] 24 p refs
(Grant NsG-203-62)
(NASA-CR-53832) OTS: $2.60 ph

The effects of LSD were studied in relation to changes induced in computed averages of epochs of EEG records during a discriminative task performance. Data were obtained from exposing 18 cats to LSD for a period of many months; the data presented are for 2 cats. LSD (75μg/Kg) was given in single doses by intraperitoneal injection at intervals of 3 to 6 weeks. Computed averages of thythmic hippocampal wave trains during approach performance showed an increase in amplitude and regularity following LSD, typically in the initial waves immediately following presentation of the situation. This modification was maximal 2 to 3 days after LSD, and decayed to control levels after 5 to 7 days. Similar analyses of record from the posterior pyriform (entorhinal) cortex indicated an increment in the early components of wave trains during discriminative performances, which also reached a maximum 2 to 3 days after LSD. Midbrain reticular activity showed only minor changes on days following LSD, also peaking about 4 days after drug dosage. P.V.E.

N64-22432 Naval School of Aviation Medicine, Pensacola, Fla.
A COMPARISON OF THE SYMPTOMATOLOGY EXPERIENCED BY HEALTHY PERSONS AND SUBJECTS WITH LOSS OF LABYRINTHINE FUNCTION WHEN EXPOSED TO UNUSUAL PATTERNS OF CENTRIPETAL FORCE IN A COUNTER-ROTATING ROOM
Ashton Graybiel and Walter H. Johnson Repr. from Annals of Otol., Rhinol. and Laryngol., v. 72, no. 2, Jun. 1963 17 p refs Previously published as NASA-CR-55621; see N64-15347 07-14
(NASA Order R-47)
(NASA-CR-55621)

The experimental design involved the use of a counter-rotating room (CRR), 21 normal subjects, and 9 deaf subjects with bilateral labyrinthine defects (LD). The CRR permitted exposure of the subjects to linear accelerations without the complication of angular velocity. Experimental variables included the inertial force, and whether the head was fixed or moving. With head fixed and eyes closed, all subjects perceived the changing direction of the resultant force with respect to themselves as an illusion of rotation and the direction of the resultant force as a tilt from the vertical with respect to the earth or floor of the room. With the room lighted, it appeared to be tilted (the oculogravic illusion), and in this regard there were differences between the normal and the LD subjects. Some of the normal but none of the LD subjects experienced symptoms of motion sickness. This group difference was attributable to the auricular sensory organs. These differences are discussed under two headings, precipitating factors and predisposing factors. I.v.L.

N64-22433 Naval School of Aviation Medicine, Pensacola, Fla.
COMPENSATORY NYSTAGMUS CONDITIONED DURING ADAPTATION TO LIVING IN A ROTATING ROOM
Fred E. Guedry, Jr. and Ashton Graybiel Repr. from J. of Appl. Physiol., v. 17, no. 3, May 1962 p 398–404 refs
(NASA Order R-1)

Seven men were rotated at 5.4 rpm in a room for 64 hr. Controlled tests before and during this interval demonstrated that disorientation and nystagmus attributable to Coriolis acceleration effects diminished markedly. A compensatory nystagmus, induced by heat or whole-body movements, was recorded more than 1 hr after the rotation had ceased. Factors of possible significance in conditioning the compensatory nystagmus are as follows: (1) otolith and proprioceptor sensory influx prior to and during discordant canal input; (2) a consistent sensory influx for each stimulus-producing movement; (3) intention in stimulus-producing movements; and (4) visual inhibition. Contributions of compensatory and arousal factors to vestibular suppression are considered in relation to practical problems of transfer of habituation from one acceleration environment to another. Author

N64-22434 San Jose State Coll. Foundation, Calif.
CONTRIBUTING FACTORS IN THE PERCEPTION OF THE OCULOGRAVIC ILLUSION
Brant Clark and Ashton Graybiel (Naval School of Aviation Med.) Repr. from the Am. J. of Psychol., v. 76, Mar. 1963 p 18–27 refs
(NASA Order R-1)

This is a study of the effect of an antecedent visual frame of reference on the perception of the horizontal when the direction and magnitude of the gravitational force acting on the body were changed. Initial static measures of the perceived horizontal were made with the experimental room stationary. Deviations of the perception of the horizontal from these static measures were determined as a function of time after exposure to a visual framework while the room was rotating to produce a change in magnitude and direction of resultant force acting on the Os; changes in the amount of the oculogravic illusion served as the criterion of change in the perception of the horizontal. The experiment consisted of observations following prolonged exposure to a

visual framework and observations following varied short exposures. The deviation of the perceived horizontal from the static line-of-subjective-horizontal increased fairly rapidly up to about 60 sec, and more slowly for an equal time thereafter, true of both long and short exposures. No consistent, systematic differences were observed between exposure time from 1 sec to 2 min. The results show a gradual, though not a simple, continuous change in the frame of reference from visual to gravitational cues, in sharp contrast with the change from a gravitational to a visual framework that occurs very quickly. Author

N64-22437 Naval School of Aviation Medicine, Pensacola, Fla.
RORSCHACH INDICATIONS OF EMOTIONAL INSTABILITY AND SUSCEPTIBILITY TO MOTION SICKNESS
Allen E. Mc Michael and Ashton Graybiel Repr. from Aerospace Med., v. 34, no. 11, Nov. 1963 p 997–1000 refs Presented at the Annual Meeting, Aerospace Medical Assoc., Los Angeles, 30 Apr. 1963
(NASA Order R-47)

Individuals having a high rigidity factor in their personality, as measured by the Rorschach test, seem to be more susceptible to motion sickness than those who are less rigid. Nine subjects were administered psychological tests and exposed to aerial acrobatics, going to sea in a power boat, experiencing 0 g, and the slow rotation room. Anxiety, dependency, drive, lability, and rigidity were correlated to the experimental conditions. G.D.B.

N64-22438 San Jose State Coll. Foundation, Calif.
PERCEPTION OF THE POSTURAL VERTICAL IN NORMALS AND SUBJECTS WITH LABYRINTHINE DEFECTS
Brant Clark and Ashton Graybiel (Naval School of Aviation Med.) Repr. from J. of Exptl. Psychol., v. 65, no. 5, 1963 p 490–494 refs
(NASA Order R-37)

Nine normal men and ten men with vestibular defects were studied in a lateral tilt chair to determine their ability to set themselves in the postural vertical position in the absence of a visual framework. The data show that with practice there is a reduction in the median error in setting the chair to the postural vertical for both groups. The normal subjects exhibited smaller average errors; however, the differences were small, particularly after 15 trials, and were not statistically significant. M.P.G.

N64-22440 National Aeronautics and Space Administration, Flight Research Center, Edwards, Calif.
AEROSPACE MEDICAL AND BIOENGINEERING CONSIDERATIONS IN LIFTING-BODY AND RESEARCH-AIRCRAFT OPERATIONS
Milton O. Thompson 11 May 1964 10 p Presented at the 35th Aerospace Med. Assoc. Ann. Meeting, Miami Beach, Fla., 11–14 May 1964
(NASA-TM-X-56005) OTS: $1.10 ph

A lifting-body research vehicle is being developed that will investigate supersonic, transonic, and subsonic flight regions. This vehicle will be full-scale in size and weight, will be launched from a B-52, and will require systems comparable to an operational-fighter aircraft or an X-15 research aircraft. The bioengineering considerations applicable to the lifting reentry vehicle as well as to the cockpit design, protective equipment, escape system, medical monitoring, and crew selection and evaluation are discussed. R.T.K.

N64-22470 Naval Medical Research Inst., Bethesda, Md.
[BASIC PHYSIOLOGICAL MECHANISMS WHICH DEFEND THE HUMAN BODY AGAINST HEAT AND COLD] Quarterly Progress Report, 1 Jan. – 31 Mar. 1964
Lutz Kiesow [1964] 3 p
(NASA Order R-38)
(NASA-CR-56293) OTS: $1.10 ph

Work was carried out in the development of methods to obtain control of internal body temperature, without the necessity of applying a temperature sensor directly to the body. A system was proposed in which the physiologic central warm-sensor could operate as the main link of a manmade control loop in a spacesuit. Also discussed is the reason why formation or reduced diphosphopyridine–nucleotide is achieved simultaneously with the oxidation of nitrite to nitrate, only when in a coupled, driving reaction electrons are transferred, through a cytochrome-chain, to terminal acceptance by molecular oxygen. P.V.E.

N64-22506 IIT Research Inst., Chicago, Ill. Life Sciences Research Div.
EFFECTS OF SPACE CABIN ENVIRONMENTS ON RESISTANCE OF MICE TO INFECTION WITH KLEBSIELLA PNEUMONIAE
Bernard J. Mieszkuc and Richard Ehrlich Brooks AFB, Tex., School of Aerospace Med., Mar. 1964 12 p refs
(Contract AF 41(657)-351)
(SAM-TDR-64-9)

This study shows the effect of exposure of mice to an altitude of 35,000 ft and to an atmosphere consisting of approximately 85% oxygen, 10% carbon dioxide, and 5% nitrogen for 3, 7, 14, and 30 days on susceptibility to respiratory infection caused by aerosols of Klebsiella pneumoniae. Mice exposed to 35,000 ft for 14 days prior to challenge and then returned to 35,000 ft exhibited an increase in mortality from 37% to 53%. There was an increased neutrophilic percentage accompanied by a lower white-cell count in the blood of mice exposed to 35,000 ft for 14 days. Mice lost weight initially when placed at 35,000 ft. They started gaining weight after about 2 weeks, and the rate of weight gain was approximately that of mice kept at ambient altitude. Mice kept at 35,000 ft consumed more food than mice kept at ambient altitude. Author

N64-22515 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio Behavioral Sciences Lab.
ENGINEERING PSYCHOLOGY, TRAINING PSYCHOLOGY, ENVIRONMENTAL STRESS, SIMULATION TECHNIQUES, AND PHYSICAL ANTHROPOLOGY: A BIBLIOGRAPHY OF REPORTS, April 1946–March 1964
Lavon E. Trygg and Lucille E. Kelsey, comp. Apr. 1964 89 p refs
(AD-600804)

N64-22518 Sheffield U. (Gt. Brit.)
THE USE OF CUING IN TRAINING TASKS Technical Report
J. Annett and J. K. Clarkson Port Washington, N.Y., Apr. 1964 53 p refs
(Contract N62558-3143)
(NAVTRADEVCEN-3143-1; AD-601352)

In this study, five different methods of training for a simple auditory detection task were compared. The methods all represent different means of providing the trainee monitor with supplementary information about the input signals and/or the adequacy of his responses. The first method, called cuing, proved superior. The third method, knowledge of results, although the paradigm for motor response learning, was less effective in this perceptual task. In general, the trainee needs

extra information about the signal rather than about his response to it. Differences in training methods show up particularly in the rate at which commissive errors (false positive responses) are made. Some tentative conclusions are drawn on the nature of perceptual learning and the vigilance decrement suggesting further research that could lead to improved training for detection tasks. Author

N64-22557 Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
INFORMATION PROCESSING IN A COMPLEX TASK UNDER SPEED STRESS Final Report
Alexander Z. Weisz and Linda S. Mc Elroy Bedford, Mass., Electronic Systems Div., May 1964 44 p refs
(Contract AF 19(604)-8449)
(Rept.-1129; ESD-TDR-64-391; AD-601379)

Differential effects of speed stress were sought in a complex task including five information processing activities differing in spatial and temporal uncertainty of events requiring response, location in display channels varying in frequency of occurrence of response events, short-term memory requirements, and perceptual requirements in event recognition. Highly practiced *Ss* were found to have evolved a priority strategy based primarily on frequency of response events in different display locations. High-frequency tasks not requiring search were relatively impervious to stress effects. Lower frequency events occurring in low-priority display locations gave rise to poorer performance at all levels of stress. Significant performance decrement under stress occurred first in the most complex low-probability task, which required search and short-term memory. Author

N64-22566 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio Behavioral Sciences Lab.
PREDICTING THE DIFFICULTY OF LOCATING TARGETS FROM JUDGMENTS OF IMAGE CHARACTERISTICS
Fen Rhodes Mar. 1964 57 p refs
(AMRL-TDR-64-19; AD-601375)

Judgments of 12 characteristics of 200 aerial reconnaissance photographs, each containing a designated target, and physical measures of target size and location were related to search time required to locate targets and to judged overall target difficulty. Twenty photointerpreters and 20 college students served as subjects. Photographs were divided into two equal groups to permit cross validation of results. A factor analysis of the data, including the two criterion measures, resulted in the extraction of eight orthogonal factors: (1) target size; (2) picture sharpness and contrast; (3) picture detail; (4) logical restrictions on possible target location; (5) target shape and pattern; (6) target location; (7) target isolation; and (8) rater bias. Raters were able to make highly reliable and seemingly valid judgments about complex perceptual characteristics of aerial photographs. There was no difference in reliability or validity between ratings made by photointerpreters and those made by untrained students. Author

N64-22567 Tufts U., Medford, Mass.
BELIEF STATES: A PRELIMINARY EMPIRICAL STUDY
Thornton B. Roby Bedford, Mass., Electronic Systems Div., Mar. 1964 42 p ref
(Contract AF 19(628)2450; Grant NSF G-10947)
(ESD-TDR-64-238; AD-600441)

The belief state, as a technique for describing beliefs, attitudes, and judgments, is proposed here as an important adjunct to psychological research, especially in the areas of decision making by individuals and by groups. The belief state is defined as a device for representing in probabilistic form an exact quantitative description of the information or beliefs an individual has about possible alternative conditions of the external world. The present study investigates the feasibility of measuring belief states in a simple laboratory situation, and of ascertaining by various statistical tests the degree to which these empirical measures conform to the normative standard of a perfect Bayesian calculation. It is shown that subjects in general depart from the standard in certain properties; that there are reliable individual differences among a subject's belief state measures as an apparent result of increasing experience with the task. Several suggestions are offered for future investigations of these measures under more closely controlled conditions. Author

N64-22646 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
CONCERNING THE QUESTION OF MECHANISM OF ACTION OF AN IRRADIATED THYROID GLAND ON THE CEREBRAL CORTEX
I. N. Kondratev 11 Feb. 1964 10 p refs Transl. into ENGLISH from Radiobiologiya (Moscow), v. 2, no. 4, 1962 p 569-572
(FTD-TT-63-231; AD-410929)

The bioelectric activity of visual and parietal regions of the cerebral cortex of 19 mature male rabbits weighing 1.8 to 2.5 kg each was studied. Two series of experiments were conducted. In the first, the intact thyroid glands were subjected to irradiation, and in the second, the denerved thyroid glands were subjected to irradiation. Investigation of dioelectric activity and recording of heart contractions were made before irradiation, again in 30 minutes, and then 3 hours after irradiation. Two to three hours after irradiation, an increase of the level of bioelectric activity and quickening of the heart contractions occurred in the rabbits with intact thyroids. In the animals with denerved glands, the reactions were sharply weakened or completely absent. P.V.E.

N64-22652 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ACUTE RADIATION INJURIES AND THEIR TREATMENT
I. M. Poltavets, F. F. Sinitsyna et al 15 Oct. 1963 180 p refs Transl. into ENGLISH from the Book "Ostryye Radiatsionnyye Porazheniya i Ikh Lacheniye" Kiev, Gos. Med. Izd. USSR, 1962 p 3-155
(FTD-TT-63-610/1+2; AD-429452)

This book describes methods of treating acute radiation injuries, the therapy of patients with radiation injuries, and the pathologoanatomical changes that occur in the body during this illness. The classification and evaluation of casualties in a focus of mass injury and the organization of dosimetric monitoring in the medical establishments and institutions are described, the latest data being taken into account. Author

N64-22665 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THE EFFECT OF TRANSVERSE ACCELERATION ON OXYGEN TENSION IN BRAIN TISSUE
Ye. A. Kovalenko, V. L. Popkov, and I. N. Chernyakov 16 Jan. 1964 12 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR, (USSR), v. 49, no. 10, 1963 p 1145-1149
(FTD-TT-63-1215/1+2+4; AD-430032)

During a gain of acceleration and during deceleration of a vehicle, a living organism is subjected to the unfavorable effect of prolonged g-forces. The degree and character of pathological disorders in the organism in many cases are determined by the

position of the body relative to the direction of the g-forces. During transverse accelerations, when considerable values are attained and act for a long time, disorders mainly associated with impairment of the function of external respiration and blood circulation develop in the organism. From the study of the oxygen tension (pO_2) of the brain tissue, the following results were recorded: (1) The average level of pO_2 during accelerations of 2 to 4 g was close to the starting level; during 6 g, it started to decrease (90%); during 8, 10, and 12 g, it was 86%, 81%, and 76% of the starting level, respectively. (2) During the initial period of rotation of the animal with accelerations of 2, 4, and 6 g, an increase of pO_2 in the brain tissue above the starting level was noted; during rotation of anesthetized dogs on a centrifuge, a similar increase of pO_2 was not noted. (3) When the head is fixed above the trunk, the transverse accelerations produced a more expressed fall of the oxygen tension in brain tissue than when the head was fixed on a level with the trunk. J.L.D.

N64-22697 Aerospace Medical Div. Aeromedical Research Lab. (6571st)., Holloman AFB, N. Mex.
TRAINING TECHNIQUES FOR THE CONTINUOUS AVOIDANCE TASK WITH CHIMPANZEES
Donald N. Farrer and Marvin E. Grunzke May 1964 17 p refs
(ARL-TDR-64-7; AD-430496)

A new training technique for teaching chimpanzees to perform the continuous avoidance task is described and compared to the traditional method of obtaining this performance from chimpanzees. The new technique was accomplished with five young chimpanzees, and the results were compared to the previous method. It was concluded that the time required to obtain stable performance was within the same limits of variability due to individual differences, but the number of shocks were substantially reduced. Author

N64-22705 Naval School of Aviation Medicine, Pensacola, Fla.
DETERMINATION OF FIRE HAZARD IN A FIVE PSIA OXYGEN ATMOSPHERE
Arthur L. Hall and Hwai S. Fang 1 Sep. 1963 17 p refs
(Rept.-4; AD-424009)

The possibility of hazardous external fire in a physiologically tolerable breathing atmosphere of 5-psia oxygen was investigated as compared to that existing in an atmosphere of sea-level pressure. In air at sea-level pressure, paper burned, and nylon, neoprene, and vinyl plastic melted. Skin of an exposed rat was singed. A toweling smother device extinguished the burning paper in one-fourth second. In the 5-psia-oxygen atmosphere paper ignited at a lower temperature and burned approximately six times as fast. The other materials also burned, as did exposed rats, which were burned over their entire body. The toweling burst into flame within one-half second. Author

N64-22711 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.
BIOMEDICAL RESEARCH STUDIES IN ACCELERATION, IMPACT, WEIGHTLESSNESS, VIBRATION, AND EMERGENCY ESCAPE AND RESTRAINT SYSTEMS: A COMPREHENSIVE BIBLIOGRAPHY
Richard G. Snyder, John Ice, Judith C. Duncan, Alvin S. Hyde (AMRL), and Sidney Leverett, Jr., (School of Aerospace Med.) Dec. 1963 3088 p refs Sponsored in Cooperation with Aerospace Med. Div. and School of Aerospace Med.
(Contract DO-33(657)62-382)
(CARI-63-30; AD-601531)

The bibliography attempts a comprehensive listing of all scientific research in the areas of acceleration, vibration, deceleration, weightlessness, and protection and survival research. Scope of the fields surveyed includes rather broad areas of prolonged acceleration including blast and impact, vibration, weightlessness, and restraint and escape systems including capsules, ejection, and evacuation. Materials appearing as early as 1818 and as late as November 1963 are covered. Author

N64-22719 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.
TRANSPOSITION AS A FUNCTION OF THE NUMBER OF TEST TRIALS
Gloria T. Chisum 19 May 1964 16 p refs
(NADC-ML-6404; AD-601374)

Forty-two female hooded rats were trained to discriminate between two stimuli, and then were tested for transposition on pairs of stimuli that were varying distances from the training stimuli. Subjects that failed to transpose immediately did so as testing under nondifferential reinforcement continued. The results agree with the adaptation level interpretation, but do not agree with an S-R or a relational interpretation. Author

IAA ENTRIES

A64-18256
MEDICAL ASPECTS OF SPACE FLIGHT.
Frank B. Voris (NASA, Office of Advanced Research and Technology, Washington, D. C.).
Space World, vol. A-2, Nov.-Dec. 1963, p. 5-9.
General discussion of some of the medical aspects of manned spaceflight, covering such areas as: respiratory requirements, pressure suits, effects of acceleration, weightlessness, radiation, shielding, collection and disposition of bodily wastes, and impact of high-speed micrometeorites. In addition, the psychological aspects of the selection and training of astronauts and of space travel are briefly considered.

A64-18257
SPACE SUITS. II.
James V. Correale and Walter W. Guy.
Space World, vol. A-2, Nov.-Dec. 1963, p. 32-35.
Description of the project Apollo suit and life-support equipment development program. Factors considered for the design analysis are conditions of the lunar surface, length of exposure, and tasks to be performed during a typical lunar exploration. In particular, the problem of determining the thermal input to the astronaut is discussed, and five thermal sources including direct solar, lunar emitted, lunar reflected, crater emitted, and crater reflected are covered.

A64-18258
BACTERIA UNDER SIMULATED MARTIAN CONDITIONS.
Richard S. Young (NASA, Ames Research Center, Biochemical Evolution Branch, Moffett Field, Calif.).
Space World, vol. A-2, Nov.-Dec. 1963, p. 36-39.
Discussion of a new technique for the simulation of known parameters of the Martian environment, along with possible biological implications. The response of bacteria to such simulation is demonstrated in terms of survival and growth, showing that certain bacteria will not only survive, but grow during simulated Martian freeze-thaw cycling if water is present. How water could be present on Mars although not detectable with current technology is demonstrated, and plans for future experimentation are discussed.

A64-18321
SEEING A SATELLITE FROM A SATELLITE.
Ingeborg Schmidt (Indiana University, Div. of Optometry, Bloomington, Ind.).
Astronautics and Aeronautics, vol. 2, May 1964, p. 31-38. 31 refs.
Discussion of the basic visual problems involved in the detection and observation of a satellite from another satellite. The visual environment in orbital flights is described, and the possible effects of motion, weightlessness, posture, noise, vibration, and thermal stresses on vision are outlined. The detection and observation of a satellite from another satellite involve a multitude of visual functions. Its detection as a lighter or darker area than the background is a function of contrast sensitivity, and its shape recognition is a function of visual acuity. Perception of motion and distances and temporal factors of vision must also be considered. The difficulties encountered in attempting to make predictions based on laboratory studies and the observations of the Mercury astronauts are discussed.

A64-18366
EYEBURN DAMAGE CALCULATION FOR AN EXOATMOSPHERIC NUCLEAR EVENT.
Harris L. Mayer and Frances Richey (E. H. Plesset Associates, Inc., Santa Monica, Calif.).
Optical Society of America, Journal, vol. 54, May 1964, p. 678-683.
Research supported by the Defense Atomic Support Agency.
Investigation of the threshold range for eyeburn damage from U.S. nuclear tests for resident populations of Pacific islands. It is stated that the visible flash caused by a high-altitude or exoatmospheric nuclear explosion may be a hazard to the eyesight of an unprotected observer. Estimates of the source strength in the visible spectrum from a weapon in the megaton range, the incident energy per unit area at a range of 1000 km, and the energy-absorption, temperature-rise, and heat-dissipation mechanisms in the retina are presented. The effect of ocular chromatic aberration on the reduction of energy density and, therefore, the damage in the absorption layer of the retina are calculated. It is concluded that the maximum rise in temperature that will result under the assumed conditions is 10°C for less than 1 msec. This is felt to be insufficient to cause eye damage.

A64-18367
DESARGUESIAN PROPERTY IN VISUAL SPACE.
John M. Foley (Columbia University, New York, N. Y.).
Optical Society of America, Journal, vol. 54, May 1964, p. 684-692. 15 refs.
Navy-supported research.
Experimental investigation of the visual space for the purpose of verifying Blank's Axiom 10, which implies that the visual space is Desarguesian. The Luneburg theory states that the visual space can be represented by one of the Riemannian spaces of constant curvature, implying that the visual space is Desarguesian. The Desarguesian property may be stated as follows: if two vertices of a triangle are joined by segments to the opposite sides of the triangle, these segments intersect. This proposition is tested by having observers move small lights so as to construct apparent segments on a given triangle. Six such experiments are performed using two triangles and five observers. In all cases the minimum physical distance between the two curves determined by the average settings of the lights is between 20 and 220". In two of the six cases, this distance is not significantly different from zero. Four determinations of the threshold for discriminating the nonintersection of two segments yielded values in the range of 59 to 92". It is concluded that the visual spaces of a significant proportion of the observers are Desarguesian, while those of the others may be non-Desarguesian.

A64-18377
EFFECT OF A MAGNETIC FIELD ON CARBOXYDISMUTASE.
George Akoyunoglou (NASA, Ames Research Center, Moffett Field, Calif.).
Nature, vol. 202, May 2, 1964, p. 452-454. 14 refs.
Experimental investigation of the effect of a magnetic field of about 20,000 gauss on the activity of carboxydismutase, the enzyme which catalyzes the primary carboxylation reaction in photosynthesis. A double-wall tube containing the enzyme solution was placed between the tapered pole caps of an electromagnet. Another similar tube, serving as control, was placed outside the magnet. Both tubes, as well as the poles of the magnet, were cooled by circulating cold water, and were covered with a piece of black fabric in order to eliminate any effect due to light. 0.5 ml of enzyme solution in phosphate or tris buffer was used in each experiment. The results of the experiments show a pronounced activating effect of 14 to 20% on carboxydismutase. It is also found that there is no difference in the results whether the pre-incubation and incubation of the enzyme with the other components of the reaction mixture were done inside or outside the magnetic field.

A64-18425
ENVIRONMENTAL CONTROL OF MANNED SPACE VEHICLES.
Robert E. Smith (California, University, Medical Center, School of Medicine, Dept. of Physiology, Los Angeles, Calif.).
IN: ADVANCES IN SPACE SCIENCE AND TECHNOLOGY. VOLUME 5.
Edited by Frederick I. Ordway, III.
New York, Academic Press, Inc., 1963, p. 87-142. 77 refs.
Study of various processes by which atmospheric and environmental controls may be achieved in the space vehicle. In the field of ecologic components, the following areas are considered: hypothermic environments, atmospheric composition, atmosphere and life systems, inert gases, carbon dioxide, water, and toxic products. The field of bioenergetics of the steady state is dealt with and, in the theory and applications of environmental control, the following subjects are discussed: elementary theory, carbon dioxide concentration, oxygen requirements, atmospheric regenerators, carbon dioxide reduction systems, waste disposal, and comparative aspects of systems design.

A64-18468
FEASIBILITY OF REGENERATION OF CARBOHYDRATES IN A CLOSED-CIRCUIT RESPIRATORY SYSTEM.
G. C. Akerlof (Food Machinery Corp., Princeton, N. J.).
(American Institute of Aeronautics and Astronautics, and Aerospace Medical Association, Manned Space Laboratory Conference, Los Angeles, Calif., May 2, 1963, Preprint 63-143.)
Journal of Spacecraft and Rockets, vol. 1, May-June 1964, p. 303-310. 7 refs.
[For abstract see Accession no. A63-17473 14-16]

A64-18471
DESIGN CRITERIA FOR A MANNED SPACE-LABORATORY ENVIRONMENTAL-CONTROL SYSTEM.
A. M. Mayo, A. B. Thompson, and G. B. Whisenhunt (Ling-Temco-Vought, Inc., LTV Astronautics Div., Dallas, Tex.).
(American Institute of Aeronautics and Astronautics, and Aerospace Medical Association, Manned Space Laboratory Conference, Los Angeles, Calif., May 2, 1963, Preprint 63-140.)
Journal of Spacecraft and Rockets, vol. 1, May-June 1964, p. 296-302. 20 refs.
[For abstract see Accession no. A63-17480 14-32]

A64-18540
APPLICATION OF H_2-OXIDIZING BACTERIA TO THE REGENERATION OF BREATHING AIR [DIE VERWENDUNG VON H_2-OXYDIERENDEN BAKTERIEN ZUR REGENERIERUNG DER ATEMLUFT].
H. G. Schlegel (Göttingen, Universität, Institut für Mikrobiologie, Göttingen, Germany).
Raumfahrtforschung, vol. 8, Apr.-June 1964, p. 65-67. 19 refs. In German.

Brief consideration of the feasibility of employing hydrogen-consuming bacteria for the reduction of carbon dioxide in closed ecological systems which do not use electrical energy to produce light (for instance, for algae photosynthesis), but for the generation of hydrogen and oxygen by the hydrolysis of water. The characteristics of two such bacteria - Clostridium aceticum (anerobic) and Hydrogenomonas (aerobic) - are discussed. The oxygen generated by hydrolysis would be deposited in the atmosphere and the hydrogen would be channelled to the bacteria, which, in their life process, reduce the excess carbon dioxide formed by breathing. Technical details for the realization of such a system are outlined and diagrams of possible systems are presented.

A64-18573
A TISSUE DOSE OF COSMIC RADIATION RECEIVED BY V.F. BYKOVSKII AND V. V. NIKOLAEVA-TERESHKOVA DURING THEIR JOINT ORBITAL FLIGHT [TKANEVAIA DOZA KOSMICHESKOI RADIATSII, POLUCHENNAIA V. F. BYKOVSKIM I V. V. NIKOLAEVOI-TERESHKOVOI V SOVMESTNOM ORBITAL'NOM POLETE].
I. A. Bochvar, A. A. Vasil'eva, I. B. Keirim-Markus, T. I. Prosina, N. A. Sergeeva, and L. N. Uspenskii.
Kosmicheskie Issledovaniia, vol. 2, Mar.-Apr. 1964, p. 304-306. 6 refs. In Russian.

Presentation of the results of dosimetric measurements on board the Vostok-5 (1963 20A) and Vostok-6 (1963 23A) spaceships. The results are shown to be in agreement with the previous measurements. An upper limit of the neutron flux in the cabins of the spaceships is determined. It is found that these doses are greater by the factor of 2 to 3 at the walls of the cabins than at the centers.

A64-18574
REACTION OF THE CARDIOVASCULAR SYSTEM OF MEN AND ANIMALS UNDER CONDITIONS OF WEIGHTLESSNESS [REAKTSIIA SERDECHNO-SOSUDISTOI SISTEMY CHELOVEKA I ZHIVOTNYKH V USLOVIIAKH NEVESOMOSTI].
R. M. Baevskii and O. G. Gazenko.
Kosmicheskie Issledovaniia, vol. 2, Mar.-Apr. 1964, p. 307-319. 18 refs. In Russian.

Presentation of some of the results of studies on cardiovascular systems of men and animals conducted on board the second and third Earth satellites and the Vostok spaceships. The phasic nature of reactions of the blood circulation system is established. It is shown that stresses on the functional state of heart and vessels are caused by: (1) a decrease in demands imposed by the organism on the cardiovascular system under conditions of weightlessness, and (2) a change in the neural regulation. The results obtained indicate a lowered level of myocardium functioning, and development of an asynchronism in the operation of the right and left sections of the heart. It is concluded that under conditions of weightlessness the tonus of the parasympathetic section of the vegetative nervous system is amplified.

A64-18575
THE EFFECTS OF FLIGHT OF THE VOSTOK-5 AND VOSTOK-6 SPACESHIPS ON THE MICROSPORES TRADESCANTIA PALUDOSA [VLIIANIE FAKTOROV KOSMICHESKOGO POLETA NA KORABLIAKH-SPUTNIKAKH "VOSTOK-5" I "VOSTOK-6" NA MIKROSPORY TRADESKANTIA PALUDOSA].
N. L. Delone, V. F. Bykovskii, V. V. Antipov, G. P. Parfenov, V. G. Vysotskii, and N. A. Rudneva.
Kosmicheskie Issledovaniia, vol. 2, Mar.-Apr. 1964, p. 320-329. In Russian.

Investigation of the effects of prolonged space flights on the microspores tradescantia paludosa. On the basis of an analysis of the experimental data obtained, it is found that three types of change have occurred in the microspores tradescantia paludosa - i.e., reorganization of chromosomes, disruption of the mitosis mechanism, and stimulation of the cellular growth processes. It is assumed that the reorganization of chromosomes is caused by the effects of dynamic factors, while the disruption of the mitosis mechanism is associated with the effects of weightlessness.

A64-18576
DEVELOPMENT OF ORGANISMS IN THE STATE OF WEIGHTLESSNESS [RAZVITIE ORGANIZMOV V SOSTOIANII NEVESOMOSTI].
G. P. Parfenov.
Kosmicheskie Issledovaniia, vol. 2, Mar.-Apr. 1964, p. 330-334. 5 refs. In Russian.

Description of the results of an experimental investigation of the problems of fertilization, multiplication, and development of drosophilas (fruit flies) under conditions of weightlessness. Data are presented on the density of experimental cultures, relation between sexes, presence of morphoses in specimens developing under conditions of weightlessness, and on the frequency of recessive details in their gametes. It is shown that for certain organisms the state of weightlessness has no effect on the fertilization and embryonic development.

A64-18577
THE CAUSES OF DEATH OF DROSOPHILA EMBRYONIC CELLS AFTER THE FLIGHTS OF THE VOSTOK-3 AND VOSTOK-4 SPACESHIPS [PRICHINY LETAL'NOSTI ZARODYSHEVYKH KLETOK U DROZOFILY POSLE POLETOV KOSMICHESKIKH KORABLEI-SPUTNIKOV "VOSTOK-3" I "VOSTOK-4"].
G. P. Parfenov.
Kosmicheskie Issledovaniia, vol. 2, Mar.-Apr. 1964, p. 335-340. 11 refs. In Russian.

Presentation of some of the results of experimental investigations on drosophilas (fruit flies) carried out during the orbital flights of the Vostok-3 and Vostok-4 spaceships. New data on dominant lethal mutations in males are presented, together with data on the frequency of this type of mutations in females. It is found that an increase in the loss of eggs, observed in the virgin drosophila females after being fertilized while on board the spaceships, is caused either by the behavioral factors or by the sterilization of males. The loss of eggs in test females is not caused by the ionising radiation. The loss of eggs under the conditions of space flight is attributed to the effects of temperature shocks.

A64-18624
WASTE-COMBUSTION AND WATER-RECOVERY SYSTEM.
Martin Macklin (Thompson Ramo Wooldridge, Inc., TAPCO Div., Cleveland, Ohio).
Journal of Spacecraft and Rockets, vol. 1, May-June 1964, p. 349-351.

Discussion of a method for the handling of human waste on extended space missions. The system employs a combustor in which the required thermal energy is obtained by burning the organic matter. In the process, the organic matter and bacteria are rendered harmless by conversion to normal combustion products. Fresh water is extracted from the urine and reused.

A64-18628
METHODS AND SOME RESULTS OF MICROBIOLOGICAL INVESTIGATIONS OF METEORITES.
S. S. Abyzov and A. A. Imshenetskii (Academy of Sciences, Moscow, USSR).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 12 p.

Discussion of three methods developed and used to study the origin of bacteria occasionally discovered in microbiological investigations of meteorites. The results obtained with various rock formations and with samples of the Sikhote-Alin iron octahedrite, the Chinge iron otoxite, the Kunashak and the Saratov stone chondrites indicate that, with the exception of the (extremely dense-structure) Chinge iron otoxite, siol bacteria were able to penetrate into the central regions of the meteorites investigated. It is concluded that only meteorites found soon after their fall, such having very dense structure, and possibly meteorites found in Arctic regions are suitable for microbiological analysis.

A64-18630
SATELLITE BIOLOGICAL EXPERIMENTS - MAJOR RESULTS AND PROBLEMS.
N. M. Sisakian, O. G. Gazenko, and V. V. Antipov (Academy of Sciences, Moscow, USSR).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 34 p. 49 refs.

Analysis of basic data obtained from biological experiments on board the spaceships Vostok-5 (1963 20 A) and Vostok-6 (1963 23 A) with: lusogenic culture E. coli K-12 (λ), seeds of wheat, onion, lettuce, carrot, and other higher plants, Tradescantia microspores, different strains of chlorella, fruit flies, and culture of Hella-strain cells. The total radiation dose experienced by the biological specimens was 63 ±10 mrad and 38 ± 7 mrad for Vostok-5 and 6, respectively. The harmful effects of the environment, primarily of cosmic radiation, and the protective effect of β-mercaptopropylamine on lysogenic bacteria are evaluated from induced phage production in experimental and control specimens. An indirect method of analysis employed is described. These results are tabulated together with data concerning: the rearrangements of chromosomes in Tradescantia microspores, the number of cells with disturbances of Mitosis in Tradescantia microspores, the absolute germination of seeds following the flights, the dynamics of sprouting of seeds, and the number of rearrangements of chromosomes in primary rootlets of seeds following the flights. These data are presented separately for each of the spaceships, and are compared with earlier data from the spaceships Vostok-3 (1962 Alpha Mu 1) and Vostok-4 (1962 Alpha Nu 1).

A64-18644
CARBON COMPOUNDS IN TERRESTRIAL SAMPLES AND THE ORGUEIL METEORITE.
W. G. Meinschein (Esso Research and Engineering Co., Linden, N. J.).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 27 p. 63 refs.

Discussion of structural and isotopic determinations of carbon compounds in the Orgueil chondrite, which indicate that these compounds are primarily indigenous. It is stated that benzene-extractable carbonaceous materials from Orgueil fragments and terrestrial sediments have similar chromatographic properties. Infrared and ultraviolet spectra show that they contain compounds of the same functional types. Mass spectrometric analyses of the alkanes from the Orgueil meteorite, sediments, and organisms are statistically indistinguishable at the 95% confidence level. Theoretical considerations and experimental data are presented which support the view that alkanes are well-constituted to serve as indicators of former life. Complex alkanes in living things are structurally and isotopically analogous to hydrocarbons in petroleum. Pristane and phytane are constituents of a crude oil that is more than one billion years old. It is noted that the structures and abundances of many alkanes in various sedimentary environments attest to the source and stability of these compounds. Based on the characteristics and distributions of organic substances on Earth, alkanes may provide the clearest insight into the origin of some carbonaceous substances in chondrites.

A64-18673
RESULTS OF BIOLOGICAL EXPERIMENTS CARRIED OUT UNDER CONDITIONS OF FLIGHT IN SHIPS VOSTOK WITH PARTICIPATION OF COSMONAUTS A. G. NIKOLAYEV, P. R. POPOVICH AND V. F. BYKOVSKY.
V. V. Antipov, N. L. Delone, G. P. Parfyonov, and V. G. Vysotskii (Academy of Sciences, Moscow, USSR).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 11 p. 30 refs.

Discussion of satellite experiments aimed at studying the reproduction processes in Drosophila melanogaster at zero, as well as the effect of the individual flight factors (primarily of weightlessness and cosmic radiation) upon the hereditary structure of the Tradescantia paludosa. The equipment and procedures used in the space laboratories are described. An analysis of the material obtained indicates that the observed rearrangements of chromosomes are caused by dynamic factors associated with the ascent and descent of a spaceship. Weightlessness, however, does not seem to cause chromosome rearrangement.

A64-18680
GULLIVER AND DIOGENES - EXOBIOLOGICAL ANTITHESES.
Gilbert V. Levin and Allen H. Heim (Hazleton Laboratories, Inc., Falls Church, Va.).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 18 p. 7 refs.

Field testing of the Gulliver experiment's ability to detect life in severe natural environments. Three sites, differing sharply in climatology, geology, and pedology, were selected in topographically diverse parts of California. A fourth field test was conducted in Virginia on a hard clay soil containing approximately 15% iron oxides, rich in limonite. The results are stated to have been one or two orders of magnitude higher than those produced by the automated field instruments in a similar period. The second life detection system called Diogenes is said to be based on the firefly bioluminescent reaction and the ubiquity of adenosinetri-phosphate (ATP) in terrestrial life. The light producing steps of the reaction are described. It is noted that the sensitivity, specificity, and rapidity of the test are adaptable to in-flight rocket soundings. As a result, a program has just been started to use the system to obtain microbial ATP profiles of the terrestrial atmosphere during non-recoverable rocket flights. It is stated that, in several aspects, the Gulliver and Diogenes projects are complementary and make good companion experiments.

A64-18740
ULTRA-HIGH AND MICROORGANISMS.
A. A. Imshenetskii and S. V. Lysenko (Academy of Sciences, Moscow, USSR).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 12 p.

Experimental investigation of the effects of ultrahigh vacuum on microorganisms. For 72 hours diverse bacteria and fungi were subjected to the action of ultrahigh vacuum equal to 10^{-8} - 10^{-9} mm Hg. It is stated that seven species of sporogenic bacteria underwent ultrahigh vacuum well. Of seven species of asporogenic bacteria, cells of three species perished completely. In four other species, a considerable number of cells died. Five species of fungi, among which there were both conidium-forming and non-conidium-forming specimens, were found to be very resistant to ultrahigh vacuum. It is noted that, in some experiments, cells of microorganisms retained greater viability in ultra-high vacuum conditions than under laboratory conditions.

A64-18743
ON THE BIOLOGICAL ROLE OF GRAVITY - SOME RESULTS AND PROSPECTS OF SPACE RESEARCH ON SATELLITES AND SPACESHIPS.
O. G. Gazenko and A. A. Gurjian (Academy of Sciences, Dept. of Physiology, Moscow, USSR).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 29 p. 59 refs.

Discussion of the biological effects of prolonged action of changed gravitational conditions: decreased gravity (weightlessness included) and increased gravity (or, equivalent in its biological effect, prolonged action of accelerations). The topics treated include

the biological role of gravity, apprehensions of the possible hazardous biological effect of weightlessness, basic results of the investigation of weightlessness effects upon the organism during spaceflight, the obscurity of the biological effect of weightlessness, the importance of a fundamental biological approach to the study of weightlessness effects, approaches to the study of the biological action of weightlessness, and the effect of prolonged exposure to accelerations upon the development of the organism.

A64-18756
THE NASA BIOSATELLITE PROGRAM.
Dale W. Jenkins (NASA, Washington, D. C.).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 7 p.

Review of the U.S. Biosatellite Program, a second-generation series of experiments designed to study the biological effects of zero gravity and weightlessness; the effects of weightlessness combined with a known source of radiation; and the removal of living organisms from the Earth's rotation. These studies will delineate hazards to astronauts and determine and define effects on degradation of human performance. The experiments are divided into six categories: (1) primates; (2) mammalian (nonprimate); (3) animal, cellular, and egg; (4) plant morphogenesis, photosynthesis, and growth; (5) biorhythm; and (6) radiation. The primate experiments concern cardiovascular studies using implanted catheters, neurological studies with deep brain probes, skeletal calcium loss, effects of weightlessness on urinary and gastro-intestinal systems, and performance.

A64-18801
ON CREATION OF ARTIFICIAL CONDITIONS OF MARS FOR MICROBIOLOGICAL INVESTIGATIONS.
A. I. Zhukova and I. I. Kondratiev (Academy of Sciences, Moscow, USSR).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 9 p.

Approach to the solution of problems regarding the character of life on Mars, by simulating Martian conditions by means of data obtained from astrophysics. Experiments are described in which pure cultures of fungi and bacteria have been used, as listed in a table. Short-time exposure has enabled conclusions on the viability of 22 strains of microorganisms under chamber conditions when the insolation source is switched on. It is concluded that: (1) spores of mold fungi are more stable than spores of bacterial cells, and (2) not all tested forms of microorganisms are capable of retaining viability under conditions imitated in the installation.

A64-18813
REQUIREMENTS OF A MINIMUM FREE LIVING REPLICATING SYSTEM.
Harold J. Morowitz (Yale University, Dept. of Molecular Biology and Biophysics, New Haven, Conn.).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 4 p.

Presentation of a partially inductive approach to the definition of a living system by formulating the features common to terrestrial living systems and seeking the minimum system showing these features. On the basis of ten generalizations, a minimum terrestrial biological system is postulated. It is stated that, in preliminary studies of various strains of living cells, it was found that there were violations of the ten generalizations postulated. The following conclusions are made: (1) extremely small free living cells exist; (2) these cells are capable of metabolizing synthesizing protein, DNA, and RNA, and replicating; and (3) any structure essential to the biological process of replication must be in these cells.

A64-18827
PROCEDURES NECESSARY FOR THE PREVENTION OF PLANETARY CONTAMINATION.
Lawrence B. Hall (NASA, Washington, D. C.) and Carl Bruch (NASA, Office of Space Science and Applications, Washington, D. C.).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 26 p. 42 refs.

Presentation of some of the results of studies of microbial survival in simulated deep-space conditions. It is shown that these conditions will not sterilize contaminated spacecraft, and that many terrestrial microbes, particularly anaerobic spore formers, readily tolerate simulated Martian conditions. The theory and principles of sterilization and their application to the special problem of spacecraft sterilization are discussed and several procedures for the prevention of planetary contaminants are reviewed. It is found that the only processes that achieve both surface and interior sterilization are heat and radiation. If all parts of the spacecraft are assembled under the most rigorous conditions of cleanliness, the capsule can be brought to terminal sterilization containing a total of not more than 10^5 viable organisms. These can be killed by exposure to 135°C for 24 hrs with a confidence of greater than 10^4. The problems associated with designing spacecraft to withstand such heat sterilization without reduction of reliability are also considered.

A64-18837
BACTERIAL ECOLOGIES IN LIMONITE.
W. Vishniac (Rochester, University, Dept. of Biology, Rochester, N. Y.).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence, Italy, May 8-20, 1964, Paper. 4 p.

Discussion of the influence of limonite on the ecology of Martian organisms. The studies made by Dollfus on the polarization of light reflected from Mars at different phase angles have led him to conjecture that the surface of Mars is covered with a layer of limonite. It is felt that iron may serve as a respiratory substrate for Martian microorganisms. In this type of respiration process, the iron serves as the terminal respiratory electron acceptor. Organic matter is consumed, respired, and assimilated, and this series of processes is accompanied by the reduction of ferric iron to ferrous iron. In a balanced ecology, the net effect of respiration is counterbalanced by photosynthesis. It is stated that this latter process would be performed on Mars by photosynthetic bacteria. Experiments that explore the possible existence of terrestrial microorganisms carrying out this type of metabolism are reported.

A64-18845
DETECTION AND IDENTIFICATION OF BIOLOGICALLY SIGNIFICANT COMPOUNDS BY MASS SPECTROMETRY.
K. Biemann (Massachusetts Institute of Technology, Cambridge, Mass.).
COSPAR, Meeting, 7th, and International Space Science Symposium, 5th, Florence Italy, May 8-20, 1964, Paper. 9 p. 8 refs.
Grant No. NsG 211-62.

Identification and determination of the structure of organic molecules of terrestrial natural products by means of mass spectrometry. The structural specificity and data obtainable from a mass spectrum are indicated in a figure which shows the mass spectra of the amino acids, valine, leucine, and isoleucine. Examples are provided which demonstrate to what extent structural information can be obtained by mass spectrometry. It is stated that, for problems of space research, this type of information may be valuable because it is not a "yes" or "no" answer, and the result is not at all dependent on a strict comparison with known systems, because a large amount of experience is presently available for the interpretation of mass spectra. The structure of a number of new amino acids has been determined by mass spectrometry, and two of them were detected unexpectedly in the mass spectrum of complex amino acid mixtures without prior separation.

A64-18853
INTERACTION OF BOUNDARY LAYER FLOW WITH ARTERIAL WALLS.
Heinz Scharfstein, William H. Gutstein, and Leon Lewis (New York Medical College, Pathology Dept., New York, N. Y.).
American Institute of Aeronautics and Astronautics, Annual Meeting, 1st, Washington, D. C., June 29-July 2, 1964, Paper 64-217. 4 p.
Members, $0.50; nonmembers, $1.00.

Experimental investigation of the interaction of a streaming fluid with the walls of the containing vessel, as a clue to the onset of atherosclerosis. The inner surface of cylindrical vessels was coated with suitable materials and water was passed through the tubes under turbulent conditions. An early or preferential removal of the coating at any particular site is interpreted on the basis of conventional boundary-layer theory as presence of excessive shearin stresses at these locations. It is stated that, although for the case of blood flow in arteries, many factors have to be taken into account, including arterial distensibility, the oscillatory nature of flow, and the nonhomogeneity of the fluid, there seems to be no reason why conventional boundary-layer considerations should not apply to the circulatory system.

A64-18865
WASH WATER RECLAMATION FOR EXTENDED DURATION SPACE VOYAGES.
Joseph A. Lubitz, Richard J. Benoit, Harold Wallman, and Thelma E. Adamson (General Dynamics Corp., Electric Boat Div., Research and Development Dept., Chemical Engineering Section, Groton, Conn.).
American Institute of Aeronautics and Astronautics, Annual Meeting, 1st, Washington, D.C., June 29-July 2, 1964, Paper 64-212. 8 p. 14 refs.
Members, $0.50; nonmembers, $1.00.
Contract No. NAS 1-2208.

Determination of the nature and concentration of impurities present in waste water resulting from personal bathing on a space flight of extended duration. Various washing compounds were evaluated and benzalkonium chloride (BAC) was selected because of its detergent and germicidal properties. BAC is also nonvolatile, nontoxic, and nonirritating. Daily sponge bathing using four pints of a 1000-ppm solution of BAC was practiced by two volunteers for several weeks. Laboratory loading tests on charcoal and ion exchange resins were carried out using the waste water to determine effectiveness in removing impurities such as urea and BAC. A multifilter unit was tested and found to be successful in purifying dirty wash water. Chemical, bacterial, and organoleptic results are given. A virus survival experiment was carried out using the multifilter system. It is stated that the filter system completely removed virus added to the feed water.

A64-18877
A PRELIMINARY APPRAISAL OF THE CORNUCOPIA CONCEPT.
C. J. Swet (Johns Hopkins University, Space Development Div., Applied Physics Laboratory, Silver Spring, Md.).
American Institute of Aeronautics and Astronautics, Annual Meeting, 1st, Washington, D.C., June 29-July 2, 1964, Paper 64-213. 8 p. 5 refs.
Members, $0.50; nonmembers, $1.00.

Description of a method for extending the utility of storable rocket propellants to include life support and other essential services in the space environment. The method employs the off-stoichiometric combustion of hydrazine with either hydrogen peroxide or nitrogen tetroxide to produce water, a two-gas atmosphere, thermal management, and power. Each aspect of performance has been examined quantitatively, with some discussion of the assumptions and computational methods. Problems of contamination, safety, and reliability were considered, and various applications of the concept were explored. Although this concept has not been validated experimentally, the potential payoff and the likelihood of feasibility are stated to appear high enough to justify such action.

A64-18878
THE SIGNIFICANCE OF THE RESULTANT VECTOR FROM GRAVITY AND CENTRIFUGAL ACCELERATIONS IN DEFINING HUMAN TOLERANCE TO ROTATION.
Bernard D. Newsom (General Dynamics Corp., General Dynamics/-Astronautics, Life Sciences Section, Aerospace Medicine, San Diego, Calif.).
American Institute of Aeronautics and Astronautics, Annual Meeting, 1st, Washington, D.C., June 29-July 2, 1964, Paper 64-219. 8 p. 16 refs.
Members, $0.50; nonmembers, $1.00.

Experimental determination of human rotation tolerance by means of quantitative tests. It is stated that the use of "Zimmer" myocervical braces seemed to decrease the incidence of nausea even at the very high rotation rates. It has been postulated that illness results from a discrepancy between visual sensations and the abnormal semicircular canal signals resulting from head movements. The five onboard observers tested wore standard neck braces that reduced head movement to 70% of normal. While wearing the braces, none of the observers became ill. This is stated to be in comparison to about 50% illness in forty engineers tested without the collars. A noticeable increase in stomach awareness takes place when the collar is removed. It is noted that this subjective evidence indicates that neck braces may be a possible protective method or one which would allow a more gradual rate of adaptation to prolonged rotation at high angular rates.

A64-18995
SPACE SUITS.
James V. Correale and Walter W. Guy (NASA, Manned Spacecraft Center, Houston, Tex.).
Space World, vol. A-1, Sept.-Oct. 1963, p. 16-18.

Brief consideration of the space suit employed in Project Mercury and that being designed for Project Gemini. It is noted that a main function of the suit for the former project is to provide temperature control by a ventilation distribution system. The system is such that oxygen is led into the suit via a torso-located connector and distributed to the extremities. A percentage of this gas is bled directly to the torso area. All the flow is then returned to the environmental control system through a headpiece connector. Gemini space-suit problem areas are said to be the provision of (1) the thermal protection required in the event of a pad abort and (2) interfaces between suit and ejection seat, which satisfy escape requirements. A partial-wear space suit is shown, in which the headpiece and arm and leg sections of the suit can be removed within the confines of the spacecraft. The ventilation system used here is designed in such a manner that the oxygen enters at the waist into a chamber, is distributed directly to the facial area, arms, and legs, and then exits at the waist.

A64-19008
INDUCTION OF A STEREOSCOPIC DEPTH EFFECT.
Nicholas Pastore (New York, City University, Queens College, New York, N.Y.).
Science, vol. 144, May 15, 1964, p. 888.

Investigation of the effect produced when two pairs of horizontal lines of equal length, with different configurations of dots above and below, are presented stereoscopically. Upon fusion, the two lines are perceived as tilting in space in directions opposite to the depth effects of the dots.

A64-19130
AN ASSESSMENT OF THE CIRCULATORY PROBLEM OF WEIGHTLESSNESS IN PROLONGED SPACE FLIGHT.
Lawrence E. Lamb (USAF, School of Aerospace Medicine, Aerospace Medical Div., Clinical Sciences Div., Brooks AFB, Tex.).
Aerospace Medicine, vol. 35, May 1964, p. 413-419. 34 refs.

Report of observations of post-flight orthostatic intolerance, with a review of the more important basic mechanisms associated with simple syncope or orthostatic intolerance. It has not been proved that weightlessness is responsible for the condition. The majority of experimental work done has involved changes in multiple environmental factors. Multiple instrumentation procedures used during experimental studies complicate the experimental design and nullify interpretation. The procedures are useful in studying syncope but artificially destroy the experimental design in the study of orthostatic tolerance. Tolerance tests in tilt-table procedures are in no way analogous to the transverse g tolerance required for re-entry for most planned, manned, space missions.

A64-19131
CARDIOVASCULAR DECONDITIONING FROM SPACE CABIN SIMULATOR CONFINEMENT.
Lawrence E. Lamb, Robert L. Johnson, Paul M. Stevens, and Billy E. Welch (USAF, School of Aerospace Medicine, Aerospace Medical Div., Environmental Systems Branch, Internal Medicine Dept., Brooks AFB, Tex.).
Aerospace Medicine, vol. 35, May 1964, p. 420-428. 15 refs.

Report of pre- and post-confinement examination of a group of 36 subjects undergoing space-cabin simulator studies. Cardiovascular deconditioning similar to studies noted in bed-rest and other immobilization experiences was observed. It was demonstrated that the prone body position or weightlessness was not necessary to produce the deconditioning. The complications of given chamber environments produced manifestations of cardiovascular deconditioning. Decreased orthostatic tolerance was manifested by an increased incidence of syncope and other effects. Cardiovascular deconditioning in the presence of normal g force can be sufficiently marked so that the influences of g-force diminution cannot be determined without consideration of the influence of physical inactivity. No uncomplicated studies are reported up to this time that clearly demonstrate that weightlessness creates an adverse effect upon the circulatory system.

A64-19132
PROBLEMS IN AIR TRAFFIC MANAGEMENT. IV - COMPARISON OF PRE-EMPLOYMENT, JOB-RELATED EXPERIENCE WITH APTITUDE TESTS AS PREDICTORS OF TRAINING AND JOB PERFORMANCE OF AIR TRAFFIC CONTROL SPECIALISTS.

David K. Trites and Bart B. Cobb (Federal Aviation Agency, Civil Aeromedical Research Institute, Oklahoma City, Okla.).
Aerospace Medicine, vol. 35, May 1964, p. 428-436. 5 refs.

Study of over 700 enroute and terminal air traffic control specialist trainees. It was learned that different kinds of pre-employment, job-related experience had differential value for the prediction of training performance. In general, experience most directly related to air traffic control work was a positive predictor; experience related to communications and piloting was negative. It was also shown that, for enroute trainees only, a composite variable (ΣAT) representing the sum of Tower, GCA, RAPCON/RATCC, and Center experience had a statistically significant, but small, relationship with ratings of job performance. In contrast, aptitude tests were superior to the experience variables for the predictions of all training course performance measures of both types of trainees, with the exception of laboratory performance of terminal trainees. In the latter instance, ΣAT was superior to the tests. For job performance, it was found that only ratings of enroute trainees could be predicted by the tests and that although the tests were superior to experience as predictors, the relationships were small. As determined in other studies, it was again shown that age at entry into training was negatively related to training and job performance and that the negative relationships were greatest with grades in simulated air traffic control work in the training school laboratories. The findings of the study led to the recommendation that selection of individuals for air traffic control specialist training be based upon aptitude tests and pre-employment, job-related experience in Tower, GCA, RAPON/RATCC and Center work.

A64-19133
RADIATION HAZARDS AND MANNED SPACE FLIGHT.
J. Hazel (Royal Victoria Hospital, Montreal, Quebec, Canada).
Aerospace Medicine, vol. 35, May 1964, p. 436-439. 14 refs.

Estimates of dosage levels in areas of cosmic radiation, trapped corpuscular radiation, and radiation due to solar flares. The three types of radiation are outlined. The biological assessment of the radiation is discussed in general terms, and the lack of specific data as to dosage rates and biological effects is pointed out. The problems of tolerance and recovery for chronic exposures to radiation over longer periods of time, as conceivable in space flight, are approached on the basis of (1) clinical situations where total body radiation is given on a fractionated basis, (2) information available from fallout studies, and (3) exposures accepted by radiological workers. The uncertainties and unknowns in the situation are considered to outweigh the facts that can be stated with certainty. Lifetime total body exposures of up to 400 r of penetrating radiation for early space explorers and up to 200 r for future space passengers are suggested as compatible with a reasonable risk of late somatic injury in the present state of knowledge.

A64-19134
SOME NOTES ON THE USE OF SUPEROXIDES IN NON-REGENERATIVE AIR REVITALIZATION SYSTEMS.
A. W. Petrocelli and A. Capotosto, Jr. (General Dynamics Corp., Electric Boat Div., Groton, Conn.).
Aerospace Medicine, vol. 35, May 1964, p. 440-443. 21 refs.

Discussion of nonregenerative systems. It is considered that they provide the most economical and reliable means for maintaining a habitable atmosphere for space missions less than one man-month long. The development of practical air revitalization systems might be achieved by use of multifunctional chemical compounds. Alkali and alkaline earth superoxides are known to have this potential. Based on their inherent possibilities and on actual experiences, a system using them is considered an attractive possibility.

A64-19135
CARDIORESPIRATORY RESPONSES OF ANESTHETIZED DOGS TO COMPRESSION THERAPY FOLLOWING EXPERIMENTAL DECOMPRESSION SICKNESS.
Robert G. McIver and Sidney D. Leverett, Jr. (USAF, School of Aerospace Medicine, Biosystems Research Div., Bioastronautics Dept., Brooks AFB, Tex.).
Aerospace Medicine, vol. 35, May 1964, p. 443-448. 17 refs.

Study of decompression sickness. A special technique was used to produce and recognize the disorder in a laboratory animal. Objective evidence is presented for substantiating the use of compression therapy in the treatment of both caisson and altitude types of decompression sickness. There is suggestive evidence that even very small overpressures may be of benefit in treating or transporting some cases of severe altitude decompression sickness. The importance of rapid recognition and treatment is emphasized, as well as careful scrutiny of all patients who appear to be hyperventilating after decompression, especially those patients with other signs or symptoms of decompression sickness.

A64-19136
ENDOCRINE AND METABOLIC EFFECTS OF SHORT-DURATION HYPEROXIA.
Henry B. Hale, Edgar W. Williams, John E. Anderson, and James P. Ellis, Jr. (USAF, School of Aerospace Medicine, Dept. of Physiology, Brooks AFB, Tex.).
Aerospace Medicine, vol. 35, May 1964, p. 449-451. 15 refs.

Investigation of the effects of breathing 100% oxygen (by mask) at 1-atmosphere ambient pressure for 4 hours on sympathoadrenal, adrenocortical, and metabolic functions in healthy human subjects. Control determinations were made on the same subjects on a separate occasion, the subjects then breathing room air (by mask). Sympathoadrenal activity was appraised by means of urinary epinephrine and norepinephrine determinations; adrenocortical activity was appraised by means of plasma cortisol and urinary 17-hydroxycorticosteroid determinations; and metabolic appraisal was made by means of urinary creatinine, urea, uric acid, phosphate, potassium, and sodium. Evidence of hyperoxia-induced adrenocortical and sympathoadrenal depression was found: plasma cortisol concentration, as well as catecholamine excretion, fell below the control levels. Urine volume also was relatively low, as were urinary sodium and phosphate values. Mask discomfort was shown to be an obscuring factor, since it acted oppositely to hyperoxia in many respects.

A64-19137
THE EEG IN AEROSPACE MEDICINE.
Donald R. Bennett (USAF, School of Aerospace Medicine, Neurology Branch, Neuropsychiatry Dept., Brooks AFB, Tex.) and Roger C. Duvoisin (Wilford Hall USAF Hospital, Lackland AFB, San Antonio, Tex.).
Aerospace Medicine, vol. 35, May 1964, p. 452-458. 38 refs.

Review of the electroencephalogram in aircrew selection. Attempts to correlate flying aptitude with the electroencephalogram have so far been unsuccessful. Although difficulties have arisen in establishing criteria for rejection of apparently normal individuals, the EEG has been shown to have a definite if limited value in screening aircrew men for epilepsy. Those with specific paroxysmal patterns should not be accepted for flying duties whether or not a history of previous episodes of loss of consciousness or seizures can be obtained. Hyperventilation and photic stimulation are useful activating procedures, but convulsive agents such as metrazol have not proved helpful in identifying epileptics. It is stated to be unjustifiable to reject a candidate whose neurological history and examination are normal on the basis of nonspecific EEG abnormalities. In-flight EEG recordings are as yet experimental and their interpretation requires simultaneous recording of other physiological variables including alveolar CO_2 and blood pressure.

A64-19138
ALCOHOL AND GENERAL AVIATION ACCIDENTS.
Charles R. Harper (Federal Aviation Agency, Office of Aviation Medicine, Aeromedical Standards Div., Accident Investigation Branch, Washington, D.C.) and William R. Albers (Federal Aviation Agency, Office of Aviation Medicine, Aeromedical Standards Div., Washington, D.C.).
Aerospace Medicine, vol. 35, May 1964, p. 462-464. 12 refs.

Study of 158 general aviation fatal accidents in which routine toxicological examinations were performed on the pilots. This represents one-third of the total number of general aviation fatal accidents for the year 1963. It was found that 56 of the 158 cases were positive for blood and/or tissue alcohol, representing 35.4% of the total general aviation fatal accidents studied. All classes of airmen and all pilot ratings were found in the positive alcohol group. The incidence of student pilot involvement in this group was found to be almost twice that in the overall fatal accident population. An interesting finding was that almost one-half of the alcohol-positive group crashed within eighteen minutes or less of takeoff. An analysis of total pilot flight time in the positive alcohol group reveals a high incidence of fatal accidents in the low total pilot time range around 300 hours. The positive alcohol group was found to have a night accident rate twice that of the overall fatal accident group.

A much higher incidence of proven alcohol in pilots in fatal general aviation accidents than was previously known is observed. The study is considered to add support to Aksnes' finding that relatively low levels of alcohol adversely affect flying performance. The results are said to show the need for further medical and human factors studies in civil aircraft accident investigations.

A64-19139
THE RELATIONSHIP BETWEEN MATHEMATICS AND PHYSICS AND FLIGHT TRAINING.
Jimmie H. Johnson and Anton S. Morton (U.S. Naval School of Aviation Medicine, Pensacola, Fla.).
(Aerospace Medical Association, Annual Meeting, Los Angeles, Calif., Apr. 30, 1963.)
Aerospace Medicine, vol. 35, May 1964, p. 465-468.

Investigation of possible correlation which, in general, was not found in primary phase flight grades, but was significant in more advanced stages. Field carrier landing practice grades were correlated negatively with final physics grades, and this was the only significant negative correlation found. Mathematics and physics grades were significantly correlated with ground grades in basic and advanced training as had been the case in preflight. Final grades were more highly correlated than were incoming grades with these ground grades. Final overall grade was significantly correlated with all the independent variables. Attrition data showed a similar pattern.

A64-19140
ON POSSIBLE BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
J. L. Ragle (Northrop Corp., Northrop Space Laboratories, Hawthorne, Calif.).
Aerospace Medicine, vol. 35, May 1964, p. 469-471.

Theoretical study. The possibility of observing effects of static magnetic fields on biological entities is considered to be almost negligible at the present time, since laboratory fields are limited to considerably less than a million gauss, and since effects due to unavoidable environmental changes are sufficiently large to mask magnetic effects at lower fields. It is suggested that field effects might profitably first be sought in photobacteria or in algal systems.

A64-19141
INJURY REDUCTION TRENDS IN AGRICULTURAL AVIATION.
Gerard M. Bruggink, Alfred C. Barnes, Jr., and Lee W. Gregg (Flight Safety Foundation, Inc., Aviation Safety Engineering and Research Div., Phoenix, Ariz.).
Aerospace Medicine, vol. 35, May 1964, p. 472-475. 12 refs.
Research supported by Public Health Service and Army.

Report of formulation of certain crash safety design concepts which found their first systematic application in aircraft designed expressly for agricultural use (crop dusting). Available accident experience with these aircraft shows a definite reduction in serious and fatal injuries sustained by accident-involved occupants.

A64-19142
CENTRAL NERVOUS SYSTEM EFFECTS OF CHRONIC EXPOSURE TO ORGANOPHOSPHATE INSECTICIDES.
J. Robert Dille and Paul W. Smith (Civil Aeromedical Research Institute, Oklahoma City, Okla.).
Aerospace Medicine, vol. 35, May 1964, p. 475-478. 7 refs.

Discussion of the toxicity of these compounds. The symptoms of organophosphate poisoning can be divided into two classes, peripheral and central. Two case histories of observed central nervous effects in agricultural pilots are presented. Physicians are becoming alert to acute peripheral signs and symptoms of organophosphate toxicity and recognize them readily. It is now considered to be apparent that they must be watchful for central nervous system symptoms as well.

A64-19143
JET FUEL INTOXICATION.
Nicholas E. Davies (USAF, Dobbins AFB, Ga.).
Aerospace Medicine, vol. 35, May 1964, p. 481, 482. 6 refs.

Description of the effects on a pilot, aged 33 and considerably overweight, who was exposed to an altitude of 18,500 ft in an unpressurized aircraft. After two hours he began to develop symptoms which progressed over one and one-half hours, by which time he had limb and joint pain, tightness of the chest, visual disturbance, headaches, and general weakness. The symptoms improved on descent but he collapsed shortly after landing at the completion of the nine and one-half hour flight. He then developed a migraine-like syndrome. In addition he had skin mottling, haemo concentration, and a raised c.s.f. protein. His condition slowly returned to normal over the following three to four days.

A64-19170
THE EFFECTS OF VIBRATION ON THE WATER METABOLISM.
Ichiro Saito, Masaaki Iwane, Mitsuru Ishizaki, and Sigeyuki Yagura.
Japanese Journal of Aerospace Medicine and Psychology, vol. 1, Nov. 1963, p. 3-10. 20 refs. In Japanese.

Examination of the bodily effects of vertical vibration at 400 cpm and 5-mm amplitude on urine volume, urinary excretion of sodium, potassium, and creatinin in a healthy male subject. The timed urine volume increased moderately during or immediately after the stress, regardless of whether the previous bodily condition was hydrated or dehydrated. Though the sodium concentration curve showed a mirror pattern to the urine volume, the amount of sodium excretion in unit time increased under stress. The potassium excretion showed a similar pattern, but was less than sodium. Creatinin was found to be more stabilized than either electrolyte. These changes are attributed to the variation of the ADH (anti-diuretic hormone) secretion.

A64-19171
THE BIOLOGICAL EFFECTS OF THE CORIOLIS ACCELERATION.
Ichiro Saito, Masaaki Iwane, and Mitsuru Ishizaki.
Japanese Journal of Aerospace Medicine and Psychology, vol. 1, Nov. 1963, p. 11-15. 5 refs. In Japanese.

Results of examination of twelve healthy subjects under coriolis acceleration. Electrocardiograms and plethysmographs were taken and examined for nystagmic eye movement, galvanic skin reflexes (GSR), and blood pressure. The coriolis acceleration was obtained by inclining their heads right and left under a constant force of 1.4 g. Pulse-rate reactions with transient tachycardia were found in most cases, but in a few cases transient bradycardia took place. The maximal blood pressure rose moderately in 11 cases. The GSR appears to correspond to the susceptibility to motion sickness. Nystagmus, contrary to expectations, was noticed in only one case. All subjects experienced positional illusion to some degree. Three cases had nausea. It is considered that these subjective symptoms did not parallel the motion-sickness constitution of each individual.

A64-19172
COLORS OF THE NATURAL BACKGROUND FOR AIRFIELD MARKINGS - SEASONAL CHANGES AT CHITOSE AIRFIELD, HOKKAIDO.
Hiroshi Kansaku.
Japanese Journal of Aerospace Medicine and Psychology, vol. 1, Nov. 1963, p. 16-25. 14 refs. In Japanese.

Investigation of the effect of seasonal changes of natural background colors on the visibility of distance markers. Measurements were made by the visual colorimetry method, using the Munsell Book of Colors. It was determined that visibility of the distance marker varied considerably in fall and winter compared to spring and summer, omitting the snow-covered period. It is considered necessary to establish an optimum background color for distance markers to eliminate the effect of seasonal changes.

A64-19173
ON THE CHANGE OF GAS METABOLISM IN MAN DURING PHYSICAL EXERCISE IN THE LOW PRESSURE ENVIRONMENT.
Ryohei Yurugi, Michihiko Iisuka, and Teruko Akiyama.
Japanese Journal of Aerospace Medicine and Psychology, vol. 1, Nov. 1963, p. 26-32. 6 refs. In Japanese.

Measurement of pulse rate, respiratory rate, respiratory minute volume, oxygen uptake and carbon dioxide output before, during, and after moderate physical exercise combined with mild hypoxia on four healthy adult males who were unacclimatized to low-pressure environment. The tests were carried out on each subject in three modes of load: physical exercise, hypoxia, and hypoxia plus physical exercise. Oxygen uptake during exercise at the simulated altitude was found to be almost the same or slightly decreased as compared with that during exercise at sea level, while respiratory minute volume during exercise did not increase at the simulated altitude as much as at sea level. On the contrary, heart rate during exercise increased markedly at the simulated altitude compared with

that at sea level. It is considered that the compensatory hyperfunction during moderate muscular exercise in mild hypoxic environment occurs mainly in the cardiovascular system, as shown by an increase in heart rate, and the respiratory compensation does not come up to the expectation in these load conditions.

A64-19174
A STUDY ON THE PHYSIOLOGICAL EFFECTS OF HIGHLY OXYGENATED ENVIRONMENT. I.
Hisashi Saiki (Tokyo Jikeikai University, School of Medicine, Dept. of Physiology, Tokyo, Japan).
Japanese Journal of Aerospace Medicine and Psychology, vol. 1, Nov. 1963, p. 33-43. 18 refs. In Japanese.

Investigation of the effects of pure oxygen on mice. The studies were performed at 1 atm, using 53 mice, all of one strain. Survival times of most 4-5-week-old mice were between the 4th and 8th day of exposure to oxygen, after which, with some intervals, the rest expired due to the effects of oxygen within thirteen days. The meann survival times were 8.3 days in the case of normal temperature (10-14°C) and 6.0 days at higher temperatures (27.5-29°C), respectively. Survival times of 8-week-old mice were between the 1st and 12th days of exposure. In this group, there was a peak of death incidence between the 4th and the 8th day. The mean survival time was 5.7 days. Various physiological effects are described. In investigating the dynamic phases of oxygen stress, it is considered reasonable to divide the course into three steps: initial few days, following several days, and the last part of the course.

A64-19489
JET CREW FATIGUE. I.
Richard H. Beck.
Air Line Pilot, vol. 33, Apr. 1964, p. 3-5, 20-22.

Presentation of the salient factors affecting jet air crew members in the performance of their duties. Flight crews are exposed to physiological hazards associated with high speeds and high altitudes, including climatic changes, anoxia, and possible decompression. Jet flight has induced changes in normal physiological rhythms affecting sleep patterns, hours of rest, body temperature, cardiovascular equilibrium, and digestive functions. Exposure to ultrasonic radiation may affect the nervous, muscular, cardiovascular, intestinal, and endocrine systems. In addition, there are the psychological factors of tension, anxiety, and emotion related to jet flight.

A64-19516
ROLE OF STIMULUS FREQUENCY AND DURATION IN THE PHENOMENON OF LOCALIZATION SHIFTS.
Robert A. Butler and Ralph F. Naunton (Chicago, University, Chicago, Ill.).
Acoustical Society of America, Journal, vol. 36, May 1964, p. 917-922. 5 refs.
Contracts No. NB 04508-01; No. 03815-03.

Discussion of experiments designed to clarify the importance of relations between the intensities and frequencies of auditory signals and interference in influencing localization judgments. Subjects are instructed to locate an auditory signal emanating from a concealed loudspeaker while an interference stimulus is being delivered monaurally. The apparent location of the signal presented in the presence of the interference is compared with that recorded in the absence of interference. In the first experiment, the signal frequency is set at either 500, 1000, 2000, 4000, or 8000 cps. The frequency range of the interference stimuli extends from two to three octaves below to an octave above the signal frequency. The apparent location of the signal is displaced toward the side receiving the interference most noticeably when the frequency of the latter is near that of the signal. A displacement effect is, however, exerted by interference stimuli whose frequencies are an octave or more below that of the signal. As the loudness level of the interference is increased, the magnitude of the displacement effect becomes greater. In a second experiment, both the signal and interference consist of random noise, and the signal duration is varied systematically. The displacement effect increases as the signal duration is lengthened from 0.5 to 100 msec.

A64-19517
ACOUSTIC-IMAGE LATERALIZATION JUDGMENTS WITH BINAURAL TONES.
B. M. Sayers (London, University, Imperial College of Science and Technology, Dept. of Electrical Engineering, Engineering in Medicine Laboratory, London, England).
Acoustical Society of America, Journal, vol. 36, May 1964, p. 923-926. 5 refs.

Discussion of experiments on the lateralization of sound images, established by binaural single or multiple tones. It is felt that the concept of sound images, of recognized position in an auditory space, usefully describes relevant auditory experience and that the phenomena concerned can be conveniently parallelled by a correlation-type fusion model. This concept is used to clarify effects such as the occurence of multiple images, discontinuities of lateralization judgments, and the interacting influence of interaural time delay and amplitude difference.

A64-19518
TEMPORAL SUMMATION AND BACKWARD MASKING.
H. N. Wright (Syracuse University, Laboratory of Sensory Communication, Syracuse, N.Y.).
Acoustical Society of America, Journal, vol. 36, May 1964, p. 927-932. 16 refs.
Contract No. NOnr-669(13).

Determination of backward masking as a function of the time interval between the onset of a pure tone and the onset of noise bursts. Transformations based on the theory of temporal summation are used to determine backward masking as a function of the time interval between the onset of a 1000-cps tone and the onset of 40-60-, and 80-db narrow-band noise bursts that partially mask the tone. Under these experimental conditions, backward masking consists of at least three phases: (1) a short phase immediately preceding the onset of the masking sound in which threshold is determined by the level of the masker, (2) a long phase in which threshold is independent of the level of the masker, and (3) a transition phase that lies between the short and long phases. The short phase and the transition phase each last about 25 msec, while the long phase extends from 50 to about 200 msec ahead of the masking sound. The theory of temporal summation is felt to be sufficient for the prediction of threshold differences during the long phase of backward masking, and probably during the short phase also. During the transition phase, however, the threshold for tones does not vary as a function of their duration.

A64-19519
MESSAGE PROBABILITY AND MESSAGE RECEPTION.
Irwin Pollack (Michigan, University, Mental Health Research Institute, Ann Arbor, Mich.).
Acoustical Society of America, Journal, vol. 36, May 1964, p. 937-945. 18 refs.

Comparison of sensory discriminability for expected and unexpected message words. Past studies have shown that high-probability words are associated with higher intelligibility scores than are low-probability words. It is felt that conventional intelligibility measures are biased with respect to differential response probability. The initial finding is, nevertheless, confirmed under typical conditions of intelligibility testing against noise with small, known word sets by intelligibility measures that are felt to be relatively unbiased. These measures are: intelligibility analysis, normalized intelligibility scores, signal-discriminability scores, and informational-uncertainty scores.

A64-19520
LOUDNESS AND DETECTABILITY SCALING OF BANDPASS-FILTERED SHORT TONES.
C. Douglas Creelman (Johns Hopkins University, Dept. of Psychology, Silver Spring, Md.).
Acoustical Society of America, Journal, vol. 36, May 1964, p. 966, 967.
Public Health Service-supported research; Contracts No. Nonr-248(55); No. Nonr-4010(03).

Discussion of loudness-matching, signal-detection, and amplitude-discrimination experiments conducted with filtered short tones. Two observers adjust gated sinusoids, which have been passed throug a bandpass filter and are presented in a noise background, to equal the loudness of unfiltered signals. Bandpass filtering decreases loudness relative to unfiltered signals when duration is less than about 100 msec. Detectability scales are constructed for 5-msec filtered and unfiltered signals presented in continuous noise, and their merit is discussed. Some theoretical implications of the data are considered.

A64-19521
MEASUREMENT OF THE CONDITIONED EYELID REFLEX.
H. S. Pennypacker (Florida, University, Dept. of Psychology, Gainesville, Fla.).
Science, vol. 144, June 5, 1964, p. 1248, 1249.
USPHS Grant No. M 5063.

Measurement of the frequency, amplitude, latency, and magnitude of the conditioned eyelid reflex. The magnitude of the conditioned eyelid reflex is defined as the integral of the amplitude over the time interval of the blink. This measure is felt to be significantly related to the conventional measures of frequency, latency, and amplitude, but exhibits variance of its own which appears to reflect its greater sensitivity to the physiological processes underlying the blink.

A64-19526
COMBINATION OF INFORMATION IN SUPERIMPOSED VISUAL FIELDS.
J. M. Naish (Ministry of Aviation, Royal Aircraft Establishment, Farnborough, Hants., England).
Nature, vol. 202, May 16, 1964, p. 641-646. 9 refs.

Investigation of the influence of position and form on combined information in superimposed visual fields. The results are summarized by treating superimposed fields as a single field of visual information. This process is aided by the use of a common field position and comfortable presentation within a common framework. It is stated that, in the aeronautical application, a reflecting collimator may be used (with relevance to safety) to present steering information during visual flight and improved tracking accuracy. Application is also possible, in principle, to televised presentation of superimposed fields. It is noted that errors and limitations have also been studied and the results do not influence the findings of this investigation.

A64-19573
THE ROLE OF AFTERIMAGES IN DARK ADAPTATION.
H. B. Barlow and J. M. B. Sparrock (Physiological Laboratory, Cambridge, England).
Science, vol. 144, June 12, 1964, p. 1309-1314. 17 refs.
Research supported by Medical Research Council, London.

Investigation of the relation between the neural and photochemical parts of dark adaptation. When the photosensitive pigments in a patch of retina are bleached, the threshold is elevated for 30 min or more, and the subject is aware of a continuing sensation of light from this region. This positive after-image was matched by a stabilized image in an adjacent retinal region. The threshold was found to be the same for light falling on the after-image and for light added to a stabilized image of matching luminance. Thus, the threshold during dark adaptation is the increment threshold against the background of the positive after-image. It is concluded that the elevation of threshold associated with bleaching is due to a spurious disturbance or "noise" generated in the receptors and that reduction in the fraction of the quanta absorbed is comparatively unimportant. This noise is not normally obvious because after-images fade like stabilized images. There are indications that fading results from a feedback process similar to an "automatic brightness control."

A64-19800
JET CREW FATIGUE. II.
Richard H. Beck (Trans World Airlines, Inc., Kansas City, Mo.)
Air Line Pilot, vol. 33, May 1964, p. 3-7, 21-23.

Discussion of factors affecting jet crew efficiency. Visual difficulties inducing fatigue arise from various causes associated with altitude and hypoxia. Excessive smoking has the effect of raising the apparent altitude at which the crew member is working. Jet flight may contribute to atherosclerosis and heart disorders to an extent not definitely proven as yet. Colds impair judgment and reduce physical performance with possible permanent ear damage. Noise and vibration contribute to fatigue. The toxic effect of ozone is not a serious factor at present, but will pose an exposure problem at altitudes at which future supersonic transports will fly. Other factors affecting jet crew fatigue are extremes of temperature and humidity, workloads and increased responsibility, intensified inspections of pilot personnel, personal problems, and apprehension. Fatigue produces a willingness to accept lower standards of accuracy and performance, which may create conditions of reduced safety.

A64-19803
THE ROLE OF THE TEST PILOT.
A. W. Bedford (Hawker Siddeley Aviation, Ltd., Hawker Blackburn Div., Kingston-upon-Thames, Surrey, England).
(Royal Aeronautical Society, Test Pilots' Group, Inaugural Lecture, England, Apr. 16, 1964.)
Royal Aeronautical Society, Journal, vol. 68, June 1964, p. 383-388; Discussion, p. 388-390.

Review of the origins of test piloting, the test pilot's task, the standard of acceptance, and ways to improve the standard. A test pilot, it is considered, should understand general theory and be trained in it. He should maintain an up-to-date knowledge of all theory that concerns his work. The comment is made that a test pilot is, in effect, an efficient and inexpensive computer. His capacity to make qualitative assessments is stressed. Air traffic problems as they affect areas available for test flying are treated. It is considered that continued development of all phases of manned flight will assure the future of test piloting in the atmosphere and in space.

LC ENTRIES

A64-80349
POISON DETECTION IN HUMAN ORGANS.
Alan S. Curry (Home Office Forensic Sci. Lab., Harrogate, England).
Springfield, Ill., Charles C. Thomas, 1963, xxi+150 p. $6.75.

A complete review is presented of toxicological methods for the detection of poisons in humans. Urine, blood, and organ analyses are given for fluorides, halogenated hydrocarbons, carbon monoxide, and borates which are toxic compounds of interest in aerospace medicine.

A64-80350
THE PROBLEM OF TIME DILATATION IN SPACE FLIGHT [DAS PROBLEM DER ZEITDEHNUNG IN DER WELTRAUMFAHRT].
Hans Seitz.
Sterne und Weltraum, vol. 3, Feb. 1964, p. 38–39.

A discussion is presented of the mathematical concepts of time, space, and relative motion and their implications for space travelers. The Einstein theories of general and special relativity are briefly explained, and the possibility of an effect on the speed of aging at various stages of space flight is discussed. By application of the same concepts to the physiological process of blood circulation, it is shown that the conditions necessary for time dilatation would probably be incompatible with life.

A64-80351
A SENSORY-PHYSIOLOGICAL PROBLEM IN CONNECTION WITH SPACE FLIGHT, WITH PARTICULAR REFERENCE TO THE VESTIBULAR NERVE [NAGRA SINNESFYSIOLOGISKA PROBLEM I SAMBAND MED RYMDFARDER MED SARSKILD HANSYN TILL NERVUS VESTIBULARIS].
Carl-Johan Clemedson (Göteborgs U. Inst. för Hyg., Göteborg, Sweden).
Svenska Läkartidningen, vol. 60, Oct. 1963, p. 2862–2879. 38 refs.
In Swedish.

Vestibular problems that may arise in space flight are analyzed on the basis of experience with experimental simulation of space stresses and with weightlessness produced by parabolic jet flights. The discussion covers the functions of otoliths, semicircular canals, utricle and saccule, the effects of artificially created gravity on equilibrium and perception, and coriolis phenomena anticipated under these circumstances.

A64-80352
CARDIOCIRCULATORY CHANGES INDUCED BY DRUGS AT REST AND DURING EXERCISE [MODIFICATIONS CARDIO-CIRCULATOIRES SURVENANT AU REPOS ET A L'EFFORT SOUS L'INFLUENCE DES AGENTS DU DOPING].
M. Segers, J. J. S'Jongers, and L. Lewillie.
Actualités Cardiologiques et Angéiologiques Internationales, vol. 12, 1963, p. 195–204. 39 refs. In French.

Studies were made of the cardiovascular effects of various drugs in 10 subjects at rest, during 30 minutes of submaximal exercise (100 watts), and 5 minutes of maximal exercise (200 watts) on a bicycle ergometer. Administration of a dextrorotatory amphetamine produced increases in cardiac and respiratory frequency, increases in blood pressure and oxygen consumption during exercise, and an increase in the coefficient of oxygen utilization at rest, with a decrease during exercise. Sodium and potassium aspartate increased respiratory frequency during exercise, decreased oxygen consumption at rest, and increased the coefficient of oxygen utilization. Meprobamate administration resulted in decreases in blood pressure and oxygen consumption, and a decrease in the coefficient of oxygen utilization during exercise, with a marked increase during recovery. Respiratory frequency was increased after administration of a placebo, and oxygen consumption and oxygen utilization were decreased. Ethyl alcohol (whiskey) produced an increase in respiratory frequency, a decrease in oxygen consumption, and a decrease in the coefficient of oxygen utilization at rest and during exercise, with an increase during recovery. Only amphetamine produced significant changes in the electrocardiogram. It is concluded that all the drugs studied had both favorable and unfavorable cardiovascular effects during exercise, but that meprobamate was the least harmful, and amphetamine the most harmful.

A64-80353
ON THE APPLICATION OF RADIOTELEMETRY IN STUDIES OF THE PHYSIOLOGY OF WORK AND SPORT ACTIVITIES [O PRIMENENII RADIOTELEMETRII V ISSLEDOVANIIAKH PO FIZIOLOGII TRUDA I SPORTA].
V. V. Rozenblat.
Vestnik Akademii Meditsinskikh Nauk SSSR, vol. 19, no. 2, 1964, p. 66–71.
In Russian.

The development of physiological telemetry by Russian scientists is reviewed briefly. Approximately 50 types of radiotelemetry devices have been developed in the last 8 years. This group includes fifteen transmitter types including semiconductor devices weighing less than 100 g., of which the KRP transmitter has been extensively modified for the recording of physiological data. Radiotelemetric investigations have been employed for gathering voluminous data from athletes on typical reactions during physical exercises and on the onset of fatigue. Studies of respiratory functions during physical stress have provided a better understanding of various changes accompanying increased pulmonary ventilation. Electrocardiographic studies of athletes reveal that the changes found are typical of individuals engaged in intensive muscular exertion. Radiotelemetry is regarded as a valuable tool for formulation of more precise physiological criteria in sports and for estimates of physical capacity.

A64-80354
THE LIMITS OF LIFE.
Peter H. A. Sneath (Med. Res. Council, Natl. Inst. for Med. Res., Mill Hill, London, England).
Discovery, vol. 25, Apr. 1964, p. 20–24.

The possibility that microorganisms could survive space travel and multiply on some other planet is discussed. The discussion includes possible effects of various temperatures, water supplies, energy supplies, acidity and alkalinity, and radiation on various organisms, including algae, bacteria, molds, and lichens. Evidence is presented suggesting that bacteria present in rockets would be protected by the cold, shielded from radiation, and not die in contaminated spaces in any reasonable time period. Possible planetary environments, including those of the Moon, Mars, Mercury, Jupiter, and Saturn, are described. Of these, Mars seems to be the most promising as a sustainer of life. Recent work has shown that many terrestrial bacteria can grow quite well in an environment similar to that of Mars. The bacteria grow when warmed, and become dormant when cooled. Terrestrial organisms most likely to be troublesome as planetary contaminants include: (1) sporing bacteria, which are long-lived and resistant to heat; (2) chemoautotrophic bacteria, which use unusual energy sources; (3) molds, which have small food requirements and are tolerant of desiccation; and (4) algae and lichens, which are hardy and versatile. The reverse danger of contaminating the earth with extraterrestrial organisms is also discussed, together with possible means of disinfecting rockets.

A64-80355
REGULATION OF RESPIRATION AND CIRCULATION BY THE OXYGEN TENSION IN THE MIXED VENOUS BLOOD [REGULATION VON ATMUNG UND KREISLAUF DURCH DEN O_2-DRUCK IM VENOSEN MISCHBLUT].
P. Hilpert (Tübingen U., Med. Klinik, Tübingen, Germany), D. Schlosser, K. Barbey, and H. Bartels (Tübingen U., Physiol. Inst., Tübingen, Germany).
Pflügers Archiv für die Gesamte Physiologie, vol. 279, Mar. 1964, p. 1–16. 28 refs. In German.

The role of the oxygen tension in mixed venous blood in the cardiac and respiratory control was explored. Hypoxemia which was confined to the right heart and to the pulmonary artery was produced by injection of sodium dithionite ($Na_2S_2O_4$) in the vena cava just before the right heart. The dithionite injection (5 ml/min) increased the oxygen uptake by 60%. Eight unanesthesized goats were studied in 22 experiments. Oxygen uptake, blood pressure, ventilation, cardiac output, and blood gas composition were determined before and during the sodium dithionite injection. Cardiac output was increased by 50%, and ventilation by 70% during the sodium dithionite injection. The changes of oxygen and carbon dioxide concentration and pressure in the arterial blood were so small that the activity of the arterial chemoreceptors most likely remained unchanged during the procedure. It is concluded that the oxygen tension in the mixed venous blood is a controlling factor of cardiac output and ventilation.

A64-80356
REACTION TIME AND ALPHA BLOCKING IN NORMAL AND SEVERELY SUBNORMAL SUBJECTS.
Beate M. Hermelin and P. H. Venables (Med. Res. Council Unit, Inst. of Psychiat., London, England).
Journal of Experimental Psychology, vol. 67, Apr. 1964, p. 365–372. 8 refs.

It has been suggested that stimuli falling into a period of blocked alpha rhythm result in faster reaction times (RT) than those which fall into a period when the alpha is present in the electroencephalogram. An experiment is described in which the interval between a warning signal and the reaction-time stimulus was varied irregularly. Thus, some RT responses were given when the alpha was still blocked by the forewarning, while for others the alpha had returned. The use of six normal subjects, six non-Mongol imbeciles, and six Mongol imbeciles was expected to elicit additional information, since alpha blocking has been found shorter in defectives. The results did not confirm the above hypothesis. The failure of the present experiment to relate electroencephalographic activity to RT may be due to the use of visual rather than auditory stimuli.

A64-80357
ADAPTATION IN THE PERCEPTION OF ROTARY MOTION.
I. Rapoport (Psychological Inst., Uppsala, Sweden).

Journal of Experimental Psychology, vol. 67, Mar. 1964, p. 263–267. 7 refs.
PHS Fellowship-MPD 15,590.

The effect of adaptation to a rotating pattern on speed ratings of the pattern was studied using a stimulus known to give a clear negative aftereffect of motion when tested on the stationary condition. A standard speed was presented for every rating. When the test speed was the same or less than adaptation speed and in the same direction, test speed was rated less than control speed. When the test speed was greater than adaptation speed, then the test speed was rated relatively higher. When adaptation and test speeds were in opposite directions, the results were not clear; however, some aftereffects appeared to be negative and some positive. These results only partially support the hypothesis that adaptation produces a negative shift along the subjective stimulus continuum.

A64-80358

AUDITORY AND VISUAL TIME JUDGMENT.

Sanford Goldstone and Joyce Levis Goldfarb (Baylor U., Coll. of Med. and Houston State Psychiat. Inst., Tex.)

Journal of General Psychology, vol. 70, Apr. 1964, p. 369–387. 15 refs.
Grant PHS-G-1121. Hogg Foundation-supported research.

Six experiments employing 740 subjects studied the difference between auditory and visual time judgment under a variety of contextual alterations (pitch, intensity, color, and brightness). Auditory durations were judged longer than visual durations regardless of the alterations. Auditory durations acted as long anchors upon visual judgments, and visual durations acted as short anchors upon auditory judgments, conforming to the basic intermodal difference. Auditory and visual durations judged in terms of the social standard (clock-second) were estimated as longer than those judged in terms of the subjective standard (longness-shortness). Long and short anchor durations exerted a similar "pulling effect" upon judgments via both modes and standards, although there was a greater perseverative effect of a previous alternate anchor with audition. Long- and short-series ranges influenced judgment similarly for both modes. There was a greater perseverative effect of a previous alternate range with the social standard, and the immediate series exerted a greater effect with the subjective standard. Pitch and intensity of the auditory durations, and color of the visual durations, had no effect on temporal judgment. Brighter lights were judged longer than dimmer lights.

A64-80359

IN VIVO STUDY OF THE OXYGEN TENSION IN THE BRAIN TISSUES DURING PROLONGED ACCELERATION.

E. A. Kovalenko, V. L. Popkov, and I. N. Cherniakov.

(Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 55, Jan. 1963, p. 43–48. In Russian).
Bulletin of Experimental Biology and Medicine, vol. 55, Mar. 1964, p. 37–40. 19 refs. Translation.

[For abstract see Accession no. A64-80043]

A64-80360

THE EFFECT OF ULTRASOUND AND TEMPERATURE ON THE COLLOID PROPERTIES OF HUMAN SERUM.

F. S. Okolov, S. Kh. Nikolov, R. F. Ivanov, V. I. Kopeikin, and V. A. Poddubnaia.

(Biulleten' Eksperimental'noi Bioligii i Meditsiny, vol. 55, Feb. 1963, p. 53–55. In Russian).
Bulletin of Experimental Biology and Medicine, vol. 55, Mar. 1964, p. 163–165. Translation.

Concentration of protein, coagulation time of serum at 62° C. (after F. S. Okolov, 1947), and viscosity (after Hess) were determined for the assessment of changes occurring in the serum under the influence of ultrasound. The action of ultrasound, with due consideration of the temperature, does not cause any changes in the properties of the serum, if the temperature of the serum is less than 56° C. Only when the temperature increases up to 62° C., can the effect of ultrasonic vibrations be shown. In this case an accelerated coagulation of serum accompanied by syneresis is observed.

A64-80361

THE RELATIONSHIP BETWEEN PSYCHOLOGICAL AND PHYSIOLOGICAL RESPONSE TO STRESS.

Arnold M. Mordkoff (Okla. U., Med. Center, Dept. of Psychiat., Neurol., & Behavioral Sci., Okla. City).

Psychosomatic Medicine, vol. 26, Mar.–Apr. 1964, p. 135–150. 21 refs.
Grant PHS-G-MH-01236; Fellowship MF-13,022.

The relationship between physiological and psychological response to stress, and the conditions under which the degree of relationship could be altered were studied. An intraindividual methodology was employed in which reports of psychological experience were obtained during a stressor film stimulus in a fashion analogous to the continuous measurement of physiological response. The conditions under which subjects made phenomenal reports were systematically varied within a 3 x 24 factorial design. A substantial relationship was obtained between physiological response and psychological experience. The various physiological variables (skin resistance, heart rate, and respiration) demonstrated differential correspondence to the ratings of psychological impact. The degree of relationship between psychological and physiological response, quantified by multiple regression analyses of the responses of each subject, was remarkably stable in the face of the experimental variations introduced in the experiment.

A64-80362

ULTRASTRUCTURAL ALTERATIONS INDUCED IN E. COLI B BY GRAVITY.

P. O'B. Montgomery, Betty Neumeyer, and Eugene Rosenblum (Texas U., Southwestern Med. School, Depts. of Pathol. & Bacteriol., Austin).

Aerospace Medicine, vol. 35, Apr. 1964, p. 360–361.
Grant NsG-210-63; Damon Runyon Mem. Fund Grant DRG-355E.

Bacterial cells subjected to gravitational fields of 110,000 g for 24 hours were examined by electron microscopy and cells so treated appear larger than control cells. The enlargement appears to be due to an overall enlargement of the cell with hypertrophy of some of the intracellular components. The possibilities that these observations are due to a dissociation between cell growth and cell division, and that they may represent genetic changes, are considered.

A64-80363

STUDIES ON BINAURAL HEARING UNDER THE INFLUENCE OF INTERFERING NOISE: A CONTRIBUTION TO THE CENTRAL NERVOUS PROCESSING OF ACOUSTIC INFORMATION [UNTERSUCHUNGEN UBER DAS BINAURALE HOREN UNTER EINWIRKUNG VON STORGERAUSCH: EIN BEITRAG ZUR ZENTRALNERVOSEN VERARBEITUNG AKUSTISCHER INFORMATIONEN].

Harald Feldmann (Heidelberg U., Hals-Nasen-Ohren-Klinik, Heidelberg, Germany).

Archiv für Ohren-Nasen-und Kehlkopfheilkunde, vol. 181, 1963, p. 337–374. 28 refs. In German.

Studies were made of the effect of interaural differences in the time and intensity of sound presentation on speech discrimination and signal perception in noise. The intelligibility of monaurally presented speech in noise was significantly improved when the same noise was presented without speech in the contralateral ear. The improvement in intelligibility was increased as the intensity of noise in the contralateral ear was increased (to a maximum intensity 10 to 20 decibels above that in the test ear). When speech was mixed with noise in both ears, intelligibility decreased to the level associated with monaural presentation, but intelligibility was increased by an interaural time difference for either speech or noise. The binaural phenomena were not observed when different noise bands were presented in each ear.

A64-80364

EFFECT OF THE RELATIVE FREQUENCY OF SIGNALS ON REACTION TIME (VLIIANIE NA OTNOSITELNATA CHESTOTA NA SIGNALITE VURKHU REAKTSIONNOTO VREME).

V. Bakalska and A. Angelov.

Bulgarska Akademiia na Naukite, Izvestiia na Instituta po Fiziologiia, vol. 6, 1963, p. 109–114. 5 refs. In Bulgarian.

A series of measurements were made of reaction times to a red flash in a two-choice situation. The probability of the red signal was varied from 1/4, to 1/2 and to 3/4. A linear correlation was established between reaction time to the red signal and the amount of information in this signal. The curve for one of the four subjects who participated in this experiment deviated from linearity. The question of a dependence of the form of the relation between reaction time and the exact amount of information on the range within which this information varies, is discussed.

A64-80365

CORTICAL AND SUBCORTICAL RESPONSES TO HYPOTHERMIA.

L. C. Massopust, Jr., M. S. Albin, H. W. Barnes, R. Meder, and H. W. Kretchmer (Cleveland Psychiat. Inst., Depts. of Neurophysiol. & Neurochem; and Western Reserve U., School of Med., Cleveland, Ohio).

Experimental Neurology, vol. 9, Mar. 1964, p. 249–261. 21 refs.
Grant NIH-G-NB-04582-01.

The purpose of this study was to compare the effects of induced hypothermia on cortical and subcortical spontaneous electrical activity under two barbiturates and one muscle relaxant. Cats with cortically and subcortically implanted recording electrodes were given either sodium pentobarbital, sodium thiamylal, or gallamine triethiodide, and hypothermia was induced by means of subtotal body cooling. Under the barbiturates, cortical and subcortical slow-wave activity was preserved until low intracerebral temperatures had been reached, at which time all activity tended to become isoelectric. However, under the muscle relaxant, cortical low-voltage fast activity was present at a readable level at low intracerebral temperatures. The most striking finding was the preservation of anterior reticular-formation activity at an excellent level at low intracerebral temperatures. It was the last brain stem region affected by hypothermia and the first to fully recover its precooling level of activity.

A64-80366
ASSESSMENT OF THE OCCUPATIONAL CHARACTER OF LEUKEMIAS IN PERSONS EXPOSED TO BENZENE [POSUZOVANI PROFESIONALITY LEUKEMII U OSOB EXPONOVANYCH BENZENU].
Alois David (Karlova U., Fakulta Všeobecného Lékarstvi, Prague, Czechoslovakia).
Pracovní Lékařství, vol. 16, Jan. 1964, p. 31–33. 75 refs. In Czech.

Neither experimental nor statistical evidence has been found of the development of leukemia after exposure to benzene. To the contrary, some work provides evidence against this assumption. However, clinical observations suggest that benzene may cause the development of myeloid leukemias, erythroleukemia, or other myeloproliferative syndromes, but most probably only in the case of a previous panmyelopathy caused by benzene, which is a preleukemic condition. Leukemia not preceded by inhibition of the bone marrow can hardly be considered as occupational. The occupational character should be evaluated according to general criteria of tumors, i.e., sufficiently long exposure (about 5 years) and adequately extensive (concentration of benzene in atmosphere about 200 milligrams per cubic meter of air). Lymphatic leukemia most probably is not caused by the action of benzene.

A64-80367
MORPHOLOGIC AND HISTOCHEMICAL CHANGES IN THE CEREBRAL NERVE CELLS OF GUINEA PIGS EVOKED BY LOUD NOISE I. MORPHOLOGIC CHANGES.
Józef Tarmas and Jan Grzesik (Silesian School of Med., Dept. of Normal Anatomy, Zabrze-Rokitnica, Poland).
Archivum Immunologiae et Therapiae Experimentalis, vol. 11, 1963, p. 664–670.

Exposure of guinea pigs to white noise of a frequency of 100–50,000 c.p.s. and an intensity of 160 db resulted in morphologic changes in the form of tigrolysis and cytoplasmic vacuolization of the neurocytes of some of the nuclei of the brainstem. The changes were greatest in the cochlear nuclei, and less marked in the nuclei of the reticular formation, ambiguous nuclei, nuclei of the solitary tract, and dorsal motor nuclei of the vagus nerve. Changes were frequently present also in the neurocytes of the superior olivary, lateral lemniscal, trapezoid, and inferior collicular nuclei. The type of acoustic stimulation which was applied did not produce any perceptible alterations in the auditory area of the cerebral cortex. Administration of vitamin B_1 to the animals exposed to such sound stimuli did not appear to have any influence on the morphologic changes in the nuclei studied.

A64-80368
ATOM TO ADAM.
Melvin Calvin and G. J. Calvin (Calif. U., Dept. of Chemistry, Lawrence Radiation Lab., Berkeley).
Proceedings of the American Philosophical Society, vol. 108, Apr. 15, 1964, p. 73–87. 43 refs.

A hypothetical scheme is presented for the development of living cells from primeval nonliving matter. Experimental reconstructions of the formation of cellular chemical structures from molecules present in the primeval atmosphere of the earth are also discussed. The scheme consists of the development of proteins, nucleic acids, and sugars from molecular hydrogen, methane, ammonia, and water, and includes (1) the construction of mononucleotides by the random supply of energy to primeval molecules, (2) combination of bifunctional molecules by a dehydration reaction into polymers (particularly nucleic acids and proteins) containing the necessary elements for the transfer of energy and information essential to life, and (3) the development of visible macromolecules such as collagen filaments which may be the inherent ultimate resultant of the primary polymer structure.

A64-80369
SOME OBSERVATIONS OF NOISE AT AIRPORTS AND IN THE SURROUNDING COMMUNITY.
Alexander Cohen and Howard E. Ayer (U.S. Dept. of Health, Education and Welfare, Public Health Service, Div. of Occupational Health, Cincinnati, Ohio).
Industrial Hygiene Journal, vol. 25, Mar.–Apr. 1964, p. 139–150. 15 refs.

Results of two airport noise studies are reported with specific attention being given to an evaluation of: (a) the noise conditions found in different airport working environments, (b) the relationship between hearing losses of airport workers and their occupational noise exposure, and (c) the community noise exposure associated with aircraft activity. Noise conditions in the ramp areas and in the jet and propeller engine test cells reached the highest observed levels and were believed hazardous to hearing. The audiometric data of unprotected airport employees having a history of excessive exposure to operational aircraft noise showed greater hearing losses than those reported for a comparable group of persons with minimal noise exposure. Measurements of flyover noise in areas surrounding an airport indicated the flyovers of jet aircraft to be more intense, more disruptive of speech, and more annoying than that of piston engine aircraft.

A64-80370
THE BEHAVIOR OF THE SWEAT REACTION UNDER INTENSIVE PHYSICAL STRESS [DAS VERHALTEN DER SCHWEISSREAKTION UNTER INTENSIVER KORPERLICHER BELASTUNG].
Horst Brenke and Siegfried Israel (Deutsche Hochschule für Körperkultur, Inst. fur Sportmedizin, Leipzig, Germany).
Theorie und Praxis der Körperkultur, vol. 12, Oct. 1963, p. 912–915. In German.

Measurements of the pH value of forehead sweat were made with pH paper in 250 athletes during a 10-minute period of 200–400 watt work on a bicycle ergometer. Sweat pH invariably showed a significant increase during exercise. The pH value of sweat was also increased progressively during 300-meter runs performed at 15-minute intervals. The sweat pH value of athletes specializing in endurance sports was greater than that of other athletes. Large interindividual differences were observed in sweat pH, but there was no apparent effect of age or sex. No change was observed in the pH of saliva during exercise.

A64-80371
THE ORGIN OF OIL—AND LIFE.
P. Sylvester-Bradley.
Discovery, vol. 25, May 1964, p. 37–42.

Chemical and geological evidence suggesting a polygenetic origin of oil, including biogenic and abiogenic, is presented. The amount of oil formed by either of these two processes individually is not known. However, the subject has already made an impact on the question of how the first living things arose from an inorganic medium. The first forms of life almost certainly appeared on the earth between 2,000 and 3,000 million years ago. As the earth itself was formed about 4,000 million years ago, there must have been a period of at least 1,500 million years during which all the earth's carbon was abiogenic. It could have occurred—as it does today—in three forms: as a native element, such as diamond; in the reduced condition, such as methane; and in an oxidized condition, such as carbon dioxide. Experiments have produced these latter two atmospheres in the laboratory. When such mixtures are irradiated with ultraviolet light, or subjected to electric spark discharges, organic compounds are synthesized from those with a reducing atmosphere, but not those with an oxidizing one. As these organic compounds contain amino acids and bases such as pyrimidines, the discovery of how life first originated appears near. However, finding answers to these problems still remain: (1) energy supply for organic synthesis before chlorophyll existed, (2) formation of life without a process of organic concentration, and (3) catalytic agent for the first compounds of life.

A64-80372
THE INFLUENCING OF AUDITORY ADAPTATION BY STIMULATION OF THE OPPOSITE EAR [DIE BEEINFLUSSUNG DER GEHORADAPTATION DURCH GEGENOHRBESCHALLUNG].
Horst Burghoff (Kiel U., Lehrstuhl für angewandte Physiol., Germany).
Archiv für Ohren- Nasen- und Kehlkopfheilkunde, vol. 181, 1963, p. 437–446. 32 refs. In German.

Experiments were conducted to determine the effects of contralateral auditory stimulation on monaural adaptation to noise exposure. Monaural hearing loss and recovery time were measured audiometrically after stimulation of the test ear for 3 minutes with 80 decibel tones at frequencies ranging from 500 to 4000 c.p.s. Contralateral stimulation with a broadband noise at 30 or 40 db. was found to decrease hearing loss and recovery time. The effect on hearing loss was greater with the more intensive contralateral noise stimulus. Stimulation of the contralateral ear with sinus tones revealed that tones closest in frequency to the test tone had the greatest effect on hearing loss. Contralateral noise stimulation was also found to decrease the masking effect of noise presented in the test ear, and the effect was greater with increasing intensity of contralateral noise.

A64-80373
NEW DATA ON THE PHYSIOLOGY OF THE LABYRINTH: ROTATIONAL STIMULUS THRESHOLDS OF THE VERTICAL SEMICIRCULAR CANALS [NEUES ZUR LABYRINTHPHYSIOLOGIE: DIE DREHREIZSCHWELLEN DER VERTIKALEN BOGENGANGE].
H. Decher (Bonn U., Klinik für Hals- Nasen- und Ohrenkranke, Germany).
Archiv für Ohren- Nasen- und Kehlkopfheilkunde, vol. 181, 1963, p. 395–407. 36 refs. In German.

Rotational stimulus thresholds of the vertical semicircular canals were determined by electro- and photoelectronystagmography in 31 subjects. The most satisfactory results were obtained with subjects in the horizontal position. Stimulus thresholds for the vertical canals were found to be more than twice the threshold values for the horizontal canals.

A64-80374
THE EFFECT OF VARIOUS STIMULUS PARAMETERS ON THE SURVIVAL AND RECOVERY TIMES OF THE ELECTRORETINOGRAM [DER EINFLUSS VERSCHIEDENER REIZPARAMETER AUF UBERLEBENS- UND ERHOLUNGSZEIT DES ERG].
J. Böck, H. Bornschein, and K. Hommer (Wien U., Physiol. Inst., and Wien U., II. Augen-Klinik, Vienna, Austria).
Albrecht v. Graefes Archiv für Ophthalmologie, vol. 166, 1963, p. 315–330. 7 refs. In German.

A study was made of the effect of light stimulus intensity and the state of light adaptation of the eye on electroretinographic amplitude during intraocular pressure ischemia in narcotized rabbits. The time duration required for the decline of pulse amplitude to half the initial value (halftime) during 2–15 minutes of ischemia was measured in 10 rabbits exposed to a double light flash (50 milliseconds duration at an interval of 0.5 seconds) with various binocular combinations of dark and light adaptation and stimulus intensity. The halftime was found to be shorter in response to the second stimulus flash than to the first flash, and was increased by light adaptation and an increase in stimulus intensity. The duration of recovery from ischemia was also shorter after the second stimulus flash. Light adaptation decreased the recovery halftime, but an effect of stimulus intensity was not demonstrated. It is concluded that light adaptation decreases retinal metabolism, resulting in increased resistance to anoxia.

A64-80375
THE CORTICAL TIME AT DIFFERENT FLASH INTENSITIES AND SHORT FLASH DURATIONS (DIE CORTICALZEIT BEI UNTERSCHIEDLICHER BLITZINTENSITAT UND KURZER BLITZDAUER).
Winfried Müller (Med. Acad., Augenklinik, Erfurt, Germany).
Albrecht v. Graefes Archiv für Ophthalmologie, vol. 166, 1963, p. 378–382. 6 refs. In German.

An experiment was conducted to determine the differential effect of flash stimulus intensities of 1, 2, 18, 50, and 100 watts on cortical time. Use of a wide range of flash intensities was found to allow recording of an occipital electroencephalographic response in 27 of 30 subjects. Response latency was generally greater after stimulation at intensities of 1 and 2 watts than after stimulation at higher intensities. Intensity differences had no significant effect on the amplitude of cortical response.

A64-80376
SELECTIVE ATTENTION IN MAN.
Anne M. Treisman (Oxford U., Inst. of Exptl. Psychol., England).
British Medical Bulletin, vol. 20, Jan. 1964, p. 12–16. 34 refs.

Behavioral research on the problem of selective attention in man is reviewed in the following areas: (1) methods, problems and approach, (2) limits to performance with competing inputs, (3) Broadbent's "filter" and "information flow" model with attention to input channels, stages of input analysis and level of filter, (4) word identification and selective response, (5) shifting of attention, and (6) short-term storage. Redefinition and extension of the traditional model of attention in the language of information theory may open the way to a more exact linkage of behavioral concepts with the underlying physiological mechanisms now being investigated.

A64-80377
VIGILANCE.
D. E. Broadbent (Med. Res. Council, Applied Psychol. Res. Unit, Cambridge, England).
British Medical Bulletin, vol. 20, Jan. 1964, p. 17–20. 49 refs.

Vigilance studies are reviewed beginning with the historical development of research in this area. An analysis is presented on the effects of the probability of signals, general state of alertness, distracting and competing stimulation, simultaneous use of different sensory modalities, and the caution-riskiness dimension in observer's reports. The emergent conclusion is that no one theory based on any of these variables explains poor vigilance performance since any given theory is inconsistent with some of the facts. A combination of various points of view into a single description using the statistical decision theory of Tanner and Swets (1954) may be the answer.

A64-80378
INSIDE THE BLACK ROOM.
Jack A. Vernon.
New York, Clarkson N. Potter, Inc./Publisher, 1963, xvii + 203 p.

Sensory deprivation (S. D.) research conducted at Princeton University since 1954 is reviewed with respect to the historical development of these studies, experimental conditions, and subject selection. Anecdotal findings are presented on relation of the subject's expectations to his behavior under S. D., as well as incidental improvements in certain health conditions under S. D., e.g. colds, poison ivy. The second part of the monograph deals with the effects of S. D. on dream activity, suggestibility, man's need for stimulation, and orientation in time. The third part covers S.D. effects on learning. Findings are presented on S.D. and hallucinations; physical effects of S. D. as expressed in changes in equilibrium, motor coordination, hand tremor, reaction time; pain perception under S. D.; individual differences in S. D. tolerance; and diet and weight loss in S. D. experiments. The final chapter summarizes known facts about sensory deprivation and raises questions for further exploration of the phenomena.

A64-80379
HUMAN PERCEPTION.
Richard L. Gregory (Cambridge U., Dept. of Psychol., Cambridge, England).
British Medical Bulletin, vol. 20, Jan. 1964, p. 21–26. 64 refs.

Research on perceptual processes, particularly in visual perception, is reviewed with respect to the following criteria: innate versus learning controversy, relation between retinal image and perception, perceptual constancy and distortions of visual space, perception of movement, and sensory discrimination-concept of threshold as limited by signal-to-noise ratio.

A64-80380
DECISION-MAKING.
R. J. Audley (University College, Dept. of Psychol., London, England).
British Medical Bulletin, vol. 20, Jan. 1964, p. 27–31. 37 refs.
USAF OSR-supported research.

Decision-making processes have been a major concern to various disciplines particularly psychology. Studies in this area are analyzed under the following topical headings: (1) theories about making rational decisions, (2) natural decision processes involving decision time, vicarious trial and error (VTE) behavior, effort, and confidence, (3) the expanded judgment task, and (4) psychological differences between logically similar decisions.

A64-80381
INFORMATION PROCESSES IN HUMAN SKILL.
E. R. F. W. Crossman (Oxford U., Inst. of Exptl. Psychol., Oxford, England).
British Medical Bulletin, vol. 20, Jan. 1964, p. 32–37. 67 refs.

Information theory is applied to the analysis of the development of skills in adult human behavior. The systematic approach to this problem in the last 15 years has assimilated engineering concepts of control and communication. The discussion is oriented around topic headings of information theory: receptor processes covering sensory filtering and memory, recognition and absolute judgment, perceptual integration, and temporary storage for perceptual responses; central processes including the habitual choice-responses, central channeling, prediction and planning, and temporary storage for effector commands; effector processes covering their organization and peripheral motor control; and the relative timing of information processes.

A64-80382
EFFECTS OF PROLONGED SENSORY AND PERCEPTUAL DEPRIVATION.
J. P. Zubek (Manitoba U., Dept. of Psychol., Winnipeg, Manitoba, Canada).
British Medical Bulletin, vol. 20, Jan. 1964, p. 38–42. 54 refs.
Defence Board of Canada-supported research.

Recent well-controlled experiments dealing with prolonged sensory and perceptual deprivation employing objective measures of performance are reviewed as to the hallucinatory-like experiences, perceptual and motor abilities, cognitive abilities, physiological changes, tolerance of prolonged deprivation, variables influencing deprivation results, and theoretical explanations. It is felt that the neurophysiological theories are the most promising approach for an adequate theory of stimulus deprivation.

A64-80383
FUNCTION OF THE HIP AND THIGH MUSCLES IN ROMBERG'S TEST AND "STANDING AT EASE": AN ELECTROMYOGRAPHIC STUDY.
B. Jonsson and B. Steen (Gothenburg U., Dept. of Human Anatomy, Gothenburg, Sweden).
Acta Morphologica Neerlando-Scandinavica, vol. 5, 1963, p. 269–276. 13 refs.

The hip and thigh muscles were studied electromyographically in 10 young healthy volunteers in five upright positions. These positions were: (1) standing at ease (feet about 12 inches apart and at an angle of about 50 degrees); (2) Romberg's position (feet close together) eyes open; (3) Romberg's position, eyes closed; (4) Romberg's position on declined plane, eyes closed; and (5) Romberg's position on inclined plane, eyes closed. The duration and intensity of electrical activity recorded in the different positions were observed. The standing at ease position was found to require less muscular work than the Romberg position. There was smaller intensity in standing with the eyes open than with eyes closed. The tensor fasciae and gluteus medius were found to be the most important postural thigh muscles.

A64-80384
HABITUATION, EFFERENCE AND VESTIBULAR INTERPLAY. III. UNIDIRECTIONAL ROTATORY HABITUATION.
E. Fluur and L. Mendel (Karolinska Sjukhuset, Dept. of Otolaryngology, Stockholm, Sweden).
Acta Oto-Laryngologica, vol. 57, Jan.–Feb. 1964, p. 81–88. 16 refs.

Fourteen vestibularly normal human subjects were administered unidirectional rotatory habituation. Before and after the habituation caloric testing was carried out to investigate whether or not there are changes in the mode of reaction of the two labyrinths comparable to those shown following monaural caloric habituation. Nine persons showed directional preponderance to the right, while five showed generally diminished vestibular reactions. One subject had a spontaneous nystagmus to the right. Ten persons showed a secondary nystagmus to the right after irrigations which produced nystagmus to the left. Nine cases presented a characteristic dysrhythmia, after habituation mainly in connection with nystagmus to the right.

Both groups seem to be extreme cases with gradations between them related to the individual's mode of reaction and the stimulus intensity. A conclusion is reached that the changes in response are not a consequence of a given method of stimulation, but a reflection of the development of habituation in the vestibular system.

A64-80385
HABITUATION (ADAPTATION) IN THE MIDDLE-EAR MUSCLE REFLEXES OF THE CAT.
F. Blair Simmons and Dana L. Beatty (Stanford U. School of Med., Div. of Otolaryngology, Stanford, Calif.)
Acta Oto-Laryngologica, vol. 57, Jan.–Feb. 1964, p. 89–96. 14 refs.
Grants NIH-B-2167; NIH-B-3407.

Habituation or adaptation of the middle-ear muscle acoustic reflex response of the cat is described. It may alter the reflex threshold sensitivity by as much as 50 decibels and affect the continuous contractions to a similar extent. These observations are offered as an explanation for the so-called species differences in reflex sensitivity and/or inter- and intraindividual variability in multiple test sessions or during a prolonged session.

A64-80386
MORPHOMETRY OF THE HUMAN LUNG.
Ewald R. Weibel (Rockefeller Inst., Dept. of Cytology, New York, N.Y.)
Berlin, Springer-Verlag, 1963, xi+148 p. 163 refs.
$12.00
Fellowship NIH-FFG-47; N.Y. HRC-1-126; N.Y. HRC-1-188; Grant NHI-H-2001.

A systematic methodology is presented for the quantitative morphologic analysis of the human lung. Microscopic examinations of tissue sections were made which allowed determination of the dimensions of the alveolar and capillary respiratory surfaces, the capillary blood volume, the alveolo-capillary tissue barrier, and the airway system distributing air into the alveoli. In some cases, geometrical formulas were derived to relate the various pulmonary dimensions to each other and to total lung size, allowing the construction of geometrical and dimensional models of the lung.

A64-80387
PHYSIOLOGICAL RESPONSES OF NORMAL AND PATHOLOGICAL SUBJECTS TO A MODIFIED WORK CAPACITY TEST.
John Naughton, Gunnar Sevelius (Oklahoma U., Med. Center, Oklahoma City, Okla.), and Bruno Balke (Federal Aviation Agency, Will Rogers Field, Oklahoma City, Okla.)
Journal of Sports Medicine and Physical Fitness, vol. 3, Dec. 1963, p. 201–207. 7 refs.
Grant PHS-G-HE-06286-02.

A modified work capacity test was given to individuals in various states of health. A treadmill test was used in which the grade was elevated to 3.5% every few minutes during the 18 minutes of work. Pulse rate, blood pressure, cardiac output, stroke volume, ventilatory efficiency, and electrocardiograms were recorded. The evaluation of this test shows that it can be applied in the testing of sedentary persons or those with heart disease, as well as highly trained and healthy individuals.

A64-80388
THE EFFECT OF D-AMPHETAMINE SULFATE ON PHYSICAL PERFORMANCE.
Lawrence A. Golding and James R. Barnard (Kent State U., Ohio).
Journal of Sports Medicine and Physical Fitness, vol. 3, Dec. 1963, p. 221–224. 7 refs.

To test the effect of d-amphetamine sulfate on treadmill running, 10 athletes and 10 unconditioned students were given 15 mg of d-amphetamine sulfate or a lactose control 2 to 3 hours before the test. The subjects made one run (rested run) and then a second run (fatigued run) 12 minutes later. In both the conditioned and unconditioned subjects the drug had no effect on performance of the rested or fatigued run. After the rested run amphetamine significantly increased heart rate and blood pressure but had no effect on respiratory rate. The recovery rate for blood pressure after the rested run was retarded by the drug. Following the fatigued run, recovery rates for heart rate and blood pressure were retarded and respiratory rate was unaffected. There was no significant effect on blood glucose.

A64-80389
CENTRAL EFFECTS ON MINOR TREMOR.
Hisanobu Sugano (Vienna U., Inst. of Psychol., Austria).
Japanese Journal of Physiology, vol. 13, 1963, p. 492–499. 15 refs.

The effect of central stimulation on minor tremor (MT) or microvibration of the body was studied with unanesthetized rabbits. The same set of electrodes which were implanted into various areas of the brain were used for recording and stimulation. MT was induced from the gluteus maximus muscle with a special pickup. Hippocampal arousal gave little effect on MT; hippocampal seizure had no effect on MT. Acceleration of MT was observed with stimulation of the motor cortex, the thalamus, and the reticular formation. Inhibition of MT was seen upon stimulation of the anterior and posterior hypothalamus suggesting that the temperature-regulating mechanism may play an important role in MT.

A64-80390
OCCUPATIONAL MEDICINE AT CAPE CANAVERAL: AN EIGHT YEAR REVIEW.
Laurent P. LaRoche (Pan American World Airways, Inc., Guided Missiles Range Div., Patrick AFB, Fla.)
(Southern Medical Association, Symposium on Astromedicine, Miami Beach, Fla., Nov. 12–15, 1962.) Southern Medical Journal, vol. 57, May 1964, p. 509–512.

Medical endeavors occurring daily at Cape Canaveral are discussed as they relate to logistic support of the 10,000 mile range and to the medical department's primary function of taking care of patients at various range stations. The practice of occupational medicine is no longer a matter of treating the casualties resulting from a given work environment. Equal emphasis must be put on controlling or changing the working conditions to prevent injury or disease. Industrial hygienists, sanitary engineers, entomologists, health physicists, human factor psychologists, and industrial chemists have the task to detect, monitor, and control harmful physical or chemical agents. Information thus obtained must be integrated into a total medical concept to be useful to the doctor or patient. The physician is and should be the manager of the health team, for only he can assemble the various biomedical inputs as they apply to personnel and coordinate the scientific approaches to make a meaningful health determination, whether it be preventive, clinical, or rehabilitative. The specific problems of missile toxicants, missile noise, and lighting are discussed.

A64-80391
HIGH STANDARDS FOR HIGH FLYERS.
Philip B. Phillips (U.S. Naval School of Aviation Med., Dept. of Neurol. and Psychiat., Pensacola, Fla)
(Southern Medical Association, Symposium on Astromedicine, Miami Beach, Fla., Nov. 12–15, 1962.) Southern Medical Journal, vol. 57, May 1964, p. 512–516.

Medical accomplishments facilitating high standards for astronauts are reviewed. Standards for naval aviators and test pilots are outlined and compared with the more stringent ones for the astronauts. Basic requirements for Mercury astronauts were: (1) to have served as a pilot in the Department of Defense, (2) to have held an engineering degree, (3) to have been a military test pilot, (4) to have logged over 1,500 hours flying time, and (5) to be 5 feet 11 inches or less in height. The various stages of the astronaut screening program are described, including the medical evaluation at the Lovelace Foundation (laboratory tests, X-ray studies, and ophthalmological studies), at the Aerospace Medical Laboratory, Wright-Patterson Air Force Base, and final screening consisting of many physiological and psychological tests, which simulated expected experiences in actual flight. Final steps in selection involved the interpretation of the accumulated data by the Candidate Evaluation Committee and the ranking of the candidates. The seven who rated "Outstanding, Without Reservations" demonstrated excellence in maturity, intelligence, motivation, and emotional stability and all but one of these were chosen as Mercury astronauts. Factors disqualifying the other applicants are outlined.

A64-80392
ROLE OF THE FLIGHT SURGEON IN THE CARE OF THE ASTRONAUTS.
W. K. Douglas (Air Force Missile Test Center, Patrick AFB, Fla.)
(Southern Medical Association, Symposium on Astromedicine, Miami Beach, Fla., Nov. 12–15, 1962.) Southern Medical Journal, vol. 57, May 1964, p. 516–521. 11 refs.

A flight surgeon was assigned as the personal physician of astronauts at the very beginning of the pilot selection program. The doctor participated in the selection program and learned to know his future patients from the first day of their association with their new job. After some 30 experienced test pilots had undergone one of the most thorough and searching physical examinations that medicine could offer, and after they had submitted to a rigorous series of tests designed to assess their ability to withstand a variety of stresses, the flight surgeon sat down with the engineers and with management, and advised them in their deliberations, which eventually resulted in the selection of 7 astronauts. The flight surgeon remained in close association with the selected astronauts throughout their training program, including physical fitness, mission orientation, and experiences on various disorientation devices. During these periods of training the flight surgeon gave lectures on various aspects of physiology and anatomy as they related to such experiences. The flight surgeon, after the flight astronaut had been selected, remained with him during the final preparation for the flight, and was there when the flight was over.

A64-80393
RESUME OF HUMAN STRESSES IN SPACE FLIGHT OPERATIONS AND METHODS OF IMPROVING MAN'S TOLERANCE.
A. H. Schwichtenberg and W. R. Lovelace, II (Lovelace Found., Dept. of Aerospace Med. and Bioastronautics, Albuquerque, N. Mex.)
(Southern Medical Association, Symposium on Astromedicine, Miami Beach, Fla., Nov. 12–15, 1962.) Southern Medical Journal, vol. 57, May 1964, p. 522–531. 8 refs.

Stresses imposed upon astronauts prior to and during flight are reviewed and discussed with regard to potential dangers involved and with respect to methods of protecting and improving man's tolerance for them. Changing concepts (e.g., man-machine systems instead of completely automatic control) due to knowledge gained from actual space operations are also discussed. Future research is needed to obtain precise knowledge of the effect of stress on such performances as learning rates, data acquisition and retention, as well as response to simulated emergencies, time of onset of fatigue, and recovery. Major advances will be required in bioinstrumentation to accurately measure psychophysiological responses. These will have far-reaching applications in every day medicine and will be one of the feedbacks to which space research and development will return to improve living and health.

A64-80394
SUPPORT OF THE FLYER IN HIGH ALTITUDE FLYING.
Paul H. Stavig (USAF Hospital, Otis AFB, Mass.)
(Southern Medical Association, Symposium on Astromedicine, Miami Beach, Fla., Nov. 12–15, 1962.) Southern Medical Journal, vol. 57, May 1964, p. 531–535. 5 refs.

Problems encountered in the medical support of high altitude manned aircraft have now become almost identical with those experienced in the Manned Space Flight Program. With the recent flights of the X-15 and the projected X-20 (DYNA SOAR) program, even the problems of radiation protection, systems for life support, and weightlessness assume significance. The endurance missions of aircraft such as the longe-range bombers of the Strategic Air Command capable of in-flight fueling add the problems of fatigue and in-flight nutrition. The aerospace medicine service at Laughlin Air Force Base, Texas, pioneered in the development of a concept referred to as physiological support. The purpose was to provide crew members totally integrated to the integrity of the military mission. This was achieved through: (1) giving basic instructions to the flyer during his initial flying training program; (2) having the flight surgeon continue this instruction with briefings on various subjects (e.g., nutrition, safety, effects of certain drugs, noise hazards, dysbarism) pertinent to the specific operational requirements; and (3) requiring all personnel on flying status to complete periodic refresher training in all aspects of physiology in flight. Pressure suits and training in their use are discussed. The training of flight surgeons is also discussed.

A64-80395
NUTRITIONAL ASPECTS OF GASTRONAUTICS.
Doris Howes Calloway (Calif. U., Berkeley; and Stanford Res. Inst., Menlo Park).
Journal of the American Dietetic Association, vol. 44, May 1964, p. 347–352. 16 refs.

The critical need for precise estimation of energy requirements of astronauts is discussed relative to the need for oxygen. A 2800-calorie diet has been established as a safe allowance for routine space missions. Consideration of caloric density suggests that 50% of calories should derive from fat. The diet should be limited to about 80 g. protein. There is no firm basis for estimating mineral allowances, but levels 10% above requirement of calcium, sodium, potassium, and magnesium appear reasonable, with all other minerals supplied by a mixed diet of processed foods. Liberal allowances of vitamins are recommended, particularly ascorbic acid and vitamin E.

A64-80396
FEEDING CONCEPTS FOR MANNED SPACE STATIONS.
Beatrice Finkelstein and John J. Symons (Whirlpool Corp., Life Support Dept., St. Joseph, Mich.)
Journal of the American Dietetic Association, vol. 44, May 1964, p. 353–357. 7 refs.

Food management for crews of orbiting space stations has been worked out on the basis of criteria that take into account the crew size, flight duration, weight, volume and power allocated for this purpose, water sources, environmental conditions, and work-rest cycles. Nutrition is designed to promote maximum efficiency, minimize monotony, ameliorate flight stress, and provide personal satisfaction. The projected work-rest cycles allow five meals. Pre-cooked, freeze-dehydrated, spray- or drum-dried foods from commercial sources, or custom-produced foods will be used. Packaging will have functions of storage, preparation utensil, and eating device. Large containers will be re-utilized to store wastes. Specifications for a feeding console housing all food service equipment are described. Techniques of eating while in a weightless state are dependent on special packaging that permits insertion of the food package into the mouth and expulsion of the contents.

A64-80397
DEVELOPMENT OF SPACE FOODS.
Mary V. Klicka (U.S. Army Natick Labs., Food Div., Natick, Mass.)
Journal of the American Dietetic Association, vol. 44, May 1964, p. 358–361.

The development of foods for project Mercury and project Gemini is summarized as it proceeded from the original idea of adaptation of high-altitude foods to space feeding requirements through to research on freeze-dehydrated foods to meet the stringent requirements of space travel. The planning of space menus took into consideration the caloric content, the optimal protein-fat-carbohydrate ratio, the handling ease, individual preferences, as well as preservation of food under space stresses. The present menus include 23 bite-size foods and 37 dehydrated foods, with the latter furnishing 36% of the food weight and 38% of the calories. The average menu will provide 2500 calories per man per day. Of these, 16% are derived from protein, 32% from fat, and 52% from carbohydrate. A daily requirement of 45 oz. of water is planned for reconstitution of the menu.

A64-80398
EFFECT OF ULTRASOUND ON THE SECRETION OF 5-HYDROXY-3-INDOLEACETIC ACID (5HIAA).
Jozef Jankowiak, M. Mazur, and I. Zbieciowa. (Balneoclimatological Inst., Pozan, Poland).
American Journal of Physical Medicine, vol. 43, Apr. 1964, p. 46–47. 9 refs.

Experiments on 34 rabbits have shown that radiation of the occiput of the skull with ultrasound produces an increase of one of the metabolic products of serotonine in the urine of those animals that before treatment showed no secretion of this product. In those animals in which the metabolite 5-hydroxy-3-indoleacetic acid was present in the urine prior to the ultrasonic radiation, no significant change was observed as the result of ultrasonic irradiation. These findings are related to clinical observations of disturbances of the autonomic nervous system, changes in the electroencephalogram, and complaints of fatigue, drowsiness, and dizziness after prolonged exposure to ultrasound.

A64-80399
THE CONTRIBUTION OF PHYSIOLOGICAL FACTORS TO THE PERFORMANCE OF MODERATELY HEAVY PHYSICAL WORK.
C. H. Wyndham, H. M. Cooke, A. Munro, and J. S. Maritz (Transvaal and Orange Free State Chamber of Mines, Applied Physiol. Lab., Union of S. Africa).
Ergonomics, vol. 7, Apr. 1964, p. 121–137. 7 refs.

A method was carried out to determine whether physical working capacity and mechanical efficiency at the task are important determinants of the level at which an individual performs a moderately heavy physical task under normal working conditions underground. The method allowed a number of important preliminary points about the underground task to be established. These were: (a) there were significant differences between men's performances at the task; (b) in general, men maintained their rank order of performance at the task over a period of 5 months; and (c) local variations in the physical features of the underground work situation had a negligible effect upon the differences in men's performances at the task. Results showed that neither of the two physiological factors examined was of any importance in determining a man's level of performance at the task, with the proviso that all men performing the task should have sufficiently high physical working capacities to enable them to peform it at an acceptable level. The conclusion is drawn that level of performance at the task is determined mainly by psychological factors, primarily the motivation of the individual or of the working group.

A64-80400
BLOOD VOLUME AND HAEMOGLOBIN CONCENTRATION AT ALTITUDES ABOVE 18,000 FT. (5500 M).
L. G. C. E. Pugh (National Inst. for Med. Res., Holly Hill, London, England).
Journal of Physiology, vol. 170, Mar. 1964, p. 344–354. 14 refs.
Med. Res. Council & Welcome Trust-supported res.

Blood volume, hematocrit, and hemoglobin concentration were followed in six subjects during prolonged acclimatization at varying altitudes up to 19,000 feet. After 18 weeks at heights ranging from 13,000 feet to 19,000 feet, blood volume was lower than at sea level in 4 out of 6 subjects, the mean reduction being 9%. During further periods of 3 to 6 weeks, and 9 to 14 weeks, at (or above) 19,000 feet, blood volume rose slowly, the final mean value being 9% above the sea-level control value. The fall in blood volume was associated with a reduction in plasma volume which amounted to 27%. Plasma volume subsequently rose slowly, but the final mean value was still 19% below sea-level control value. Red cell volume and total hemoglobin rose progressively, reaching mean values of 49% above the sea-level control values. Hemoglobin concentration rose by 30% in the first 18 weeks, and 8% during the following 9 to 14 weeks. According to data collected on 8 expeditions to the Himalaya and Karakoram, hemoglobin concentrations in plainsmen living at 18,000 feet and above do not reach the values (22.9 g/100 ml) reported in Andean natives living at 17,500 feet. The mean value

for 8 parties was 20.19 g/100 ml. It was concluded that change in plasma volume is a major factor in the regulation of hemoglobin concentration under these conditions.

A64-80401
CONTACT LENSES FOR FLYING PERSONNEL: A CLINICAL INVESTIGATION.
Floyd M. Morris (USAF School of Aerospace Med., Brooks AFB, Tex.)
Contacto, vol. 8, Mar. 1964, p. 12–15, 23, 25.
Eight-two USAF flight personnel who were fitted with corneal contact lenses at the USAF School of Aerospace Medicine during the years 1959–1960 were reevaluated by questionnaire on their contact lens wear in 1960 and again in April, 1963. Slightly more than 50 percent of those fitted reported either full or occasional wear of their lenses. Only 20 percent were full-time wearers. Reasons given for discontinuing wear were: persistent irritation, visual disturbances, infection, broken or lost lenses, decrease in motivation, or dust, sun, and wind on the flight line. Dislodgment of lenses in flight was extremely rare. Formation of bubbles under the lenses at altitude was never reported. It is concluded that at this stage the disadvantages of contact lenses in military aviation outweigh the advantages, e.g. minimum difficulties in wearing oxygen mask or pressure suit.

A64-80402
AN EXPERIMENTAL STUDY ON RELATIVITY, ERROR AND SEX DIFFERENCES IN THE PERCEPTION OF VELOCITY, TIME AND DISTANCE.
Madjid Mashhour (Stockholm U., Psychol. Lab., Stockholm, Sweden).
Reports from the Psychological Laboratory, University of Stockholm, no. 159, Sep. 1963. 26 p.
USAF Office of Aerospace Research-supported res.
Proceeding from the principle of relativity in perception, it was found empirically that subjective velocity of and subjective distance (space) covered by a moving object are also relative, in the sense that (a) subjective velocity is a negatively decelerating power function of the motion-track length (or observation time); (b) subjective motion-track length varies directly with speed (actually it varies inversely with time); and (c) the relation between subjective velocity and time (or space) as well as that between subjective space and time are independent of any definition of physical velocity. The absolute error of the subjective velocity (time, space) estimates was found to be a parabolic function of the subjective estimates of velocity (time, space) lying between 0–1, while a linear function was found for the values beyond 1. The relative error follows a hyperbolic curve for the subjective estimates of velocity (time, space) within the former range but a parabolic curve within the latter one. Sex differences were not found in the estimation of subjective time and space. Women, however, have higher estimates of the same subjective speeds than men.

A64-80403
THE CONCEPT OF ACCIDENT PRONENESS: A REVIEW.
Peter Froggatt and James A. Smiley (Queen's U., Dept. of Social and Preventive Med., Belfast, Ireland).
British Journal of Industrial Medicine, vol. 21, Jan. 1964, p. 1–12. 95 refs.
The term accident proneness was coined by psychological research workers in 1926. Since then its concept—that certain individuals are always more likely than others to sustain accidents, even though exposed to equal risk—has been questioned but seldom seriously challenged. This article describes much of the work and theory on which this concept is based, details the difficulties encountered in obtaining valid information, and the interpretive errors that can arise from the examination of the imperfect data, and explains why accident proneness became so readily accepted as an explanation of the facts. A recent hypothesis of accidental causation, namely that a person's liability may vary from time to time, is outlined, and the respective liabilities of this and of accident proneness in accord with data from the more reliable literature are examined. The authors conclude that the hypothesis of individual variation in liability is more realistic and in better agreement with the data than is accident proneness.

A64-80404
SEROTONIN AND 5-HYDROXYTRYPTOPHAN LOADS IN RABBITS INTOXICATED WITH TETRAETHYL LEAD [CARICO DI SEROTONINA E DI 5-IDROSSITRIPTOFANO IN CONIGLI INTOSSICATI DI PIOMBO TETRAETILE].
F. Brugnone, G. C. Corsi, and L. Galzigna (Universita di Padova, Istituto di Med. del Lavoro, Padova, Italy).
Medicina del Lavoro, vol. 55, Mar. 1964, p. 184–187. 11 refs. In Italian.
Normal and tetraethyl lead intoxicated rabbits were subjected to loads of 5-hydroxytryptophan and serotonin. The urinary level of 5-hydroxyindole acetic acid remained unchanged in the intoxicated animals that had been treated with 5-hydroxytryptophan, while it increased markedly in the intoxicated animals treated with serotonin as well as in all the healthy treated animals. These data confirm (1) the hypothesis that tetraethyl lead acts by inhibiting specifically the cerebral pathway via hydroxyindole acetic acid, and (2) the fact that 5-hydroxytryptophan is the only hydroxyl metabolite of tryptophan capable of passing the blood-brain barrier.

A64-80405
STUDY OF SKIN TEMPERATURES.
Henry V. Malin (Veterans Admin. Center, Temple, Tex.)
Texas State Journal of Medicine, vol. 60, Apr. 1964, p. 376–378. 6 refs.
Skin temperatures of various body areas were measured and evaluated. Forehead temperature readings were also compared with rectal readings. Results of these studies show: (1) complex or expensive equipment is unnecessary for the determination of surface skin temperatures; (2) there is no appreciable variation of skin temperatures under normal conditions on symmetrical sides of the body or its extremities; (3) average skin temperatures were established as norms for comparative use; (4) deviations from these established norms may be anticipated in circulatory disturbances; (5) there is no statistically significant correlation between rectal and skin temperatures; and (6) the presence of a temperature gradient was demonstrated, both internally and externally.

A64-80406
EFFECT OF RAPID TRANSPOSITION AROUND THE EARTH ON DIURNAL VARIATION IN BODY TEMPERATURE.
Takashi Sasaki (Kentucky U. Med. Center, Dept. of Physiol. and Biophys., Lexington, Ky.)
Proceedings of the Society for Experimental Biology and Medicine, vol. 115, Apr. 1964, p. 1129–1131. 8 refs.
NIH Grant.
The diurnal pattern of body temperature was observed in 3 members of a family including a 6-year-old child for two weeks covering the period during and after an eastbound flight that resulted in an advance of daily routine by as much as 10 hours. Adjustment of diurnal rhythm to a new local time was discussed with reference to the speed of transposition. With the rapid shift of local time zones the characteristics of the normal pattern were disturbed, but gradually approximated the new time pattern (approximately 40-50 minutes shift per day).

A64-80407
CARDIOVASCULAR RESPONSE TO ACUTE HYPOCAPNIA DUE TO OVERBREATHING.
Robert C. Little and Charles W. Smith (Seton Hall Coll. of Med. and Dentistry, Dept. of Physiol., Jersey City, N.J.)
American Journal of Physiology, vol. 206, May 1964, p. 1025–1030. 28 refs.
Grant NIH-H-3490; New Jersey Heart Assoc. Grant.
Anesthetized dogs were maintained by artificial respiration at a fixed rate and depth. The composition of inspired CO_2 was varied while O_2 was maintained at control levels. Cardiac output was measured by the indicator-dilution technique. Acute reduction of end-expiratory CO_2 levels below the normal value caused a decrease in blood pressure, pulse pressure, stroke volume, and cardiac output, no essential change in heart rate, and an increase in total peripheral resistance. Mean systemic blood pressure and net vascular resistance were less with hypocapnia than they were at the same cardiac output at normal CO_2 levels. However, the overall vascular resistance was greater with hypocapnia than it was in the same animal at normal CO_2 levels and control output values. Analysis of these data leads to the conclusion that the hypocapnia produced by overbreathing causes some degree of net vasodilation. The hypotension associated with hyperventilation appears to result in these experiments from the drop in cardiac output and to a lesser degree the relatively less than normal compensatory increase in total peripheral resistance.

A64-80408
EFFECT OF HYPOXIA ON THE CORONARY CIRCULATION: PRELIMINARY REPORT [L'INFLUENCE DE L'HYPOXIE SUR LA CIRCULATION CORONAIRE: RAPPORT PRELIMINAIRE].
P. R. Moret, R. Mégevand, J. Pattay, F. Infante, and P. Bopp (Centre de Cardiologie, Hop. Cantonal, Genève, Switzerland).
Cardiologia, vol. 44, 1964, p. 208–217. 10 refs. In French.
By reducing coronary vascular resistance, arterial hypoxia causes a marked increase in coronary blood flow, amounting to 100% at arterial oxygen saturation of 50%, and to 200% at arterial oxygen saturation of 35%. Coronary hypoxia is associated with disturbances of the mechanics of left ventricular contraction and myocardial metabolism. Left ventricular efficiency is diminished. Oxygen consumption and utilization as well as CO_2 elimination and respiratory quotient are altered. The myocardial partial oxygen pressure drops. The vasodilatation is due to reduction in coronary or myocardial partial oxygen pressure and also to peripheral factors acting through nervous pathways.

A64-80409
CHANGES IN THE ACTIVITY OF GLUTAMINATE-PYRUVATE TRANSAMINASE AND GLUTAMINATE-OXALACETATE TRANSAMINASE IN VARIOUS ORGANS BY EXPOSURE TO OXYGEN WANT [AKTIVITATSANDERUNGEN DER GLUTAMINAT-PYRUVAT-TRANSAMINASE UND

GLUTAMINAT-OXALACETAT-TRANSAMINASE IN VERSCHIEDENEN ORGANEN DURCH SAUERSTOFFMANGELEXPOSITION].
G. Schäfer and K. H. Weiner (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Inst. für Flugmedizin, Bad Godesberg, Germany).
Internationale Zeitschrift für angewandte Physiologie, vol. 20, 1964, p 195–201. 20 refs. In German.

Exposure of rabbits to anoxia at 7000 m. simulated altitude resulted in the increase of the glutaminate-pyruvate transaminase and the glutaminate-oxalacetate transaminase contents in liver, kidney, brain, and heart muscle. Increase of hemoglobin reaches its maximum on the 24th day of anoxia coinciding with transaminase maxima in the liver, kidney, and brain, whereas the enzyme activity of the heart continues to increase. The enzyme activity in the liver, kidney, and brain decreases after the 24th day. Extremely low anoxia tolerance observed in some animals was accompanied by absolute or relative decrease of the transaminase activity in organs concomitant with an increase in the serum transaminases.

A64-80410
EFFECT OF NOISE ON TEST PERFORMANCE [LARMWIRKUNG UND TESTLEISTUNG].
G. A. Lienert (Marburg U., Inst. für Psychol., Germany) and G. Jansen (Max Planck-Inst. für Arbeits Physiologie, Dortmund, Germany).
Internationale Zeitschrift für angewandte Physiologie, vol. 20, 1964, p. 207–212. 10 refs. In German.

Forty students were administered the Intelligence-Structure-Test (Amthauer, 1955) and the Concentration-Performance-Test (Düker and Lienert, 1959) under conditions of (1) room noise of 20–25 decibels, and (2) a diffuse noise of 70–75 decibels. Although there were no significant changes in the total performance on the first test, an effect of noise could be discerned on several subtests. Noise facilitated performance on one of the subtests but depressed it on two others. Achievement on the concentration test did not show any significant differences between the control and the experimental situation. These results are discussed in terms of (a) Hörmann's hypothesis that sensory stimulation results in activation, and (b) Düker's hypothesis that overstimulation leads to reactive performance increase.

A64-80411
EXPERIMENTALLY INDUCED LOCALIZATION OF DECOMPRESSION PHENOMENA IN MAN DURING ASCENT TO SIMULATED ALTITUDES [EXPERIMENTELLE "ZWANGSLOKALISATION" VON DRUCKFALLERSCHEINUNGEN AM MENSCHEN BEIM AUFSTIEG IN SIMULIERTE HOHEN].
O. Wünsche (Inst. für Flugmedizin, Bad Godesberg, Germany).
Internationale Zeitschrift für angewandte Physiologie, vol. 20, 1964, p. 213–222. 28 refs. In German.

Six subjects, 20–23 years old, underwent repeated ascents in a pressure chamber, reaching 10,000 m. simulated altitude within six minutes. Due to barotraumatic symptoms recompression was interrupted or extended on several occasions. A total of 18 decompressions were done with specific ergometric exercises of the knee, elbow, hand, and index finger. Two ascents were carried out by the experimenter with voluntary deep knee bends as exercise. This series confirmed that it is possible to provoke decompression symptoms in designated joints by dynamic exercising of the extremities in question. Insofar as these symptoms (pain) are in excess of the actual stress of the exercise as determined in pre-ascent exercises at normal atmospheric pressure and disappear promptly upon recompression, they are a direct result of decompression phenomena rather than fatigue. The formation of gaseous nuclei and physico-chemical as well as anatomic-physiological factors facilitating the appearance of bubbles in exercised joints and muscle are discussed.

A64-80412
AN EVALUATION OF THREE STANDARD TESTS OF PHYSICAL FITNESS.
H. Monod and S. Bouisset (Centre Natl. de la Recherche Sci., Lab. de Physiol. du Travail, Paris, France).
Internationale Zeitschrift für angewandte Physiologie, vol. 20, 1964, p. 223–232. 17 refs.

Classifications of physical fitness were carried out according to the Pignet index (morphological type) and cardiovascular indices (physiological type) on 100 subjects, 18 to 33 years old. Physical training of these subjects had been followed and their ability in sports noted. The results demonstrate that the Pignet index is insufficient to evaluate physiological fitness. The correlations obtained between the morphological index and cardiovascular tests were low. The authors suggest replacement of the Pignet index with a cardiovascular strain test. Though the Ruffier test is the simplest one to carry out, a battery of physiological tests is preferable for a more precise evaluation of physical fitness.

A64-80413
NOISE EFFECT DURING PHYSICAL WORK (LARMWIRKUNG BEI KORPERLICHER ARBEIT).
Gerd Jansen (Max Planck-Inst. für Arbeitsphysiologie, Dortmund, Germany).
Internationale Zeitschrift für angewandte Physiologie, vol. 20, 1964, p. 233–239. 9 refs. In German.

Eight subjects participated in 368 experiments employing the same level of physical work (5 kilopond meter/second) but with different noise stresses (broad-spectrum noise, and narrow-band noise). Preliminary experiments with nonworking subjects confirmed previous findings from noise research. Broadspectrum noises exerted a more powerful effect on peripheral circulation than the narrow-band noise. These findings applied also to work performance at the intensities of 5 kpm/second, whereby the broad-spectrum noise significantly inhibited circulation while the narrow-band noise had no effect on the circulation.

A64-80414
HANDBOOK OF PHYSIOLOGY. SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber. Washington, D.C., American Physiological Society, 1964, ix + 1056 p.

This section of the Handbook of Physiology contains chapters dealing with various aspects of organ systems adapting to environmental changes. Pertinent contributions are abstracted separately.

A64-80415
CELLULAR LEVEL OF ADAPTATION.
Z. I. Barbashova (Sechenov Inst. of Evolutionary Physiol., Leningrad, U.S.S.R.)
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 37–54.
150 refs.

Data are presented making possible the conclusion that besides the well-known systems of changes, tissue or cellular adaptation is an important mechanism for the adjustment of organisms to the action of unfavorable factors in the environment. In the case of an oxygen deficiency, there are two aspects: (a) the struggle for oxygen, and (b) adaptation to hypoxia. For different animals and sometimes for the same animals, where there are different degrees of hypoxic action, at times one and then the other mechanism or avenue of adaptation will be of primary importance. Some of the compensatory reactions, such as the extraordinary increase in the activity of the respiratory, circulatory, and blood-forming systems, indicate the incompleteness of acclimatization rather than its completeness. True adaptation of an organism to life in a changed environment is achieved mainly through metabolic and physicochemical reorganization at the tissue or cellular level, i.e., by means of tissue or cellular adaptation. The increase in resistance of tissues and cells is nonspecific and this provides the basis for developing measures to increase the resistance of the human organism to the action of unfavorable environmental and industrial conditions, to infectious diseases, etc.

A64-80416
ORGAN SYSTEMS IN ADAPTATION: THE NERVOUS SYSTEM.
H. Hensel and G. Hildebrandt (Marburg U., Physiol. Inst., Marburg/Lahn, West Germany).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 55–72.
118 refs.

Data concerned primarily with slow adaptive responses, acclimation and, to some extent, phylogenetic adaptation, are reviewed. The following aspects involved in the regulatory and sensory adaptation to various environmental stimuli are included: (1) general and theoretical aspects (adaptation and stabilization, the time factor, specificity of responses, and basic nervous mechanisms); (2) peripheral nerves and receptors (adaptation of nerve conduction, nerve function in hibernators, and acclimatization and receptor activity); (3) central nervous functions (habituation, cerebral cortex and habituation, changes in response patterns, shift in level of regulations, synchronization, behavioral adaptation, and neural control of endocrine responses); (4) temperature adaptation in homeotherms (heat adaptation, cold adaptation in animals, and cold adaptation in man); (5) adaptation to low oxygen tension (brain vascularization, anoxic tolerance of the brain, and changes in nervous functions); (6) prolonged exposure to carbon dioxide; (7) central nervous function in hibernators (hibernation and hypothermia and arousal from hibernation); and (8) adaptation in poikiloorganisms (capacity adaptation and resistance adaptation).

A64-80417
ORGAN SYSTEMS IN ADAPTATION: THE SKIN.
Hisato Yoshimura (Prefectural U. of Med., Dept. of Physiol., Kyoto, Japan).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 109–131.
89 refs.

The role of the skin during adaptation to environmental changes and the adaptation mechanism is described. The following aspects are included: (1) protective functions of the skin (mechanical and actinic protection, keratinization, and pigmentation); (2) skin in thermal regulation, with special reference to acclimatization (circulation and sweating); and (3) skin in adaptive changes of water and salt metabolism.

A64-80418
ORGAN SYSTEMS IN ADAPTATION: THE CARDIOVASCULAR SYSTEM.
Steven M. Horvath and Charles D. Howell (Calif. U., Dept. of Phys. Educ., Environ. Stress Lab., Santa Barbara, Calif., and Redlands U., Dept. of Biol., Calif.)
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 153–166.
101 refs.
Contract DA-49-193-MD-2202.

Cardiovascular responses to various stresses, including heat, diving, hypodynamic states, exercise, high altitudes, and cold are reported. The cardiovascular system alters its performance with changes in rate, pressure, output, total volume, blood composition, properties, and fractional distribution. Occasionally these alterations persist for long periods; but frequently they are quite transient, depending, in part, on the nature, intensity, and persistence of the stress being imposed on the organism. They may reflect imbalance in many aspects of the total physiology of the individual and may fluctuate or even return to "normal" under a new dynamic equilibrium while the stress continues unbalanced and unmodified. There has been some implication that genetic constitution is involved in these adaptations. However, physiological variation between different populations of a species may not be the result of inherent genetic differences, but, more likely, reflect the labile nature of a physiological response as influenced by environmental factors.

A64-80419
ORGAN SYSTEMS IN ADAPTATION: THE TEMPERATURE REGULATING SYSTEM.
S. Gelineo (Yugoslav Academy of Sciences and Arts, Biol. Inst., Rovinj, Yugoslavia).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 259–282.
202 refs.

The temperature regulating system in warm-blooded and cold-blooded animals is reviewed. The following aspects are discussed: (1) characteristics of thermoregulation in homeotherms; (2) general curve of thermogenesis; (3) thermal adapatation in general; (4) thermogenesis in homeotherms (adaptation to cold environments, adaptation to warm environments, temperature and curve of thermogenesis, seasonal changes in metabolic adaptation, adaptation of homeotherms and body temperature, mechanisms of adaptation, sources of energy, development of thermoregulatory system in the newborn, and surface area); (5) thermal adaptation of poikilotherms (terrestrial and aquatic poikilotherms, metabolism of some poikilotherms at different latitudes); and (6) climate and temperature regulating system (adaptation of homeotherms at altitudes and adaptation of homeotherms in hot and humid atmospheres).

A64-80420
WEATHER, CLIMATE, AND MAN.
S. W. Tromp (Biometeorological Res. Center, Leiden,The Netherlands).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 283–293.
56 refs.

Six aspects of the problem of weather and climate influence on the general adaptational capacity of man are reviewed: (1) principal biometeorological concepts; (2) principal biometeorological factors (thermal properties, solar radiation, high altitude, air pollution, ionization of the air, and fluctuations in the electric field of the atmosphere); (3) methods applied in biometeorological analysis; (4) physiological reactions as a result of meteorological stimulation (differences in biometeorological reactions of the autonomic nervous system, influence on response of the thermoregulatory system and methods for its determination, influence on endocrines, influence on spleen, liver, and gall bladder, influence on composition and physicochemical state of blood, influence on local and general resistance of the body to infections, and influence of seasons on amplitude of meteorotropic reactions); (5) physiological mechanisms of adaptation to the meteorological environment (general mechanism of acclimatization, influence of differences in human psychological and physiological pattern, influence of meteorotropic diseases on rate of adaptation to meteorological environment, and influence of weather and climate on adaptation to drug treatment); and (6) climato- and balneotherapeutic methods facilitating adaptation to meteorological environment.

A64-80421
GEOGRAPHY AND SEASON: MAMMALS AND BIRDS.
J. S. Hart (Natl. Res. Council, Div. of Applied Biol., Ottawa, Canada).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 295–321.
219 refs.

Seasonal and geographical differences in climate are associated with physiological and structural modifications in birds and mammals. The morphological modifications include slight geographic and seasonal changes in internal and external dimensions in some species and important changes in plumage and pelage. Physiological modifications comprise geographic and seasonal changes in diurnal activity (circadian) rhythms, in breeding period, and in temperature regulation, together with associated cardiovascular and endocrine adjustments. It seems clear that seasonal modifications in nature do not result from any one environmental factor but from a complex interaction of various environmental effects (temperature, light, nutrition) with endogenous rhythms of the organism.

A64-80422
LABORATORY FACILITIES FOR ADAPTATION RESEARCH: HIGH AND LOW TEMPERATURES.
Austin Henschel (Public Health Service, Div. of Occupational Health, Occupational Health Res. and Training Facility, Cincinnati, Ohio).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 323–328.

Various aspects of climatic chambers and their usefulness in environmental physiology studies are discussed. Included are the following: (1) rationale for climatic chambers, (2) chamber versus field research, (3) performance requirements of hot chambers, (4) performance requirements of cold chambers, (5) hot and cold climate problems, (6) mobile laboratories, (7) climatic chambers in use, and (8) data-recording systems for climatic chambers.

A64-80423
LABORATORY FACILITIES FOR ADAPTATION RESEARCH: LOW PRESSURES.
Ulrich C. Luft (The Lovelace Foundation for Med. Educ. and Res., Dept. of Physiol., Albuquerque, N. Mex.)
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 329–341.
53 refs.

Facilities and techniques for research on adaptation to reduced barometric pressure are reviewed including the following: (1) research at high altitudes (on mountain expeditions, permanent laboratories at altitude, and in balloons, airplanes, and spacecraft); and (2) artificial facilities for low barometric pressure (decompression chambers, low oxygen mixtures, and rebreathing systems).

A64-80424
TERRESTRIAL ANIMALS IN COLD: HIBERNATORS.
Roger A. Hoffman (Colgate U., Dept. of Biol., Hamilton, N.Y.)
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 379–403.
161 refs.

Hibernators are unique in that they possess adaptive mechanisms which permit normal homeothermic existence during certain times of the year but which, under other conditions, allow their possessors to make use of the advantages of poikilothermism by withdrawing into hibernating burrows for the winter months in the face of a potentially dangerous environment. The following aspects of the adaptive processes of hibernators are reviewed: (1) physiological changes (metabolism and temperature regulation, circulation, and respiration); (2) seasonal changes; (3) preparation for hibernation, general aspects and endocrine system (pituitary-gonad changes, pituitary-thyroid changes, adrenal gland, and endocrine pancreas); and (4) entrance into hibernation (temperature and metabolic changes, heart rate, and the nervous system).

A64-80425
TERRESTRIAL ANIMALS IN COLD: RECENT STUDIES OF PRIMITIVE MAN.
H. T. Hammel (John B. Pierce Found. Lab., New Haven, Conn.)
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 413–434.
50 refs.

Various types of adaptation enabling primitive man to cope with the potential or real cold stresses in all climates are reviewed. Included are the following: (1) description of environments wherein primitive man experiences diurnal, seasonal, or continual cold exposure (physiological versus technological adaptations, adaptations to whole-body exposure versus exposure of extremities, and current methods for assessing cold adaptation in primitive man); (2) adaptations to whole-body exposure (Australian aborigines, bushmen of the Kalahari Desert, Europeans living under primitive conditions, Alacaluf Indians of Tierra del Fuego, Arctic Indians, Andean Indians, Eskimos, and Lapps); (3) adaptations to exposure of extremities; and (4) discussion (summary of results of physiological studies on primitive man, effects of diet, physical fitness, and acclimatization to other stresses upon responses to cold, the concept of cold acclimatization, assessment of survival value of physiological adaptations to cold, and role of cold adaptation in distribution of primitive man over the earth).

A64-80426
TERRESTRIAL ANIMALS IN COLD: MAN IN POLAR REGIONS.
O. G. Edholm and H. E. Lewis (Natl. Inst. for Med. Res., Div. of Human Physiol., Hampstead, London, England).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 435–446.
39 refs.

Adaptation of men living in polar regions for limited periods of time is discussed. The following aspects of this problem are considered: (1) the environment; (2) shelter and clothing (insulation, protection against wind, and permeability to water vapor); (3) activity patterns; (4) energy expenditure and caloric intake; (5) water balance; (6) diurnal rhythms; and (7) evidence of physiological adaptation to cold in man (local adaptation and general adaptation).

A64-80427
TERRESTRIAL ANIMALS IN DRY HEAT: MAN IN THE DESERT.
Douglas H. K. Lee (Public Health Service, Div. of Occupational Health, Occupational Health Research and Training Facility, Cincinnati, Ohio).
IN: HANDBOOK OF PHYSIOLOGY, Section 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 551–582.
88 refs.

Thermoregulatory responses of man to hot desert conditions are reviewed. Included are the following: (1) thermal aspects of desert environments (air temperature, humidity, air movement, direct solar radiation, reflected solar radiation, ground temperature, and sky temperature); (2) determination of heat load; (3) thermoregulatory responses (nervous regulation, skin temperature, skin wetness, respiratory heat loss, surface area, and heat production); (4) acute secondary consequences of thermoregulation (cardiovascular, water and electrolyte balance, urinary, alimentary disturbances, disturbances of the nervous system, and changes in skin function); (5) factors affecting responses (acclimatization, age, sex, race, physical fitness, and variability in exposure); (6) failures in adaptation (heat stroke, heat exhaustion, heat cramps, dehydration, anhydrosis, hidromeiosis, photochemical lesions, and hyperplastic responses of the skin); (7) physiological aspects of shelter; and (8) physiological aspects of clothing (modification of radiation exchange, modification of evaporation convection loss, metabolic effects, and design principles of clothing for deserts).

A64-80428
TERRESTRIAL ANIMALS IN HUMID HEAT: MAN.
William S. S. Ladell (Chemical Defence Experimental Establishment, Porton Down, Salisbury, Wilts, England).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 625–659.
249 refs.

The differences between indigenous tropical and indigenous temperate climate men in many ways suggest that it is the latter who show adaptation to their natural climate rather than the former. Indigenous tropical men do not show excessive adaptation to heat; they sweat less than temperate-climate men resident in the tropics. A temperate-climate man who readapts to tropical conditions is handicapped by a highly reactive endocrine system. He overadapts to heat and becomes hyperacclimatized with uneconomically high sweat rates. His heart rate rises steeply with body temperature and physical performance fails off accordingly. Even when he is residentially acclimatized, the circulation of a temperate-climate man is less stable, and he is susceptible to heat illness even at temperatures well tolerated by tropical man. Tropical man is not immune to heat disorders, but he succumbs only at ambient temperatures much above the usual tropical climatic norm. Special sections deal with specific changes (sweat and the sweat glands, cardiovascular system, water and electrolyte balance, and endocrines); growth and sexual maturity in a hot-wet climate; blood chemistry and blood pigments; nutrition in hot-wet areas; metabolic rate and body shape; skin color; and failures in adaptation in tropical man. Nonbiological adaptation (including cultural and mental, clothing, and housing and comfort dilemma) is also discussed.

A64-80429
ANIMALS IN TOXIC ENVIRONMENTS: MAMMALS IN POLLUTED AIR.
Paul E. Morrow (Rochester U., Depts. of Radiation Biol. and Pharmacology, Rochester, N.Y.)
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 795–808.
127 refs.

A review is presented of the origin and nature of atmospheric pollutants and the response of the living organism to them. Included in this survey are the following: (1) adaptations to atmospheric pollutants, consisting of ozone and other oxidants with primary action in the respiratory tract, primary irritants of respiratory tract structures (inducing shallow breathing, increased secretions, bronchiolar constriction, and hyperplasia of bronchiolar and alveolar epithelium), mineral dusts, tobacco smoke, and carbon monoxide; and (2) mechanisms of adaptation to ozone and other oxidants, primary irritants mineral dusts, tobacco smoke, and carbon monoxide. It is concluded that now the paucity of data on man and the difficulties of extrapolation from other animal data are discouraging. However, in the next decade more and basic toxicological information will come forth supplying the physiologists with needed data for the study of man's adaptation to air pollutants as environmental factors.

A64-80430
ANIMALS IN TOXIC ENVIRONMENTS: MAN AND INDUSTRIAL CHEMICALS.
Horace W. Gerarde (Esso Res. and Eng. Co., Med. Res. Div., Linden, N.J.)
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 829–834.
10 refs.

Evidence is presented which shows adaptation in man as a result of repeated exposure to industrial chemicals. This is manifested as an increased tolerance to atmospheric chemicals which may elicit discomfort or unpleasantness in unacclimatized individuals. The tolerance is transitory and may be lost following a relatively brief interval of nonexposure to the chemical. Exposure to industrial chemicals which are absorbed and metabolized results in adaptation at the cellular level. This involves enzymes normally present which adjust or adapt by metabolizing the moiety of the foreign molecule which is similar or identical to normal dietary constituents. There is no evidence that this type of adaptation is harmful to normal healthy industrial workers exposed daily to generally accepted hygienic standards (threshold limits).

A64-80431
ANIMALS IN HIGH ALTITUDES: THE AEROSPHERE.
F. A. Hitchcock (Ohio State U., Dept. of Physiol., Columbus, Ohio).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 835–839.
9 refs.

The earth's atmosphere is briefly described, with particular emphasis being placed on those aspects of greatest significance to the biologist. In man, if the partial pressure of oxygen in inspired air falls much below 100 mm. Hg, some degree of hypoxia is likely to occur, and if it rises above 400 mm. Hg, symptoms of oxygen poisoning usually appear. Most physiologists believe that if the partial pressure of carbon dioxide rises above 8 mm. Hg deleterious effects are likely to be produced in normal men who have not had an opportunity to adapt themselves to higher concentrations of this gas. In considering altitude it is well for the biologist to keep in mind certain critical heights. Above 3,050 meters most persons require the addition of oxygen to the air they breathe. At about 10,700 meters, 100% oxygen must be breathed. At about 15,240 meters, little oxygen reaches the alveoli of the lungs even while breathing 100% oxygen, since at this altitude the total barometric pressure, 87 mm. Hg, would equal the sum of the partial pressures of water, 47 mm. Hg, and of carbon dioxide, 40 mm. Hg, were it not for hyperventilation. The chief contributions of the atmosphere to the biosphere are discussed.

A64-80432
ANIMALS IN HIGH ALTITUDES: RESIDENT MAN.
Alberto Hurtado (Peruvian U. of Med. and Biol. Sciences, High Altitudes Res. Inst., Lima, Peru).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 843–860.
79 refs.

This chapter reviews various physiological, chemical, and anatomical modifications occurring in man born and living in a high-altitude environment. These changes enable the human body to best tolerate constant hypoxia brought about by a decreased partial pressure of oxygen in the inspired air. Included are the following aspects: adaptive mechanisms in natural acclimatization (total oxygen tension gradient, increased pulmonary ventilation, decreased alveolar-arterial oxygen tension gradient, polycythemia, affinity of hemoglobin for oxygen, acid-base balance and gas transport, and adaptive mechanisms at the tissue level); the physiology of physical activity in natural acclimatization; other aspects of natural acclimatization to high altitudes (cardiovascular characteristics and endocrinological observations); and loss of natural acclimatization (chronic mountain sickness).

A64-80433
ANIMALS IN HIGH ALTITUDES: MAN ABOVE 5,000 METERS—MOUNTAIN EXPLORATION.
L. G. C. E. Pugh (Med. Res. Council Labs., Natl. Inst. for Med. Res., Div. of Human Physiol., Hampstead, London, England).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 861–868.
45 refs

Present knowledge of man above 5,000 meters depends on recorded experiences of mountaineers and the observations of physicians and physiologists accompanying them. The following physiological aspects of mountain exploration are reviewed: (1) ascent to extreme altitude, (2) oxygen equipment, (3) mental effects, (4) medical hazards, (5) barometric pressure and altitude, (6) alveolar air, (7) respiratory regulation, (8) hemoglobin, (9) muscular exercise, (10) effect of oxygen, (11) heart and circulation at rest, (12) nutrition and fluid balance, and (13) acclimatization.

A64-80434
ANIMALS IN HIGH ALTITUDES: EARLY BALLOON FLIGHTS.
F. A. Hitchcock (Ohio State U., Dept. of Physiol., Columbus, Ohio).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 869–876.

A history of balloon development as well as manned balloon flight is presented. The balloon opened up two new lines of scientific investigation, including (1) study of the atmosphere, and (2) exposing man and other animals to altitude and low barometric pressure without the exertion and fatigue associated with mountain climbing. From the early balloon flights came the suggestion that frequent ascensions would result in acclimatization to high altitude. The chief limitations of the balloon as a scientific instrument are discussed.

A64-80435
ANIMALS IN HIGH ALTITUDES: IN SPACE CAPSULES.
David G. Simons (USAF School of Aerospace Med., Brooks AFB, Tex.)
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 877–892.
53 refs.

Space flight introduces man to a hostile environment in which his success and survival depend on alertness and sound judgment. Operational experience and experiments have demonstrated the serious loss of insight and judgment which can accompany stresses such as hypoxia and fatigue. One means of protection in a situation demanding sustained performance is to provide bioinstrumentation that detects serious decrements in the functional integrity of the central nervous system (CNS). CNS function is approached in terms of general arousal and reflex activity. Personalized radio-telemetry techniques have measured four physiological parameters which reflect CNS activity, electroencephalogram, electrocardiogram, respiration, and electrodermal response. Each of these measures is analyzable in terms of average values and quantitative reflex activity, corresponding to the two categories of CNS function. Study of specific reflex activity, indicates that identification of specific reaction patterns and interrelationships between average values and specific reflex activity may lead to indices of CNS functional integrity, emotional lability, strong emotional arousal, and other specific responses of significance in adapting to the space environment. This concept extends man's control of his environment to the use of bioinstrumentation as a warning of his inability to meet adequately his responsibilities with unimpaired mental function.

A64-80436
MAN AND NOISE.
G. Lehmann (Max-Planck-Inst. für Arbeitsphysiologie, Dortmund, Germany).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 1007–1013.
34 refs.

Adaptation to low sound levels involves increased perceptivity for faint acoustic signals. An adaptation to loud and disagreeable sound implies that perceptivity for high sound levels is diminished. To determine whether these two types of adaptation are based on the same process, interactions among the following four stages of hearing were investigated: (1) external ear and auditory canal; (2) eardrum and ossicles; (3) internal ear; and (4) reactions to stimuli and adaptation (primary vegetative reactions, secondary vegetative reactions, and reactions to silence). Ear protection, adaptation of the sound-conducting apparatus, possibility of two different adaptive mechanisms in the ear, similarities of changes of the vegetative state with adaptive mechanism, similarities of psychic level effects with adaptive phenomena, and general adaptation of man to certain noise levels are discussed.

A64-80437
MAN AND MOTION.
G. R. Wendt (Rochester U., Dept. of Psychol., N.Y.)
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 999–1005.
54 refs.

Adaptation to motion includes a number of processes such as peripheral sense organ refractoriness or inhibition; similar processes in the centers producing reflex response or subjective reports; habituation of reflex, autonomic, or subjective responses on repetition of stimulation; and development of active counterprocesses during vestibular stimulation, after removal of labyrinths, or as a result of long-continued stimulation. Habituation of vestibular nystagmus, of postural reflexes, and vestibular autonomic effects is found almost universally in warm-blooded forms. Such habituation may involve an active compensatory process, an increasing dominance of visual or kinesthetic influences, or the loss of nystagmus because of its replacement by autogenous, wandering eye movement. Lesions of the central nervous system outside the vestibular nuclei greatly reduce habituation.

A64-80438
ORGAN SYSTEMS IN ADAPTATION: THE MUSCULAR SYSTEM.
H. Hensel and G. Hildebrandt (Marburg U., Physiol. Inst., Marburg/Lahn, West Germany).
IN: HANDBOOK OF PHYSIOLOGY, SECTION 4 (ADAPTATION TO THE ENVIRONMENT).
Edited by D. B. Dill, E. F. Adolph, and C. G. Wilber.
Washington, D.C., American Physiological Society, 1964, p. 73–90. 176 refs.

The role of the muscular system in adaptation to the environment is characterized by (a) increase in muscular strength on mechanical requirements, (b) improved supply of energy and O_2 to the muscle during chronic hypoxia and prolonged mechanical exercise, and (c) increase in heat production during cold. The muscular system in hibernators is phylogenetically adapted to body temperature as low as 5° C. The adaptation of neuromuscular transmission to low temperature may be superimposed by individual acclimation. Muscular depots of glycogen and energy-rich phosphates are the main source of energy for arousal from hibernation. Adaptive processes occurring in the heart muscle are largely independent of those in the skeletal muscle. They are closely connected with general circulatory adjustments. The diaphragm as a continuously active muscle also shows some special adaptive properties. Besides more specific adaptations, the muscular system is involved in general adaptive changes of water and mineral metabolism. In poikilotherms, changes in tissue respiration and muscular function are important adaptive mechanisms.

A64-80439
VIGILANCE AS A FUNCTION OF SIGNAL FREQUENCY AND FLASH RATE.
Hugh M. Bowen (Dunlap and Associates, Inc., Stamford, Conn.)
Perceptual and Motor Skills, vol. 18, Apr. 1964, p. 333–338. 10 refs.

Signal frequency (1, 10, or 20 signals per hour) and signal flash rate (one flash every 2 or 1 1/4 seconds) were varied in two vigilance experiments using a noisy simulated radar display as the sensory input. The results indicated small changes in vigilance over the course of 1 hour. The data suggest that vigilance will decrease, stay level, or improve as a function of signal frequency and the inherent detectability of the critical signal. It is suggested that vigilance behavior is related to the extent to which a subject can comprehend (and hence predict) the temporal pattern of critical signals. It is concluded that not enough is known about the conditions which determine the occurrences of decrement in vigilance.

A64-80440
RELATION OF CERTAIN PERSONALITY VARIABLES TO DECISION MAKING IN PERCEPTION.
Bonnie R. Strickland and Albert S. Rodwan (Emory U., Atlanta, Ga.)
Perceptual and Motor Skills, vol. 18, Apr. 1964, p. 353–359. 14 refs.
Emory U. Res. Committee-supported research.

Fifty-six subjects in two sessions made guesses on the forthcoming event in a two-choice card situation where 75 cards contained a circle and 25 cards were blank. Their predictions on the second session's presentations

were quantified in terms of the likelihood of false positive error and the hit rate over false alarm rate. Independently of the behavioral task, all subjects completed two personality inventories (Marlowe-Crowne Social Desirability Scale, internal-external dimension scale by Liverant et al, 1961) designed to assess the need for approval and a dimension of internal versus external control of reinforcement. Scholastic Aptitude Test scores and subjects' estimates of the number of circles present in the stimulus set were incorporated as control variables. Results clearly show the effect of personality differences on guessing behavior. Subsequent related studies for psychophysics and judgmental responses were suggested.

A64-80441
TOLERANCE OF MICE X-IRRADIATED IN AN OXYGEN RICH ENVIRONMENT TO EXPLOSIVE DECOMPRESSION.
Donald E. Furry (US Naval School of Aviation Med., Pensacola, Fla.)
Aerospace Medicine, vol. 35, May 1964, p. 459–461. 7 refs.

Male Swiss albino mice exposed to 700 roentgens whole body X-irradiation while breathing either air or 100% oxygen were explosively decompressed from sea level to a terminal altitude of 30,000 feet. A second group of mice exposed to X-irradiation only while in an air or oxygen-rich environment were maintained for a 30-day observation period. On the basis of pooled survival data it is concluded that the use of either an air or oxygen-rich environment during exposure to X-irradiation has no effect on the tolerance of mice to explosive decompression as evidenced by immediate survival or 30-day survival. The expected 30-day survival proportion of mice exposed to whole body X-irradiation only while breathing oxygen is significantly reduced when compared to the survival proportion of mice breathing air.

A64-80442
DECOMPRESSION SICKNESS AT 18,500 FEET: A CASE HISTORY WITH COMMENT.
D. I. Fryer (R.A.F. Inst. of Aviation Med., Farnborough, Hants, England).
Aerospace Medicine, vol. 35, May 1964, p. 479–481. 9 refs.

A pilot, aged 33 and considerably overweight, was exposed to an altitude of 18,500 ft. in an unpressurized aircraft. After two hours he began to develop symptoms which progressed over one and a half hours, by which time he had limb and joint pain, tightness of the chest, visual disturbance, headaches, and general weakness. The symptoms improved on descent but he collapsed shortly after landing at the completion of the nine and a half hour flight. He then developed a migraine-like syndrome. In addition he had skin mottling, irritability, signs in the central nervous system, haemoconcentration, and a raised cerebrospinal fluid protein. His condition slowly returned to normal over the following three to four days.

A64-80443
BIOLOGICAL EFFECTS OF COSMIC RAYS ON THE HUMAN BODY [ZUR BIOLOGISCHEN WIRKUNG DER KOSMISCHEN STRAHLEN IM MENSCHLICHEN KORPER].
J. Eugster (Zurich U., Switzerland).
Raketentechnik und Raumfahrtforschung, vol. 7, Oct.–Dec. 1963, p. 163–165. 13 refs. In German.

The technique of coordination of emulsion of specially prepared nucleus films and biological substrates is explained with directions as to the choice of emulsion, fixation of it on the substrate, localization of fixation points, and the choice of biological tissue. Observations were made of nuclear hits in 33 human subjects after 3-4 weeks at altitudes ranging to 3,500 meters. Skin tissue was excised after a month's latency. Evaluation of topographical comparison of the physical trace analyses and fresh histological changes in the tissue shows a high correlation between the most extensive cell changes and primary hits.

A64-80444
AN INVESTIGATION INTO ACCOMMODATION.
Ayrshire Study Circle.
British Journal of Physiological Optics, vol. 21, Jan–Mar. 1964, p. 31–35.

The accuracy of the existing tables of accommodation as well as the normal variations were reexamined by the Ayrshire Study Circle. Monocular accommodation was recorded for 614 eyes in male subjects and 693 eyes in female subjects, ages ranging for both sexes from 30 to 75 years. In age groups 34–47, and 53–60, women exhibit more accommodation than men, the difference being about half a diopter. After the age of 52, there is a definite leveling off in the fall of accommodation. The curve shows two distinct humps, which indicates that loss of accommodation does not follow a gradual curve but is more marked at some ages than at others. Some accommodation remains even at quite advanced age.

A64-80445
NERVE MECHANISMS OF SPATIAL ORIENTATION IN MAN [LES MECANISMES NERVEUX DE L'ORIENTATION SPATIALE CHEZ L'HOMME].
I. S. Beritachvili (Acad. des Sciences, RSS de Georgie, Inst. de Physiol., Tbilissi, U.S.S.R.)
Neuropsychologia, vol. 1, Dec. 1963, p. 233–249. 20 refs. In French.

Spatial orientation of man in an environment is carried out mainly by visual and kinesthetic perception. Animal experiments have shown that stimulation of labyrinthine receptors together with visual ones is the main factor in spatial orientation. Analogous experiments on blindfolded, normal, deaf-mute, and blind children showed good spatial orientation whereby it was possible for them not only to traverse along a once-traveled route but also to proceed by other shorter routes to a terminal point. Deaf-mute children with nonfunctioning labyrinths were unable to perform when blindfolded. Persistent training resulted in some retention of the route although not with the precision obtained by use of labyrinthine receptors. Blind children orient in space on the basis of acoustic and labyrinthine impressions and surpass in ability blindfolded normal children. Although the sensation of approaching solid objects manifests itself as cutaneous, exclusion of cutaneous senses with permission of acoustic stimulation will preserve these sensations, whereas the exclusion of acoustic stimulation will cause their disappearance. These sensations, however, do not play a role in spatial orientation at a distance which is determined solely by labyrinthine reception.

A64-80446
BIOLOGISTICS FOR A MANNED SPACE STATION BASED ON THE METABOLIC APPROACH.
William L. S. Wu and Mahmoud M. Yakut (Gen. Dynamics/Astronautics, San Diego, Calif.)
Journal of Spacecraft and Rockets, vol. 1, Mar.–Apr. 1964, p. 204–209. 9 refs.

Specification of biologistics for future space stations will require accurate and standardized sets of environmental specifications, nutritional data, and metabolic calculations, which must take into account the effects of prolonged weightlessness (or hypogravity in the case of a rotating space station). It is proposed that the catabolic effects of weightlessness on the musculoskeletal system, and indirectly on the cardiovascular system, should be related to the daily work output of the body. By controlled diets and exercises, astronauts could be "titrated" to their normal earth (or other prescribed) metabolic rates. (This hypothesis is, of course, subject to verification in space.) A coincident, desirable result of this metabolic approach is that biologistics for all types of spacecraft and space stations can be calculated (or, better, experimentally determined) in standard units per man-day without regard to the metabolic effects of variable gravity. A table of biological specifications is developed and then applied, with associated engineering constraints and trade-offs on requirements for power supply, heat rejection, and integration of the power system with the life-support system, to describe optimum life-support requirements for 30- to 100-day missions.

A64-80447
ASSESSMENT OF RISK TAKING BEHAVIOR.
Paul Slovic (Michigan U., Ann Arbor, Mich.)
Psychological Bulletin, vol. 61, Mar. 1964, p. 220–233. 74 refs.

Risk-taking propensity has been hypothesized to be a general personality disposition and many devices have been proposed for use in its assessment. Several types of studies relevant to the validity of these measures are reviewed. These studies expose a considerable lack of agreement among what are supposed to be measures of the same general characteristic. This implies that the domain of risk-taking behavior may not be as conceptually unitary as many psychologists would like to believe. Some explanations for this lack of agreement are offered in an attempt to provide a more adequate means of conceptualizing and assessing risk-taking behavior.

A64-80448
EVALUATION OF RADIATION EFFECTS IN SPACE.
Rainer Berger (Lockheed-California Co., Burbank, Calif.)
Annals of the New York Academy of Sciences, vol. 108, Jun. 1963, p. 482–486. 22 refs.

The formation of complicated organic compounds from simple predecessors by radiation synthesis is discussed. Various experiments exposing the primitive earth atmosphere (thought to consist of methane, water, ammonia, and hydrogen) to an electric discharge, ultraviolet light, and high energy radiation, such as X- and gamma-rays are reviewed. A host of biologically important compounds were detected in the reaction mixtures, particularly synthesized amino acids. It is suggested that initially radiation may have been the agent that at least in part built up molecules to such systems, which finally were able to handle in a controlled manner, radiation or rather light quanta. The first such successful system to use radiation energy for the synthesis of organic compounds was the beginning of photosynthesis. With the aid of radiation as a form of energy, chemical species can be synthesized which are the building blocks of proteins, nucleic acids, and other important biological compounds. Experimental evidence points to a major role for space radiation in the processes leading to the creation and functioning of life.

A64-80449
OBSERVATIONS ON THE NATURE OF THE "ORGANIZED ELEMENTS" IN CARBONACEOUS CHONDRITES.

Frank W. Fitch (Chicago U., Dept. of Pathol., Ill.) and Edward Anders (Chicago U., Enrico Fermi Inst. for Nuclear Studies, Depts. of Chem. and Geophys. Sciences, Ill.)
Annals of the New York Academy of Sciences, vol. 108, Jun. 1963, p. 495–513. 21 refs.
AEC-supported research.

Organized elements found in Class I carbonaceous chondrites are a heterogeneous group of particles which are probably best classified into two types: those that have a highly structured morphology and those that have a much simpler appearance. The particles with highly structured morphology are less numerous than the simpler type. They have not been seen in thin sections and many appear to have a strong resemblance to common terrestrial contaminants. The particles of simpler morphology which do not fluoresce, which either do not stain or stain atypically with biological stains, and which are soluble in acids seem to be of an inorganic composition and origin. It is possible that life did exist in meteorites, but present evidence appears inadequate to suggest an extraterrestrial biological origin for the particles found in the carbonaceous chondrites.

A64-80450
ON THE ORIGIN OF CARBONACEOUS CHONDRITES.
Edward Anders (Chicago U., Enrico Fermi Inst. for Nuclear Studies, Depts. of Chem. and Geophys. Sciences, Ill.)
Annals of the New York Academy of Sciences, vol. 108, Jun. 1963, p. 514–533. 69 refs.
AEC-supported research.

The carbonaceous chondrites seem to have been produced by the action of liquid water on a more primitive source material. Their mineralogy implies that this exposure to water occurred at temperatures near 300° K, a pH of 6–10, a reduction potential of ≤ -0.2 volts, and that it lasted for at least 10^3 years. Their high content of chalcophile trace elements and primordial noble gases suggests a source material more primitive than ordinary chondrites; yet the presence of high-temperature minerals implies that this source material passed through at least one high-temperature state. These conditions would be satisfied by material expelled from the sun in a gaseous state, and accreted to solid bodies after condensation and cooling. The exposure to liquid water could have occurred in subsurface regions of an asteroid heated by extinct radioactivity or another internal energy source. Sunlight for photosynthesis would not reach these regions, but an appreciable amount of free energy would be available from the conversion of olivine to hydrated silicates. Although this source of energy is finite, it may have served as the basis for the evolution of an nonphotosynthetic life form. None of the isotopic data suggest the presence of life, however.

A64-80451
AQUEOUS, LOW TEMPERATURE ENVIRONMENT OF THE ORGUEIL METEORITE PARENT BODY.
Bartholomew Nagy, Douglas J. Hennessy (Fordham U., Dept. of Chem., New York, N.Y.), and Warren G. Meinschein (Esso Res. and Engring. Co., Linden, N.J.)
Annals of the New York Academy of Sciences, vol. 108, Jun. 1963, p. 534–552. 46 refs.
NSF-supported research.

The Orgueil meteorite has long been known to contain bound-water, organic matter, and sulfur, in addition to silicate, iron oxide, and magnesium sulfate. Trace element data in Orgueil, obtained during the present study, were found to be consistent with the average abundances of trace elements in chondritic meteorites but they appeared dissimilar to average abundances in terrestrial shales and igneous rocks. Electron microscopy showed that the meteorite consists mainly of micaceous minerals. X-ray, electron diffraction studies and thermogravimetric analysis confirmed the occurrence of hydrous layer lattice silicates and of magnetite, in addition to some magnesium sulfate. The mineral suite prescribes an aqueous environment of the parent body. The parent body temperature seems to have been low to moderate and one may speculate that the environment was slightly reducing and that the pH was slightly alkaline.

A64-80452
FURTHER OBSERVATIONS ON THE PROPERTIES OF THE "ORGANIZED ELEMENTS" IN CARBONACEOUS CHONDRITES.
George Claus (New York U. Med. Center, N.Y.); Bartholomew Nagy (Fordham U., Dept. of Chem., N.Y.); and Dominic L. Europa (Bellevue Hosp., Dept. of Pathol., New York).
Annals of the New York Academy of Sciences, vol. 108, Jun. 1963, p. 580–605. 81 refs.

Consideration of the fine morphology, physical and chemical tests, staining with biological stains, and further evaluation of contaminations suggest that the Orgueil, Ivuna, Tonk, and Alais carbonaceous meteorites contain indigenous, organic microstructures which seem to be of biogenic origin. Full proof of the indigenous and biological nature of the organized elements is still not available but the indications seem to be strong. A critical, systematic, and objective evaluation of the organized elements is essential if an accurate identification of these particles is to be achieved.

A64-80453
QUANTITATIVE INTERACTIONS OF INCREASED P_{O_2} AND P_{CO_2} UPON RESPIRATION IN MAN.
C. J. Lambertsen, P. Hall, H. Wollman, and M. W. Goodman (Pa. U., Schools of Med., Labs. of Pharmacol., Phila.)
Annals of the New York Academy of Sciences, vol. 109, Jun. 1963, p. 731–742. 19 refs.
Contract Nonr 551(14); and Grants PHS-G-M-692; PHS-G-2G-215.

An attempt is made to separate quantitatively the stimulative and depressive effects of oxygen at supranormal tensions on respiration. Carbon dioxide tension (P_{CO_2}) is employed as an index for an overall, acid-base stimulus, without regard for the manner by which change in P_{CO_2} accomplishes stimulation. The investigation includes the following: (1) oxygen breathing without added CO_2, (2) addition of CO_2 to O_2 inhaled at increased ambient pressure, (3) inhalation of CO_2 with O_2 at one atmosphere, and (4) maximum depression of ventilatory response to CO_2 by O_2. In several subjects the residual respiratory response to CO_2, especially during oxygen breathing at 2.0 atmospheres, was comparable in degree to that portion of the total ventilatory response to CO_2 previously found to be unrelated to the changes in blood pH, but proportional to changes in either P_{CO_2} or extravascular pH. The values for control effects of CO_2 upon ventilation in these subjects are only about one-half of the levels of reactivity encountered in the different subjects studied by others at a higher range of P_{CO_2}.

A64-80454
EFFECT OF ALTITUDE ON RESPIRATORY REGULATION.
Ralph H. Kellogg (Calif. U., Med. Center, Dept. of Physiol., San Francisco; and White Mountain Res. Station, Big Pine, Calif.)
Annals of the New York Academy of Sciences, vol. 109, Jun. 1963, p. 815–828. 26 refs.
ONR and NSF-supported research.

The alteration in chemical regulation of breathing, or, more specifically, the fall in B (zero ventilation intercept) as well as the rise in S (slope of the CO_2 response curve) occurring during acclimatization to altitude cannot be explained simply in terms of the blood acid-base changes, which are not sufficient even to compensate for the respiratory alkalosis. It seems reasonable to suppose that there might be an adaptation to prolonged hypocapnia originally stimulated and maintained by the persistent hypoxic stimulation of the chemoreceptors. This would place the changes in altitude acclimatization at the opposite end of the same spectrum as the changes Schaefer discussed in chronic hypercapnia, but this does not suggest the mechanism involved in adaptation in either direction. One might speculate that the adequate stimulus produced by CO_2 inhalation may be effective pH in some region which is readily penetrated by CO_2 and less readily by other acids and which tends to change its acid-base characteristics, perhaps by active transport across its limiting membranes, in such a way as to restore its own pH to normal within a few days (i.e., faster than the kidney restores the pH of the blood) despite continued depression of P_{CO_2}.

A64-80455
REGULATION OF RESPIRATION AND BLOOD GASES.
R. L. Riley, R. E. Dutton, Jr. (Johns Hopkins School of Hygiene and Public Health, Dept. of Environmental Med., Baltimore, Md.), et al.
Annals of the New York Academy of Sciences, vol. 109, Jun. 1963, p. 829–851. 12 refs.
Contract No. AF 41(657)-388; and Grants NHI-G-H.1929; NHI-G-HTS-5453.

A possible control mechanism based on oscillations in arterial P_{CO_2} caused by the respiratory cycle is investigated. Five methods for indirect estimation of mixed venous P_{CO_2} are presented and discussed. Also discussed are results of the following: (1) ventilation versus mixed venous P_{CO_2} during CO_2 breathing and exercise, (2) ventilatory response to exercise of a patient with anomalous pulmonary venous drainage and atrial septal defect, (3) lag in ventilatory response to changes in end-tidal P_{CO_2}, (4) ventilation versus arterial P_{CO_2} in recovery from maximal exercise, (5) evidence against control related to mean arterial P_{CO_2}, and (6) intermittent versus continuous administration of CO_2 mixtures. It is concluded that the relationship between ventilation and mixed venous P_{CO_2} is not incompatible with the hypothesis that ventilation can be stimulated by oscillations in arterial P_{CO_2} or by an increase in mean arterial P_{CO_2}. The experiments which demonstrated a lag in the ventilatory response when CO_2 was first administered and when it was first discontinued provides the most beautiful example of the interrelation between the mixed venous hypothesis and the oscillation hypothesis.

A64-80456
RELATIONSHIP BETWEEN P_{ACO_2} AND RESPIRATORY WORK DURING EXTERNAL RESISTANCE BREATHING IN MAN.
J. Milic-Emili and J. M. Tyler (Harvard School of Public Health, Dept. of Physiology; and Lemuel Shattuck Hosp., Dept. of Public Health, Boston, Mass.)
Annals of the New York Academy of Sciences, vol. 109, Jun. 1963, p. 908–914. 10 refs.
Grants NIH-G-H. T. S. 5379 and NIH-G-H 3804.

End-tidal P_{CO_2}, pulmonary ventilation, and mechanical work of breathing were measured in 6 normal subjects breathing various mixtures of carbon dioxide, with 3 graded-resistances added independently or simultaneously to inspiration and expiration. A linear relationship was found between the rate of mechanical work done by inspiratory muscles and end-tidal P_{CO_2}; this relationship was uninfluenced by added resistance. No consistent relationship was observed between either ventilation or rate of work developed by expiratory muscles and end-tidal P_{CO_2}. These results suggest that carbon dioxide controls only the inspiratory phase of respiration, with activity of expiratory muscles only coincidentally involved.

A64-80457
BEHAVIORAL AND PSYCHOLOGICAL STUDIES IN AEROSPACE MEDICINE.
Don E. Flinn, Eli S. Flyer, and Fred E. Holdrege, Jr. (USAF School of Aerospace Med. and 6570th Personnel Res. Lab. Aerospace Med. Div., Brooks AFB, Tex.)
Annals of the New York Academy of Sciences, vol. 107, May 1963, p. 613–634. 10 refs.

The development of objective measures of adjustment and achievement prior to enlistment or during basic military training has been one of the major aims of aerospace psychology in order to cut down on attrition and training costs. Three sets of predictor data which have shown promise are discussed: aptitude and education level information, high school reference evaluations, and peer-rating variables. In addition to large-scale screening, other areas of concern are the study of unique job factors which affect performance and selection for special jobs. This includes the study of environmental and psychological aspects of space environment which may influence the reliability and proficiency of the astronaut. Work with one- and two-man space cabin simulators has contributed data toward the evaluation of operator proficiency, work-rest cycles, inter- and intrapersonality variables, motivation, and perception.

A64-80458
METHODOLOGY AND PATTERNS OF RESEARCH IN AIRCRAFT ACCIDENTS.
Jerome Lederer (Flight Safety Found. Inc., Cornell-Guggenheim Aviation Safety Center, New York, N.Y.)
Annals of the New York Academy of Sciences, vol. 107, May 1963, p. 670–685. 51 refs.

This brief review of methodology and patterns in aircraft accidents attempts to show that aviation accident investigation differs from other categories of accident investigation by having many more variables to consider. It lists several steps that could be taken to ease the investigation of aircraft accidents with the complex aircraft and operating systems now being used and especially for the future. In common with investigations in other accident areas, the human factors need much more thorough investigation not merely from the physiological and psychological standpoint but also in respect to social and economic factors which may induce accidents. With regard to difficulty of securing frank disclosure of information on accidents from individuals, the military system of conducting two types of hearings—one privileged, the other public—is more likely to bring out evidence which will help to prevent the recurrence of accidents. It recommends the use of modern statistical concepts for the analysis of accidents.

A64-80459
A CRITIQUE OF ACCIDENT RESEARCH.
Ross A. McFarland (Harvard School of Public Health, Div. of Environmental Health Sciences, Boston, Mass.)
Annals of the New York Academy of Sciences, vol. 107, May 1963, p. 686–695. 22 refs.

An attempt has been made in this paper to evaluate the general field of research relating to accident causation and prevention. A number of deficiencies characterizing much of the work are pointed out. Also, some of the unsolved methodological problems facing the research worker are outlined. A number of promising developments toward meeting the difficulties relating to improved conceptualization and theory in this field, toward developing better ways of analyzing the multiple influences in accidents, and toward a general sharpening of research in the accident field are briefly reviewed. Attention is also called to the need for research in a virtually neglected area, that of the design and testing of preventive activities. Some of the requirements for carrying out evaluation studies are outlined.

A64-80460
VISION EXAMINATIONS FOR CIVILIAN AIR PERSONNEL.
Frederick W. Hebbard (Ohio State U., School of Optometry, Columbus, Ohio).
Journal of the American Optometric Association, vol. 35, May 1964, p. 406–410.

To hold a license, an airman must meet the physical requirements for his rating. A vision examination is included as a part of the physical examination. The Federal Aviation Agency provides aviation medical examiners with explicit instructions for performing the vision examination. Tests to be given in the vision examination for the First-Class, Second-Class, and Third-Class Certificate requirements are described, including distant vision, near vision, intraocular vision, color vision, field of vision, and heterophoria. The three classifications comprise airline pilots with an air-transport rating, commercial pilots other than airline pilots (e.g., flight engineers or navigators, air traffic control tower operators), and private or free balloon pilots, respectively.

A64-80461
EYE MOVEMENTS FROM SEMICIRCULAR CANAL NERVE STIMULATION IN THE CAT.
Bernard Cohen, Jun-Ichi Suzuki, and Morris B. Bender (Mount Sinai Hosp., Dept. of Neurol., Neurophysiol. Lab., New York, N.Y.)
Annals of Otology, Rhinology and Laryngology, vol. 73, Mar. 1964, p. 153–169. 20 refs.
Grant PHS-G-NB-00294 and Special Fellowship No. BT-597.

Electrical stimulation of the ampullary nerves from semicircular canals in cats with trains of closely-spaced square waves evoked distinctive eye movements. The direction of these eye movements was characteristic for each canal nerve. Single anterior or posterior ampullary nerve activation resulted in dissociated upward or downward eye movements. Conjugate contralateral movements followed lateral canal stimulation. Activation of both anterior canal nerves produced conjugate eye movements, while unilateral anterior and posterior canal nerve stimulation gave rotatory conjugate eye movements. By simultaneously stimulating one lateral with both anterior or posterior canal nerves, oblique eye movements were evoked. In these the deviation of eyes from the horizontal plane was dependent on the relative strength of stimulation to horizontal or vertical canal nerves. When the nerves of canals lying in the same plane were simultaneously stimulated, there were no eye movements. Analysis of muscle activity showed that every eye muscle was either activated or inhibited during stimulation of any single canal nerve in the cat. Several levels of excitatory activity resulting from single canal nerve stimulation were designated on the basis of constancy, amplitude, and latency of contraction. Excitatory and inhibitory activities appeared to summate in a predictable pattern.

A64-80462
SEEING A SATELLITE FROM A SATELLITE.
Ingeborg Schmidt (Indiana U., Bloomington).
Astronautics and Aeronautics, vol. 2, May 1964, p. 31–38. 31 refs.

Visual problems facing the astronaut are discussed with respect to the visual environment in orbital flights and the specific effects of orbital flights (weightlessness, posture, noise, vibrations, thermal stress, and psychological stress). Visual functions in detection of a satellite from a satellite are multiple, involving: contrast sensitivity, shape recognition, motion and distance perception, and the time factor in adaptation and perceptual latency. In space the eyes will be primarily light adapted which requires only a few minutes as contrasted to the slow process of dark adaptation. Difficulties in predicting visual function in space on the basis of laboratory studies are enumerated.

A64-80463
A SELF-STERILIZING COATING FOR SPACECRAFT SURFACES.
Myra Willard and Alice Alexander (Hughes Aircraft Co., Materials Technol. Dept., Culver City, Calif.)
Nature, vol. 202, May 16, 1964, p. 658–659.

Sterilization techniques developed for the Surveyor spacecraft moon landings are described. These processes include heat sterilization to achieve internal sterility and gas sterilization prior to launching with 12% ethylene oxide–88% Freon 12 mixture to achieve external sterility. In order to avoid recontamination in areas necessitating application of a thermal control coating subsequent to heat sterilization, a self-sterilizing coating has been proposed which incorporates a sterilizing agent in the thermal control coating formulation. Essentially it consists of 3.7% formaldehyde added to the coating formula. The sterilizing properties of this mixture were demonstrated experimentally with a fresh paint sample and a sample stored for four weeks.

A64-80464
ON THE RELATIONSHIP BETWEEN SUBJECTIVE TIME, SPACE AND VELOCITY.
Madjid Mashhour (Stockholm U., Psychological Lab., Sweden).
Reports from the Psychological Laboratory, University of Stockholm, no. 151, May 1963, 36 p. 18 refs.
USAF Office of Aerospace Res.-supported research.

Two methods were applied to test the truth of the hypothesis that the relation between subjective velocity, space, and time is the same as the relation between their corresponding physical variables. This hypothesis was found untrue in disagreement with previous findings by J. F. Brown. Sources of this disagreement were explored. The equation relating subjective velocity to subjective space and time was derived theoretically and verified empirically; it describes subjective velocity as: directly proportional to subjective space raised to a power, and indirectly proportional to subjective time raised to another power, or stated equivalently, subjective velocity is a power function of the ratio of subjective space to subjective time. The meaning of this purely subjective equation was discussed. It was indicated that perception of

velocity, like perception of space, is immediate in nature, thus being basically independent of physical time and space magnitudes which are large enough to be experienced within the "psychological present." Physical time and space might however, affect only the basic magnitude of a perceived speed.

A64-80465
THE EFFECTS OF "DRY" HEAT ON THE CIRCULATION OF MAN: CORONARY HEMODYNAMICS.
Salvatore M. Sancetta, Donald B. Hackel, Elmerice Traks, and Benjamin Wittels (Cleveland Metropol. Gen. Hosp., Ohio).
American Heart Journal, vol. 67, May 1964, p. 593–598. 9 refs.
Grants PHS-G-H-4302 and PHS-G-H-863.

Subjects with normal hearts, as well as patients with enlarged left ventricles, compensated or in left ventricular failure, were exposed for two hours to a dry, warm environment of 98° F and 40% relative humidity. Brachial arterial pressure and left ventricular myocardial oxygen consumption decreased significantly. There was a positive correlation between these measurements. These changes are not harmful to the overburdened left ventricle and, within the design of the experiment, may actually be considered to be beneficial in the case of resting subjects.

A64-80466
DEVELOPING AN UNCONVENTIONAL FOOD, ALGAE, BY CONTINUOUS CULTURE UNDER HIGH LIGHT INTENSITY.
Robert O. Matthern (U.S. Army Natick Labs., Food Div., Natick, Mass.) and Robert B. Koch (Armed Forces Food and Container Inst., Chicago, Ill.)
Food Technology, vol. 18, May 1964, p. 58–62, 64–65. 9 refs.

A description of the methods and operation of a system for cultivating and producing the alga, Chlorella pyrenoidosa 7-11-05, for food is presented. Light intensity of 52,000 lumens is used. Temperature is controlled by a special cooling apparatus, and is kept at about 37° C. A new growth medium is developed, and the maximum concentration of algae reaches 23.78 g/liter at a feed rate of 26.6 ml/hour. The medium utilizes urea as the nitrogen source. Diagrams of the apparatus used are given.

A64-80467
MOUNTAIN SICKNESS: A CEREBRAL FORM.
Ray F. Fitch (Wilford Hall USAF Hosp., Aerospace Med. Div., Dept. of Med., Lackland AFB, Tex.)
Annals of Internal Medicine, vol. 60, May 1964, p. 871–876. 22 refs.

A case of severe mountain sickness in a female mountain climber presented primarily as a cerebral form was described. Although apparently quite unusual, the medical profession should be aware of the possibility of its occurrence. Of special interest are the severity and the duration of symptoms that were rapidly and totally resolved without residual when the patient was returned to a lower altitude. Possible mechanisms of the maladaptive physiologic responses in this case have been discussed but remain a matter of conjecture. Although time is an important dimension of adaptation, other factors are also operative. Failure of any of the adaptive mechanisms may result in the appearance of disease.

A64-80468
USE OF H_2-OXIDIZING BACTERIA FOR REGENERATION OF EXPIRED AIR [DIE VERWENDUNG VON H_2-OXYDIERENDEN BAKTERIEN ZUR REGENERIERUNG DER ATEMLUFT].
G. Schlegel (Göttingen U., Inst. für Mikrobiologie, Germany).
Raumfahrtforschung, vol. 2, Apr.–Jun. 1964, p. 65–67. 19 refs. In German.

Additional generation of hydrogen and oxygen through electrolysis of water is an essential step in the regeneration of expired air by bioregenerative processes. Hydrogen utilizing bacteria, such as Hydrogenomonas or Clostridium aceticum, may be employed for the breakdown of CO_2 in the presence of molecular hydrogen. Genus Hydrogenomonas bacteria are able to grow with CO_2 as the sole source of carbon, and with molecular hydrogen as the H-source under aerobic conditions in a simple mineral medium. A desired byproduct is poly-β-hydroxybutyric acid. Clostridium aceticum is an anaerobic microorganism with slow cell mass growth producing large quantities of acetic acid in an atmosphere of H_2 and CO_2 in a mineral-slime medium. It permits full exploitation of electrolyzed hydrogen with complete return of oxygen to the atmosphere. Drawbacks of Clostridium aceticum are low production of protein, low nutritional value of acetic acid, and difficulties in maintaining anaerobic growth. Two different methods of culture within a regenerating system are described as to the process, dimensions and utilization of accruing cell mass.

A64-80469
NEW FACTORS OF INDIVIDUAL VARIATIONS IN THE RESPONSES OF THE BRAIN BIOPOTENTIALS TO RHYTHMICAL LIGHT STIMULATION [NOVYE FAKTORAKH INDIVIDUAL'NYKH RAZLICHII V REAKTSIIAKH BIOTOKOV MOZGA NA RITMICHESKOE SVETOVOE VOZDEISTVIE].
D. Nebylitsyn (RSFSR Acad. of Pedagogical Sciences, Inst. of Psychol., Moscow, USSR).
Journal Vysshei Nervnoi Deiatel'nosti, vol. 14, Mar.–Apr., 1964, p. 195–203. 9 refs. In Russian.

An outline is given of the results of a statistical approach to studying the relationships between (1) characteristics of driving response at various frequencies, (2) characteristics of activation responses, and (3) some characteristics of the EEG background. The correlations thus obtained provide a ground for deducing some dependence of driving response to low frequencies (theta rhythm band) on the equilibration of nervous processes, as well as of the driving response to a wider group of frequencies on the strength of the nervous system relative to excitation. Another conclusion reached is that the driving response to low (theta zone), middle (alpha zone), and high (beta zone) frequencies of stimulation is determined by different factors of nervous activity.

A64-80470
THE ORIGIN OF THE AFTER-EFFECT OF MOVEMENT.
Mary J. Pickersgill (London U., Bedford Coll., Dept. of Psychol., England) and M. A. Jeeves (Adelaide U., Dept. of Psychol., Australia).
Quarterly Journal of Experimental Psychology, vol. 16, May 1964, p. 90–103. 29 refs.

Previous experimental work on the origin of the aftereffect of seen movement is discussed and the relevance of the argument from transfer, which is generally used to demonstrate that the effect is central, is brought into question. The problem is reformulated in terms of whether a retinal contribution is necessary throughout the aftereffect and experiments are described which support the hypothesis that it is necessary. It is suggested that perception of the movement aftereffect also involves normal movement perception, which itself is dependent on the integrity of cerebral functioning.

A64-80471
ERROR-CORRECTING PERCEPTUAL MECHANISMS.
D. P. Andrews (Keele U., Dept. of Commun., Ireland).
Quarterly Journal of Experimental Psychology, vol. 16, May 1964, p. 104–115. 19 refs.

The metric of the visual field, a set of rules defining distances between two points in space, is generally accurate but subject to changes dependent on stimulation. It is suggested that these changes indicate how the metric develops initially, and that the features of the visual signal that control the metric are the distributions of contours and of contour-curvatures over the field. These distributions are genetically prescribed for the organism; they correspond well with the distribution of these features in patterns derived optically from the environment; hence, visual shapes and physical shapes are maintained in correspondence. Further short discussions concern physiological hypotheses and the extension of the above to senses other than vision.

A64-80472
IS THE WEBER FRACTION A FUNCTION OF PHYSICAL OR PERCEIVED INPUT?
Helen E. Ross and R. L. Gregory (Cambridge U., Psychological Lab., Great Britain).
Quarterly Journal of Experimental Psychology, vol. 16, May 1964, p. 116–122. 12 refs.

It is well known that a given physical input (e.g. intensity of light or sound, length or weight of an object) does not always give rise to the same sensation. For example, arrow heads affect the perceived length of lines (Muller-Lyer illusion) and size affects the apparent weight of an object (size-weight illusion). It is generally assumed that the differential threshold is a simple function of the physical intensity of the stimulus. We may, however, ask whether the differential threshold is affected by illusions. To answer this question, we estimate differential thresholds under a pair of conditions in which the relevant input is the same but appears different. Using the size-weight illusion, we have found that the differential threshold for weight is greater for a set of small weights than for a set of larger and apparently lighter weights.

A64-80473
REDUNDANCY IN NON-SEQUENTIAL PATTERNS.
Alan Staniland (Exeter U., Psychol. Lab., Great Britain).
Quarterly Journal of Experimental Psychology, vol. 16, May 1964, p. 134–146. 10 refs.

Recognition, discrimination, and delayed discrimination tasks were carried out with selections of composite visual patterns, ordered in terms of a generalized measure of redundancy based upon transmission between determinates under four determinables. Results in the recognition experiment showed a significant relationship with redundancy and there was indication of a similar effect in delayed discrimination. Redundancy levels, however, appeared irrelevant to simultaneous discrimination, where each response could be made discretely without reference to the structure of the selection as a whole.

A64-80474
THE TELEMETRIC METHOD OF THE STUDY OF PHYSIOLOGICAL PARAMETERS IN MAN DURING EFFORT [TELEMETRYCZNE METODY BADANIA PARAMETROW FIZJOLOGICZNYCH U CZLOWIEKA W CZASIE WYSILKU].
H. Zakrzewski (Inst. Naukowy Kultury Fizycznej, Warszawa, Poland).
Wychowanie Fizyczne i Sport, vol. 8, 1964, p. 179–184. In Polish.

A description is given of two models of the apparatus used by the author for the telemetric recording of the electrocardiogram and respiratory rhythm of athletes engaged in various sport activities. Representative records are reproduced.

A64-80475
THE APPLICATION OF THE TELEMETRIC METHOD TO THE PHYSIOLOGIC STUDIES OF PHYSICAL EFFORTS [ZASTOSOWANIE METODY TELEMETRYCZNEJ DO FIZJOLOGICZNYCH BADAN WYSILKU FIZYCZNEGO].
J. Pocztarska-Bielecka (Inst. Naukowy Kultury Fizycznej, Zaklad Fizjologii, Warszawa, Poland).
Wychowanie fizyczne i sport, vol. 8, 1964, p. 185–190. In Polish.

The telemetric registration of pulse and respiratory rhythm is valuable in the study of the adaptive ability of the organism to stress conditions. The method yields an accurate record of the physiological indices before, during, and after physical effort and permits evaluation of energy expenditure and degree of fatigue. It may be applied to great advantage, in the various sport disciplines, in many branches of industry, in medicine (particularly anesthesiology), aviation, physiological experiments, and in the evaluation of the efficiency of the cardiovascular system. Representative recordings and graphs based on them are reproduced.

A64-80476
BIOASTRONAUTICS.
Schaefer, K. E., ed. (U.S. Naval Med. Res. Lab., Groton, Conn.)
New York, The Macmillan Co., 1964, ix +406 p. $16.00.

This volume contains reviews by fifteen contributors of bioastronautics problems. In Part 1, "Physiological Problems of Space Flight", the various effects of environmental stressors (acceleration, vibration, noise, gaseous requirements, heat, radiation, magnetic fields, physiological rhythms, and psychophysiological problems) are reviewed in 8 chapters. Part 2 deals with "Technological Aspects" such as bioengineering and space ecological systems. Part 3, "Space Flight Operations," summarizes the medical aspects of astronaut training and the physiological results of spaceflight in animals and man. A problem area of bioastronautics is opened in Part 4, "Perspectives," which examines the problems of altered dimensions of space and time that will be encountered by the human organism in space exploration. Also included is a 6-page subject index. Pertinent chapters are abstracted separately.

A64-80477
ACCELERATION STRESS.
J. P. Meehan (Southern California U., Los Angeles).
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 3–26. 56 refs.

Various types of acceleration stresses (positive, negative, transverse) to be encountered in human space flight can be simulated on centrifuges, rocket-powered sleds, drop towers, and vibrating devices. A review is presented including—current acceleration terminologies; subjective end-points in human acceleration experiments; the effects of long duration acceleration on the cardiovascular and respiratory systems, vision, vestibular senses, central nervous and motor systems (reaction time, cognitive processes, continuous control performance); acceleration protection by means of partial pressure suits, seat and couch design, water immersion of space crews, training on a centrifuge; current programs for human centrifuges in the United States and several centrifuge devices in Canada, Sweden, Italy, France, and Great Britain; the slow rotation room; rapidly applied acceleration; vibration; combined stresses; and the effect of weightlessness and zero g on the cardiovascular system, locomotion, motor performance, and sensory vestibular systems.

A64-80478
TRANSIENT ACCELERATION, VIBRATION AND NOISE PROBLEMS IN SPACE FLIGHT.
Henning E. von Gierke (Aerospace Med. Res. Labs., Biodynamics and Bionics Div., Wright-Patterson AFB, Ohio).
IN: BIOASTRONAUTICS.
Edited by Karl E. Shaefer.
New York, The Macmillan Co., 1964, p. 27–75. 144 refs.

This condensed review is part of the chapter "Biodynamics of Space Flight" by H. E. von Gierke and E. P. Hiatt, published in Progress in the Astronautical Sciences, Volume I, 1962, edited by S. F. Singer (Amsterdam, North Holland Publishing Co., 1962). It considers the dynamic spectrum from the short-duration, high-amplitude characteristics of ground impact to buffeting, structure-borne vibrations and airborne noise. After a summary of the mechanical environments to be expected in spaceflight, the methods for laboratory simulation of these environments, the terminology for biodynamic acceleration research, and the techniques of determining human tolerance limits to acceleration are described. The human body as a mechanical system is discussed, along with the mechanical, physiological, and performance reactions of man exposed to abrupt acceleration, vibration, and noise environments. The physiological basis of the limits of human tolerance to these dynamic environments is described, and practical criteria for operational application presented. Methods of protection against the effects of mechanical forces are considered, and areas needing experimental exploration listed.

A64-80479
GASEOUS REQUIREMENTS IN MANNED SPACE FLIGHT.
Karl E. Schaefer (U.S. Naval Res. Lab., Physiol. Branch, New London, Conn.)
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 76–110. 124 refs.

A review of the literature is presented which includes the following aspects: tolerance limits to low oxygen (altitude); limits of acute exposure and natural acclimatization to altitude; acute acclimatization to altitude (carbon dioxide inhalation); threshold values of increased oxygen; hazards of spaceflight influenced by gaseous composition (oxygen and inert gas) of the capsule atmosphere; atelectasis and bends; possible need for nitrogen to sustain life; fire hazards and micrometeoroid penetration; acute effects of and adaptation to CO_2, acute acclimatization to and tolerance of CO_2; time concentration relationship in carbon dioxide toxicity; carbon monoxide; toxic trace substances in confined spaces; threshold limit values for continuous 90-day exposure in a nuclear submarine; aerosols and ions; and means to increase resistance against environmental stressors.

A64-80480
THERMAL BALANCE, HEAT TOLERANCE, AND PROTECTION.
Paul Webb (Webb Associates, Yellow Springs, Ohio).
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 111–128. 39 refs.

The methods by which thermal balance is maintained in the artificial space environment are summarized, keeping in mind those responses and conditions unique to the space traveler. The review also includes the following topics: man in an isolated radiation environment; the special importance of humidity control in sealed cabins; the need for precise figures for metabolic heat production for long periods and under subgravity conditions; the thermal problems of pressurized suits; and human tolerance to extreme thermal transients (slow heat pulses) encountered during the aerodynamic heating period of reentry. The applications of heat and cold in bioastronautics are described in terms of heat exposure as a selection and training procedure for astronauts, precooling in anticipation of heat exposure, and hypothermia for prolonged space missions.

A64-80481
DOSIMETRY OF RADIATION FIELDS IN SPACE.
Hermann J. Schaefer (U.S. Naval School of Aviation Med., Biophys. Dept., Pensacola, Fla.)
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 129–172. 49 refs.

Complete analysis of a radiation field requires: (1) measurement of the tissue ionization dosage in roentgens; (2) assessment of linear energy transfer of all components producing the ionization; and (3) establishment of intratarget dosage distribution. For radiation fields in space, measurement would require exposure of a life-size, tissue equivalent phantom containing several air-equivalent small ionization chambers. Current available information is limited essentially to the particle frequencies of various radiation beam and their respective total ionization, measured with extremely compact instrumentation in balloon gondolas, satellites, or space probes. This limitation applies to a much higher-degree to the heterogeneous radiation beams in space, with the exception of high-intensity proton beams in the inner Van Allen Belt, and in interplanetary space after large solar flares. A discussion is included of dosimetric analysis of the ordinary cosmic ray beam and high intensity proton radiation fields, and of time factors and emergency exposure to radiation in space flight. Dosimetry of ionizing radiation in space is an area that requires new definitions and supplementary provisions of existing radiation safety regulations.

A64-80482
BIOLOGICAL EFFECTS OF MAGNETIC FIELDS IN THEIR RELATION TO SPACE TRAVEL.
Dietrich E. Beischer (U.S. Naval School of Aviation Med., Pensacola, Fla.)
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 173–180. 29 refs.

A review of the literature on biomagnetics is presented with special consideration to the physiological functioning and behavior of man in extraterrestrial magnetic fields. Experiments with man exposed to low magnetic fields indicates no serious, adverse effects. The effects on man of high intensity magnetic fields appear to be visual. Plants, as well as many animals, from unicellular organisms to mice, were exposed to fields of different configurations (uniform and nonuniform) and to field strengths up to 120,000 gauss. The fields studied were the effects on growth, physiological functions, behavior, and genetics. The physical forces causing the effects of magnetic fields in man and animals are briefly discussed.

A64-80483
PHYSIOLOGICAL RHYTHMS AND BIOASTRONAUTICS.
Franz Halberg (Minnesota U., Med. School, Dept. of Pathology, Minneapolis).
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 181–195. 35 refs.
Grant (NsG-517); PHS; American Cancer Society; Elsa U. Pardee Foundation; and State of Minnesota Dept. of Public Welfare grants.

This review of the literature dealing with physiological systems includes: physiological rhythms in man; interactions among rhythms; various spectra of physiological rhythms; circadian systems—their external and internal timing, limits of temporal adaptation, mechanisms of organization and desynchronization. Conditions encountered by astronauts during space flight will be more complex than those simulated on earth and will cause alterations of physiological rhythm. Whether astronauts can perform optimally on a non-24-hour work-rest cycle, presumably without a 24-hourly periodic geophysical and/or other environmental input, constitutes an applied problem.

A64-80484
PSYCHOPHYSIOLOGICAL PROBLEMS IN SPACE FLIGHT.
George Hauty (Federal Aviation Agency, Civil Aeromed. Res. Inst., Okla. City, Okla.)
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 196–224. 27 refs.

Problems of weightlessness, vigilance, and sensory deprivation in spaceflight are discussed in relation to the requirements of reliability imposed upon the human component of an advanced space system designed for extensive operations. Illustrations of vigilance experiments are given in which subjects performed tasks continuously for prolonged periods in the space cabin simulator. Some subjects perceived no change in work load, others thought work had decreased as flight continued, and still others—whose proficiency evidenced profound manifestations of circadian periodicity—perception of work load corresponded closely with the temporal course and amplitude of this phasic function. Typical reports made by subjects undergoing sensory deprivation in the space cabin simulator revealed impairment of cognitive function, and perceptual experiences somewhat similar to hallucinatory aberrations.

A64-80485
BIOENGINEERING AND BIOINSTRUMENTATION.
Alfred M. Mayo (Chance Vought Corp., Dallas, Tex.) and James Paker Nolan, Jr. (NASA Headquarters, Office of Manned Space Flight, Wash., D.C.)
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 227–273. 124 refs.

This review of the literature on man-machine systems includes the following aspects: man-machine systems analysis for spaceflight; an integrated control system of the space vehicle; overall designs of the control station and system; cabin arrangement; mission objectives; environment of the spacecraft interior; materials and conponents; the spacecrew; psychological problems involved in mission tasks and habitability; structural requirements for the spacecraft cabin; atmosphere control systems for cabin and crew; weightlessness and acceleration stresses during spaceflight; escape systems; extravehicular equipment; and biological research applied to biosatellites and manned space vehicles. Descriptions are included of widely used bioinstrumentation applicable to spaceflight experiments such as the electrocardiograph, the phonocardiograph, and recording instruments of blood pressure, temperature, respiration, electroencephalogram, electromyogram, galvanic skin response, and blood flow.

A64-80486
SPACE ECOLOGICAL SYSTEMS.
Eugene B. Konecci (NASA, Office of Biotechnol. and Human Res., Wash., D.C.)
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 274–304. 25 refs.

Ecological systems in space vehicles are compared with those in permanent or semipermanent lunar or planetary bases. Vehicular ecological systems will be dependent on the propulsion capability in the 1960–1975 time period. Systems analyses (physical, chemical, biological, situational) are performed on orbital, lunar, and interplanetary space vehicles. A summary of studies, with sample designs, of several selected ecological systems are discussed including the Mercury life support system, the orbital system, and the proposed nuclear Reusable Interplanetary Transport Approach (RITA concept).

A64-80487
MEDICAL ASPECTS OF ASTRONAUT TRAINING.
William K. Douglas (AF Missile Test Center, Patrick AFB, Fla.)
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 307–313.

From a medical standpoint the training of a space pilot is divided into three major categories: (1) the basic sciences (human anatomy, physiology, medicine); (2) physical fitness; and (3) familiarization with the conditions of spaceflight (accelerations, atmospheric conditions, temperature and altitude changes, noise, vibration, disorientation, weightlessness, cosmic ray hazards). Extensive training is needed in related fields such as survival, problems associated with boredom, isolation, sensory deprivation, and physical maneuvers or use of mechanical devices required to combat deterioration of cardiovascular reflexes during spaceflight. The flight surgeon responsible for supervising and training astronauts must become intimately familiar with the spacecraft and with the many engineering and technical details of the flight. He must personally experience all stresses of the training program.

A64-80488
PHYSIOLOGICAL EFFECTS OF SPACE FLIGHT IN ANIMALS AND MEN.
James P. Henry (Southern California U., Dept. of Physiol., Los Angeles, Calif.)
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 314–329. 28 refs.

This summary of the theories concerning the physiological effects of the weightless state during spaceflight includes the following aspects: labyrinthine disturbances, digestive upsets, sensory deprivation, sleep and diurnal rhythm changes, circulatory impairment, and muscle and bone atrophy. These possible disturbances are cited in order of their expected development, ranging from a rapid onset in minutes or hours for labyrinthine symptoms such as nausea and vertigo, to a matter of weeks to months for evidence of muscle and bone atrophy. The results of various studies conducted in aircraft, ballistic rockets, and orbiting spaceflight are reviewed. Instrumentation included measures of body temperature, electroencephalogram, electrocardiogram, respiration rate, blood pressure, task performance, and performance of functions such as eating, drinking, micturation, and sleeping. No physiological disturbances directly attributable to spaceflight were recorded. The probable effectiveness of precautions to be taken in the future to prevent the development of subtle or gross disturbances is discussed.

A64-80489
BIOLOGICAL COMPUTERS.
W. Ross Ashby and Heinz von Foerster (Illinois U., Dept. of Electrical Engineering, Urbana).
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 333–359. 26 refs.

A review is presented of the cybernetic theory and its interpretation of life, intelligence, and evolution. A neuron-model for computing logical functions analogous to the elementary information-processing unit (neuron) of the living organisms is described. Any functional behavior can be defined logically and unambiguously in a finite number of words realized by a network composed of simple neurons. Elements and networks can be combined into complex systems. Every function observable in the behavior of living organisms can be represented in the processes of the general-purpose computer. Parallel networks with a given unalterable internal structure and dynamically adaptive systems are described and, related to them, some essential features of computational principles in living organisms are sketched.

A64-80490
EXPERIENCED SPACE AND TIME.
Hermann von Schelling (General Electric Co., Advanced Technol. Labs., Schenectady, N.Y.)
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 361–385. 7 refs.

In physics, space and time are inseparable, united by Einstein's theory of relativity. Luneburg's theory of space perception predicts the perception of a fixed configuration of objects in three-dimensional space. When considering moving objects, time must be included into the finite invariant on which the theory is based. This is done in a discussion of basic formulae in Minkowski's coordinates and translation of the formulae into real time, in complete analogy to the more restricted former results. Until now, theorems referred to a fixed point of awareness. Changing from the finite invariant to an infinitesimal linear element a new perceptual theory of relativity is possible with integration of differential equations of geodetic lines. Integration proves that physiological age does not change on space trips as predicted by the notion of time dilatation. It also demonstrates that the particular linear element belongs to a matter-free gravitational field according to Einstein's notation.

A64-80491
EXPERIMENTS CONCERNING THE NON-EUCLIDEAN STRUCTURE OF THE VISUAL SPACE.
Gerhard Kienle (Fed. Rep. of Tübingen, Universitatsnervenklinik, Tübingen, Germany).
IN: BIOASTRONAUTICS.
Edited by Karl E. Schaefer.
New York, The Macmillan Co., 1964, p. 386–400. 19 refs.

The theory and historical background of mathematical formulas, analytical operations, etc., corresponding to visual perception are reviewed. A preliminary report is made of experiments with 200 subjects viewing 1,300 curves of visual circles and apparent straight lines in visual frontal planes, taken with the horopterscope. Used in the tests were Hjelmsler's central line determination, the axiom of parallels, and Poincaré's model of hyperbolic space. It is questionable whether visual space is built according to geometric rules, although mutual configuration of visually concentric circles is described by a hyperbolic family of circles in physical space with accuracy. The hyperbolic set of circles depended on choice of the first set circle or position of the subject in the test area. This may imply a contradiction to the axiom of congruence.

A64-80492
ELECTROENCEPHALOGRAPHIC PATTERNS IN CASES OF CHRONIC EXPOSURE TO CARBON MONOXIDE IN AIR [OBRAZ ELEKTROENCEFALOGRAFICZNY W PRZYPADKACH PRZEWLEKLEJ EKSPOZYCJI NA MAKE STEZENIA TLENKU WEGLA W POWIETRZU].
Barbara Grudzinska (Klinika Neurologicznej, Zabrze, Poland).
Folia Medica Cracoviensia, vol. 5, 1963, p. 493–515. 50 refs. In Polish.

A study was made on 60 subjects exposed occupationally to carbon monoxide in concentrations of less than 0.01%, and a control group of 30 workers employed similarly but not exposed to CO. The following tests were performed: hematocrit, hemoglobin and carboxyhemoglobin levels, complete history, physical examination, autonomic nervous function tests by Shellong and Aschner, and electroencephalograms at rest and after activating tests. In the experimental group COHb averaged 7.4%; in 11 subjects it exceeded 10%. In the control group COHb averaged 3%. Neurasthenia with predominantly organic symptoms was diagnosed in 63% of the experimental group although neurasthenic symptoms were also present in 40% of the control group. The percentage of pathologic EEG findings was the same in both groups, but the greatest intensity was found in 3 members of the exposed group. Also, the exposed group had a higher proportion of flat, low amplitude tracings with scanty alpha rhythm. In the exposed group, all pathologic tracings, 81% of low-amplitude tracings, scanty alpha rhythm, and tracings of the first sleep phases were found in the neurasthenic individuals. Chronic monoxide poisoning may have an inhibitory effect on the bioelectric activity of the brain which manifests itself in nonspecific changes. EEG examination in such cases may serve only as an aid to confirm the diagnosis.

A64-80493
NEUROPSYCHOLOGICAL EFFECTS OF EARLY SENSORY RESTRICTION.
Ronald Melzack and S. K. Burns (MIT, Depts. of Psychol. and Electrical Engring. and Res. Lab. of Electronics, Cambridge).
Boletin del Instituto de Estudios Medicos y Biologicos, vol. 21, Dec. 1963, p. 407–425. 28 refs.
Grant NIH-G-MH-4235-C3; and Army-Navy-USAF-supported research.

Behavioral studies carried out with dogs that have been raised in restriction cages from infancy to maturity show that (1) they become extremely active after they are removed from the restriction cage and are placed into a new environment, (2) they exhibit abnormal perceptual behavior to visual, auditory, olfactory, and noxious stimuli, and (3) they have difficulty in "inhibiting" irrelevant responses such as position habits, responses that no longer bring food rewards, and stereotyped behavior patterns. These results suggest a neural model in which failure to filter out irrelevant information on the basis of prior experience leads to excessive arousal which, in turn, interferes with mechanisms (in part innately determined) that normally act in the selection of cues for adaptive response. Physiological experiments currently under way tend to support this conceptual model.

A64-80494
SOME STATISTICAL CHARACTERISTICS OF ELECTROCORTICAL ACTIVITY IN RELATION TO VISUAL-OCULOMOTOR TRACKING IN MAN.
John S. Barlow (Mass. General Hosp., Boston; and Res. Lab. of Electronics, Cambridge).
Boletin del Instituto de Estudios Medicos y Biologicos, vol. 21, Dec. 1963, p. 497–518. 10 refs.
Grants PHS-G-5-K3-NB-9201; and PHS-G-B-3752.

Three subjects were employed in a study involving visual-oculomotor tracking of a spot of light on an oscilloscope screen shifted vertically at predictable and unpredictable intervals between two alternate positions. Simultaneous recordings of the tracking signal, eye position, and the midline parietooccipital electroencephalogram were analyzed. The analyses included: histograms of oculomotor reaction times, average response type computations of stimulus-locked and oculomotor-response-locked activity in the electroencephalogram, and amplitude histograms of the EEG's at various times with respect to the stimulus and to the oculomotor response. Responses evoked by the stimulus, and by the subsequent shift in position of the eyes which constituted oculomotor response, were clearly separable by averaging technique, the clearest separation being obtained for the subject having the greatest variability of oculomotor-reaction times. No evidence was found to suggest that the occurrence of oculomotor responses was phased with respect to rhythmic components in the parietooccipital EEG, but minimal evidence, for one subject, was found which suggested a quantification of reaction times.

A64-80495
INTEGRATED HUMAN RESEARCH AND AEROSPACE MEDICINE.
Carl-Johan Clemedson (Gothenberg U., Gothenberg, Sweden).
Aerospace Medicine, vol. 35, Jun. 1964, p. 511–518.

A review is presented of human research necessary to better accommodate man for future aerospace missions and to determine his performance capabilities under known and foreseeable conditions of such missions. Man's tolerance to single stresses has been evaluated in terms of limits, including injury and consciousness limits. When a number of stresses are combined it becomes problematic, however, whether these limits are actually valid. To answer this pertinent question, extensive integrative human research in terrestrial space flight simulators and in actual space flight is urgently needed. To be included in such research are: (1) acceleration, (2) weightlessness, (3) radiation, (4) biologistics, (5) physiology, and (6) psychology. The integration of human physiological and psychological needs with the technical advancements of space technology and adapting and strengthening the weakest link in the man-machine system constituted by the spacecraft will permit man to conquer the whole solar system. In the past few years the machine capability has advanced far beyond that of man. It is the task of bioastronautics research in general and applied integrative human research in particular to bring this disproportion back into balance.

A64-80496
EFFECT OF TONUS CHANGES ON PERCEIVED LOCATION OF VISUAL STIMULI.
Csaba Sziklai, Seymour Wapner, Joseph H. McFarland and Heinz Werner (Clark U., Worcester, Mass.)
Aerospace Medicine, vol. 35, Jun. 1964, p. 519–523. 12 refs.
Grant PHS-G-MH-00348.

A series of 4 experiments are reported, dealing with the effect of muscle tonus on localization in the up-down dimension of space, as measured by the apparent eye-line. Under dark room conditions, a visual stimulus placed objectively in line with the subject's eyes is adjusted to a position where it appears to be in line with his eyes. To be seen in line with the eyes, the stimulus has to be adjusted relatively toward the feet under conditions assumed to change muscular tone: (a) when the subject is erect as compared with when he is tilted or supine; (b) when the tension of the antigravity musculature is increased; and (c) when the subject, while supine, has his feet touched as compared with when he has both his shoulders and feet touched.

A64-80497
SUBRADIATION EXPERIMENTS CONCERNING THE CONCEPT OF THE NATURAL RADIATION ENVIRONMENT.
James G. Eugster (Bern and Zurich U., Bern, Switzerland).
Aerospace Medicine, vol. 35, Jun. 1964, p. 524–526. 7 refs.

Results of studies concerning the effects of subradiation on biological objects are presented. The subjects were chosen according to a scale of innate-radioactive levels: (1) Artemia eggs (low activity), (2) seeds of gold barley (moderate innate-activity), and (3) green algae (very high innate-activity). The designation of the innate-activity levels of the subjects was precisely determined by repeated analysis of their ashes. One group of subjects in each of the activity categories was held and observed for several years in a radiation-free milieu inside the Simplon tunnel and was later compared with a control group kept at the surface of the earth. The results showed that subjects in group 3 were most sensitive to a change in milieu, while the first group exhibited the greatest resistance. It is concluded that when examinations of the effects of weak radiation levels (environmental radiation) are to be made, the radioactivity of the subject itself must be taken into account, especially in biological investigations in the lower radiation belt.

A64-80498
A PROPOSED SPEECH DISCRIMINATION TEST FOR SENIOR NAVAL AVIATORS.
Vernon C. Bragg and James W. Greene (U.S. Naval School of Aviation Med., Pensacola, Fla.)
Aerospace Medicine, vol. 35, Jun. 1964, p. 527–529.

A new test is formulated for the purpose of evaluating the naval aviators' ability to interpret speech in a background of high-intensity noise such as that found in an aircraft cockpit. The test consists of one hundred one-syllable words recorded in 100 db of aircraft noise at a signal-to-noise ratio of + 15 db. Twenty-four Service Group I and three Service Group III naval aviators between the ages of 40 and 50 were tested using two forms of the test. Mean scores showed no difference between groups, despite differences in threshold acuity for pure tones. Retest revealed an expected improvement due to practice. The test is proposed as a realistic method for use in determining the senior aviator's qualification to perform in Service Group I.

A64-80499
DECOMPRESSION OF MICE IN ATMOSPHERES CONTAINING HELIUM OR ARGON IN PLACE OF NITROGEN.
James D. Witherspoon (Western Maryland College, Dept. of Biology, Westminster); Jacob E. Wiebers, William A. Hiestand, and Ann H. Heimlich (Purdue U., Dept. of Biol. Sciences, Lafayette, Indiana).

Aerospace Medicine, vol. 35, Jun. 1964, p. 529–532. 18 refs.
Grant NIH-G-RG-8535 and Purdue Research Foundation-supported research.

Mice slowly decompressed to 179 mm. Hg survived longer after saturation with a helium-oxygen atmosphere in place of an argon-oxygen atmosphere or air. When mice were rapidly decompressed to pressures from 60 to 220 mm. Hg, previous saturation with the helium-oxygen atmosphere had little or no effect on survival. When mice were exposed in a helium-oxygen atmosphere as compared with air (1) their oxygen consumption and carbon dioxide production were raised slightly, (2) their activity (body movements) and breathing rate were not altered, (3) their body temperatures were reduced, and (4) they became more tolerant to a combination of glycolysis inhibition and anoxic anoxia. The increased hypoxic resistance displayed by mice after exposure to a helium-oxygen mixture, is probably the result of the reduction of body temperature or a change of energy storage or utilization by the body.

A64-80500
NEGATIVE (–Gz) ACCELERATION IN RELATION TO ARTERIAL OXYGEN SATURATION, SUBENDOCARDIAL HEMORRHAGE AND VENOUS PRESSURE IN THE FOREHEAD.
Otto H. Gauer (Freie U., Dept. of Physiol., Berlin, Germany) and James P. Henry (Southern California U., Dept. of Physiol., Los Angeles).
Aerospace Medicine, vol. 35, Jun. 1964, p. 533–545. 62 refs.

Three facets of a series of early studies of the physiology of negative acceleration are presented together with brief resumés of recent related developments. Original observations are cited demonstrating the change in the oxygenation of arterial blood and the enhanced pulmonary shunting of blood which occurs during acceleration. With the advent of prolonged rocket launch and reentry accelerations, shunting and the pulmonary atelectasis that may accompany it, have become matters of practical concern in bioastronautics. Evidence is presented that the subendocardial hemorrhages that occur during the forceful beating of a poorly filled ventricle, as in hemorrhagic shock, are due to isometric contractions with consequent disturbed pressure relationships within the ventricular wall. Factors controlling pressure in the venous system during gravitational stress are analyzed, including considerations of geometry, the available blood volume, and the elasticity of the vascular system. The significance of the angle made by the forward position of the eyes relative to the heart is recognized.

A64-80501
EJECTION SEAT DESIGN AND VERTEBRAL FRACTURES.
Phillip M. Levy (Station Hosp., USMCAS El Toro Santa Ana, Calif.)
Aerospace Medicine, vol. 35, Jun. 1964, p. 545–549. 21 refs.

Ejection seat design contributes to the incidence of vertebral fractures sustained by aviators on ejecting from present-day jet aircraft. Seat design as related to poor body positioning and excessive ejection forces is discussed. Recommendations are made for improving certain features of present-day ejection seats.

A64-80502
PHYSIOLOGICAL EFFECTS OF INDUCED HYPOXIA DURING INSTRUMENT FLYING.
Charles E. Billings, Mary F. Foley, and Charles R. Huie (Ohio State U., Dept. of Prevent. Med., Aviation Med. Res. Lab., Columbus).
Aerospace Medicine, vol. 35, Jun. 1964, p. 550–553. 6 refs.
Scott Aviation Corp. sponsored research.

The physiological responses of twenty experienced pilots were studied during flight at an altitude of 2,500 feet. Each subject was exposed in random order to four oxygen-nitrogen mixtures under double blind conditions. The gas mixtures provided tracheal oxygen tensions equivalent to those obtained breathing air at sea level, 7,000, 10,000 and 13,000 feet pressure altitude. It was found that the average metabolic cost of performing a simulated instrument approach in a light twin-engine aircraft was approximately 53% in excess of the resting oxygen uptake under each of the conditions studied. Ventilation and respiratory exchange ratios increased as tracheal oxygen tension was reduced; these alterations were due to mild hypoxia. Performance of this task did not tend to prove hyperventilation. Finally, it was found that the Müller-Franz portable respirometer, properly maintained and calibrated, is an efficient and relatively precise tool for study of metabolic variables in flight.

A64-80503
SUMMARY AND EVALUATION OF AIRCRAFT ACCIDENTS AND FATALITIES.
Horace S. Bell and Samuel P. Chunn (Deputy Inspector General for Safety, Norton AFB, Calif.)
Aerospace Medicine, vol. 35, Jun. 1964, p. 553–559.

Causal factors and trends in United States Air Force aircraft accidents resulting in major injuries and fatalities are reviewed. The following conclusions are drawn: (1) aircraft accidents and incidents should be more thoroughly investigated to reduce the number now classified as undetermined; (2) there should be more frequent periodic training stressing the importance of psychophysiological factors involved in present accident experience; (3) because crash landings in high performance aircraft are untenable, emphasis should be placed on the decision to eject at a safe altitude and on training in the use of mission aircraft equipment; (4) there should be an active and aggressive program devoted to the improvement of all required items of personal equipment; and (5) an effective personal and crash locator beacon should be obtained as soon as possible to expedite the location of downed crew members and of the crash site.

A64-80504
EJECTION SEAT ACCELERATIONS AND INJURIES.
Walton L. Jones, William F. Madden, and Gerald W. Luedeman.
Aerospace Medicine, vol. 35, Jun. 1964, p. 559–562. 7 refs.

The U.S. Navy aircraft emergency escape systems have saved many lives, but have caused a 21 percent incidence of fractured vertebrae. A program is underway to reduce the g loading and obtain at the same time better performance by means of a rocket propelled ejection system which combines a lower boost phase followed by an even lower sustained rocket thrust phase. The aviators with vertebral fractures have, in general, fared well. Most have returned to full flight status. Early ambulation seemed to assist in the healing process as well as the maintenance of aeronautical adaptability and high morale. Canopy ejections continue to present special problems which are being met in part by training the aviator to keep his seat low for ejection.

A64-80505
INFLUENCE OF ENVIRONMENTAL TEMPERATURE ON THE TOXICITY OF OXYGEN.
Armand J. Gold, Elaine C. Silver, and Harry E. Hance (Gen. Elec. Space Technol. Center, Biosciences Operation, Valley Forge, Pa.)
Aerospace Medicine, vol. 35, Jun. 1964, p. 563–567. 14 refs.

Experiments to determine the effects of temperature on chronic exposure to atmospheric oxygen were carried out in separate studies on the mouse (Bar Harbor Strain C-57) and on the giant amoeba (Pelomyxa carolinensis). In the former, results indicated increased sensitivity to oxygen with increased temperature, LT_{50}'s for oxygen-normal temperature and oxygen-100° F groups being 100 and 35 hours, respectively. However, high temperatures appeared to dominate the effect of oxygen, LT_{50}'s for groups exposed to either oxygen or air at 110° F and 115° F being approximately one to two hours. Evidence of oxygen toxicity (pulmonary edema and atelectasis) was found in the lungs of mice exposed to increased temperatures less than 100° F. Pulmonary hemorrhage was the only significant pathological finding in the lungs of mice exposed to oxygen or air at 100° F and above. In the second study, air-exposed amoebae in solution at room temperature increased their number by 87% after 72 hours. Oxygen-exposed amoebae showed an increase of only 21%. The data suggest that oxygen effects (growth attenuation), evident at normal and near-normal temperatures, were abolished or replaced by high-temperature effects (cell disintegration). Some destruction of amoebae occurs at low temperatures.

A64-80506
GLAUCOMA INCIDENCE AND SIGNIFICANCE IN AVIATORS.
A. Merceir, G. Perdriel, P. Sole, J. Chevaleraud, and J. Graveline.
Aerospace Medicine, vol. 35, Jun. 1964, p. 567–571. 17 refs.

The authors observed that a number of flying personnel with glaucoma, treated or not, demonstrated a decrease of the ocular tension in the low-pressure chamber, which was thought to be related to a hyposecretion of the aqueous humor, secondary to anoxemia. Altitude apparently does not aggravate ocular hypertension. Visual fatigue and psycho-ocular interactions peculiar to flying personnel were discussed as possible contributing factors of inducing glaucoma. Visual fatigue as well as psychological factors observed in flying personnel may be predisposing, but not determining factors of glaucoma. The decision to maintain flight qualification depends upon the degree of glaucoma, the effectiveness of medical therapy, and the state of the visual functions after miotic-induced contraction of the pupil. Fistulizing procedures make it difficult to continue air activities. A regular periodic examination of the ocular tensions should be required after 35 years of age.

A64-80507
IS THERE A MOON ILLUSION IN SPACE?
Ingeborg Schmidt (Indiana U., Div. of Optometry, Bloomington).
Aerospace Medicine, vol. 35, Jun. 1964, p. 572–575. 14 refs.

The moon illusion is the phenomenon in which the horizon moon appears larger than the zenith moon. The following factors favor the apparent size in the direction of enlargement: (1) nearness to the horizon, (2) a terrain so oriented that it extends from the observer's feet toward the horizon, (3) a time around sunset or sunrise, (4) overlay produced by terrestrial objects or by clouds, and (5) a hazy atmosphere. In order to draw conclusions about the possibilities of a moon illusion in space, it is of interest to find out how the illusion is affected when the relationship of observer-terrain-moon is altered by receding from the terrain in an airplane. Interrogations among pilots revealed that when observing from the air, the moon and stars appear

larger at the horizon than overhead. The phenomenon increases when descending. On the basis of knowledge about moon illusion on earth, it can be predicted that in space there may be some apparent enlargement of the horizon moon because of a relative rather than absolute distance problem, namely overlay. Aerial perspective may also be a factor. The illusion will be a transitory phenomenon because of the changeable orientation of the astronaut to earth and because of the apparent movement and much greater speed of the celestial bodies.

A64-80508
INFLIGHT LOSS OF CONSCIOUSNESS.
J. Robert Dille and Pei Chin Tang (Federal Aviation Agency, Civil Aeromed. Res. Inst., Oklahoma City, Okla.)
Aerospace Medicine, vol. 35, Jun. 1964, p. 579–583. 26 refs.

A case of inflight vertigo and loss of consciousness in a private pilot, flying alone, is presented. The differential diagnosis and the significance of the findings of 5 to 7 per second theta waves in his resting electroencephalogram (EEG) and high voltage slow waves during caloric irrigation of his right ear are discussed. The possibility that the abnormal EEG activity is the result of traumatic head injury cannot be ruled out since the subject sustained head injury in his boyhood and also might have had concussion during his crash after landing. The appearance of high voltage slow waves during the caloric test was unexpected. However, the fact that abnormal EEG waves can be provoked by vestibular stimulation appears to be in perfect agreement with the contention that the lesion, if there is any, must be subcortical and very likely in the brain stem. Because of the possibility of unpredictable recurrences with serious consequences, it would be hazardous for this air man to resume flying until the cause and nature of his vertigo, period of unconsciousness, and EEG abnormality are better understood. Periodic assessments of his interval history and physical condition are planned to determine when, or if, he may safely return to flying.

A64-80509
COMPARATIVE STUDY OF SLEEP CYCLES IN RODENTS.
T. Weiss and E. Roldán (Czechoslovak Acad. of Sciences, Inst. of Physiol., Prague).
Experientia, vol. 20, May 15, 1964, p. 280–281. 7 refs.

In rodents (rabbit, rat, mouse) of a comparable brain organization the sleep cycles are characterized by cyclic alternation of (a) generalized slow irregular high amplitude activity, and (b) neocortical desynchronization and regular theta-activity in the hippocampus. The velocity of the sleep cycles increases as the size of the animal decreases, i.e. the mouse has the shortest cycles. The relative duration of sleep cycles in species having similar brain organization, but differing in body weight, body surface, and metabolic rate, indicates that intrinsic brain mechanisms (pacemaker) determining the cyclic alternation of sleep cycles, are a metabolic feature or are controlled by metabolic factors in the lower brain stem.

A64-80510
IS SUGGESTION THE SOURCE OF REPORTED VISUAL SENSATIONS IN PERCEPTUAL ISOLATION?
Marvin Zuckerman (Albert Einstein Med. Center, Dept. of Endocrinol. and Reprod., Philadelphia, Pa.) and Nathan Cohen (Ohio State U., Columbus).
Journal of Abnormal and Social Psychology, vol. 68, Jun. 1964, p. 655–660. 17 refs.

The hypothesis that expectation or suggestion is responsible for the reports of visual sensations in perceptual isolation was tested using a control group and three additional groups incorporating increasing amounts of verbal and placebo suggestion. Subjects were 58 male undergraduates. Prior knowledge and expectations were unrelated to reports of visual sensations. Only the least structured and meaningful type of reported visual sensations were found to increase with suggestion. Other reactions to isolation were unrelated to suggestion. Although the role of direct suggestion in perceptual isolation has been overestimated, the continuous reporting method may be influential in eliciting reports of visual sensations.

A64-80511
CHRONIC TOXICITY OF ETHYLENE OXIDE: A STUDY OF HUMAN RESPONSES TO LONG-TERM LOW-LEVEL EXPOSURES.
Roy E. Joyner (Union Carbide Chemicals Co., Texas City Plant, Tex.)
Archives of Environmental Health, vol. 8, May 1964, p. 700–710. 11 refs.

Thirty-seven chemical operators working in ethylene oxide production for a mean period of more than ten years were subjected to a thorough study of their overall health level. These operators were presumably exposed to levels of ethylene oxide in air of approximately 5–10 p.p.m for the duration of their service. Numerous approaches were utilized in evaluating the health status of this group. Laboratory procedures and other objective measurement methods failed to reveal evidence that the study group had suffered any ill effects from their exposure. The 37 individuals comprising the study group will be followed with similar evaluation techniques at five-year intervals in the future.

A64-80512
OBJECTIVE MEASUREMENT OF VISUAL ACUITY.
Lee R. Wolin and Arline Dillman (Cleveland Psychiat. Inst., Lab. of Neurophysiol., Ohio).
Archives of Ophthalmology, vol. 71, Jun. 1964, p. 822–826. 10 refs.
Grant NIMH-M-05756.

A method for the objective measurement of visual acuity based on the evocation and inhibition of optokinetic nystagmus and using electro-oculography for recording the test results has been described. The results of measurements of acuity of 101 eyes with both the optokinetic technique and the Snellen test showed a satisfactorily high and statistically significant correlation ($r = 0.85$, $P \leq 0.001$) between the two tests.

A64-80513
STRESS RESPONSE IN TOTAL AND PARTIAL PERCEPTUAL ISOLATION.
Marvin Zuckerman, Sheldon Levine, and D. Vincent Biase (Albert Einstein Med. Center, Dept. of Endocrinol. and Reprod., Res. Labs., Philadelphia, Pa.)
Psychosomatic Medicine, vol. 26, May–Jun. 1964, p. 250–260. 19 refs.
Grants NIMH-MH06875-01; NIMH-EP 7-RDI.

A study was made of physiological (Galvanic Skin Response) and verbal stress responses to total perceptual isolation (darkness and silence) and partial isolation (darkness with sound or silence with light). The results on the GSR indices indicate that, after 1 1/2 hours, total isolation is more stressful than partial isolation. Verbal indices indicate that all types of isolation are equally stressful. The results indicate that a social set theory is not sufficient to explain the stressful effects of perceptual restriction.

A64-80514
ACID MUCOPOLYSACCHARIDE CONTENT OF DERMAL CONNECTIVE TISSUE OF NORMAL AND STRESSED RATS.
Zina Fediay and Michael M. Clay (Columbia U., Coll. of Pharm., Div. of Pharm. and Biol. Sciences, New York, N.Y.)
Nature, vol. 202, May 30, 1964, p. 907–908. 9 refs.
CIBA Pharmaceutical Co.-supported research.

Dermal diffusibility and changes in mucopolysaccharide content were investigated in (a) a control group of 16 rats maintained under stress-free conditions, (b) a group of 16 rats maintained for two days in individual steel cages at 12° (short-term stress), and (c) a group of 16 rats subjected to cold and restriction of movement for fourteen days (long-term stress). Both stress conditions increased relative adrenal gland weight, elevated plasma corticosterone levels for 14 days, and decreased relative thyroid weights. Two-day stress caused a decrease in hyaluronic acid and chondroitin sulphate. Fourteen-day stress caused an increase in hyaluronic acid and chondroitin sulphate and a decrease in heparin. Dermal spread of the indian-ink-hyaluronidase solution decreased with the decrease in the concentration of hyaluronic acid and chondroitin sulphate; it increased with an increase in these substances.

A64-80515
MUSCULAR EXERCISE AT GREAT ALTITUDES.
L. G. C. E. Pugh, M. B. Gill et al (Med. Res. Council Labs., Natl. Inst. for Med. Res., Div. of Human Physiol., Hampstead, London, England).
Journal of Applied Physiology, vol. 19, May 1964, p. 431–440. 28 refs.
Medical Research Council and The Wellcome Trust-supported research.

Six subjects performed ergometer exercise at various altitudes from sea level to 24,400 feet during a Himalayan expedition lasting 8 months. Oxygen intake for a given work rate was constant and independent of altitude, up to the maximum work rate that could be maintained for 5 minutes. Maximum oxygen intake declined with increase of altitude, reaching 1.4 liters/minute at 24,400 feet in the best subject. Ventilation for a given work rate was independent of altitude in light and moderate exercise but increased at each altitude as maximum oxygen intake was approached. Heart rates at altitude were higher at low and moderate work intensities, but the same as or lower than the corresponding sea-level value for the same work load, as maximum oxygen intake was approached. Breathing oxygen at sea-level pressure at 19,000 feet reduced ventilation and heart rate for a given work rate, restored work capacity almost to sea-level values, and increased maximum heart rate. Evidence that lung diffusion, cardiac output, and the high oxygen cost of extreme ventilation all contributed to the limitation of exercise at 19,000 feet is presented.

A64-80516
HEMODYNAMIC RESPONSES OF NORMAL MEN TO GRADED TREADMILL EXERCISE.
Burton S. Tabakin, John S. Hanson, Thornton W. Merriam, Jr., and Edgar J. Caldwell (Vermont U., Coll. of Med., Cardiopulmonary Lab., Burlington).
Journal of Applied Physiology, vol. 19, May 1964, p. 457–464. 19 refs.
Grants NHI-HE-6121-01; NHI-HTS-5286-C1-C2.

The physiologic variables defining the circulatory and respiratory state in normal man have been measured in recumbency, standing at rest, and during progressively severe grades of exercise approaching near-maximal levels. Indicator-dilution technique was used for determination of cardiac output with simultaneous radioelectrocardiographic recordings of heart rate. Direct intra-arterial pressure measurements were utilized for calculation of

peripheral vascular resistance. Minute volume of ventilation, oxygen utilization, and carbon dioxide elimination were obtained from analysis of expired air collected at the time of each cardiac output determination. A peak mean workload of 1,501 kg-m/min was realized during the treadmill exercise. Increases in cardiac output over the range of exercise employed correlated well with indices of workload such as heart rate, oxygen utilization, and minute volume of ventilation. There was no correlation of stroke volume with these indices. It is concluded from examination of individual stroke-volume responses that a progressive increase in stroke volume is not a necessary or constant phenomenon in adapting to increasing workload.

A64-80517
CARDIAC OUTPUT IN MUSCULAR EXERCISE AT 5,800 M (19,000 FT.)
L. G. C. E. Pugh (Med. Res. Council Labs., Natl. Inst. for Med. Res., Div. of Human Physiol., Hampstead, London, England).
Journal of Applied Physiology, vol. 19, May 1964, p. 441–447. 19 refs.
Medical Research Council and the Wellcome Trust-supported research.

Cardiac output during muscular exercise was estimated by the acetylene technique on four members of the Himalayan Scientific and Mountaineering expedition 1960–1961 at sea level and 19,000 feet. The output for a given work intensity at 19,000 ft. was comparable with the output at the same work intensity at sea level, but the maximum output was reduced, the mean value being 16 liters/min, compared with 23 liters/min at sea level. Heart rates during light and moderate exercise were higher than the rates observed at the same work intensity at sea level. The maximum heart rate during exercise was limited to 130–150 beats/min compared with 180–196 beats/min at sea level. The stroke volume at altitude was lower than at sea level at each work rate. On breathing oxygen at sea-level pressure, heart rate for a given work intensity was reduced; but the maximum heart rate increased. Indirect evidence suggested that maximum cardiac output increased but probably not to the sea-level values because of the increased hemoglobin and lower heart rate.

A64-80518
WORK TOLERANCE: AGE AND ALTITUDE.
D. B. Dill, S. Robinson, B. Balke, and J. L. Newton (Indiana U., Dept. of Anatomy and Physiol., Bloomington).
Journal of Applied Physiology, vol. 19, May 1964, p. 483–488. 11 refs.
Contract FAA-FA 2049; Grant NHI-HE-06308.

The work capacity at sea level and high altitude was measured on 9 men, 5 of whom had taken part in similar studies at high altitudes from 18 to 33 years earlier. Except for a few measurements on the treadmill at sea level each subject rode the bicycle ergometer; the brakeload was increased minute-by-minute until his limit was reached. The maximum capacity for oxygen intake declined with age both at high altitude and at sea level. Individual responses varied greatly: the most fit individual, age 54, had about as great an oxygen intake on the ergometer at a barometric pressure of 455 mm. Hg as had a man one-half his age at sea level. After 5 or 6 weeks of acclimatization a man of 71 attained at a barometric pressure of 485, a greater oxygen intake per minute and per kilogram than that of a man of 27. At that barometric pressure the limiting oxygen intake on the bicycle ergometer may be only one-half of the sea-level value 2 or 3 days after arrival; after 4-6 weeks it may range from two-thirds to five-sixths of the sea-level value.

A64-80519
TRANSIENT ARTERIAL LACTIC ACID CHANGES IN UNANESTHETIZED DOGS AT 21,000 FEET.
S. M. Cain and J. E. Dunn II (USAF School of Aerospace Med., Physiol. Branch, Brooks AFB, Tex.)
American Journal of Physiology, vol. 206, Jun. 1964, p. 1437–1440. 19 refs.

Blood lactic acid levels have been reported by some to be elevated during exposure to altitude and by others to be unaffected. Both the hyperventilation caused by hypoxia and tissue hypoxia itself should cause a rise in blood lactic acid, the latter factor being reflected primarily as excess lactate. After a 3-hour control period at ground level, unanesthetized dogs were exposed for 8 hours to 21,000 ft. simulated altitude. Arterial blood samples were drawn frequently from a Teflon T-cannula surgically placed in a carotid artery 1 or 2 days prior to the experiment. Lactic and pyruvic acid concentrations, carbon dioxide tension (P_{CO_2}), oxygen tension (P_{O_2}), and pH were measured. At altitude, the average arterial P_{O_2} was 32 mm. Hg, P_{CO_2} was 24 mm. Hg, and pH was 7.50. All control values fell in normal ranges. Although the magnitude of changes differed among animals, arterial lactic acid reached a peak value within the first 2 hours at altitude and gradually declined thereafter and, in most animals, closely approached the control value during the 8th hour at altitude. Excess lactate changed in a similar manner. The decline in lactic acid, with no concomitant relief of arterial hypoxia and hypocapnia, remains unexplained.

A64-80520
THE SIGNIFICANCE OF MASTER'S STEP TEST IN THE RECOGNITION OF REDUCED CORONARY CIRCULATION [DIE BEDEUTUNG DES MASTER-BELASTUNGSTESTES ZUR ERFASSUNG EINER CORONAREN MINDER-DURCHBLUTUNG].
H. W. Kirchhoff (Flugmedizinisches Inst. der Luftwaffe, Fürstenfeldbruck, Germany).
Zentralblatt für Verkehrs-Medizin, Verkehrs-Psychologie, Luft- und Raumfahrt-Medizin, vol. 10, May 1964, p. 65–73. 19 refs. In German.

A review is presented of Master's Step Test as a diagnostic instrument of latent coronary insufficiency. In comparison with other cardiovascular stress tests employing knee bends, Master's Step Test has the advantages of greater reliability in reproduction of the results, interindividual comparability of results, a lesser stress due to milder exertion for longer time period in place of high exertion for a brief period of time, and greater diagnostic and prognostic capabilities. Among its drawbacks is the low stressor value for physically trained individuals, which necessitates taking into account the physical fitness of the subject. Its chief value is the confirmation of disturbances of coronary circulation and the prognostic index of the clinical course.

A64-80521
GYNECOLOGIC PROBLEMS IN AVIATION AND SPACE MEDICINE [GYNAKOLOGISCHE PROBLEME IN DER LUFT- UND RAUMFAHRTMEDIZIN].
H. G. Mutke (Philipps-U., Strahlen Biologie und Isotopenforschung, Marburg/Lahn, Germany).
Deutsches Ärzteblatt-Ärztliche Mitteilungen, vol. 61, Apr. 1964, p. 985–987. 37 refs. In German.

Gynecological problems in aviation and space medicine are described in view of the increasing number of women flying either as passengers or in a professional capacity, e.g. stewardesses. Flight stresses have been blamed for polymenorrhea, or amenorrhea, fatigue, and exhaustion in airline stewardesses. Psychological stresses, including anxiety, fear of flying, and emotional stresses occasioned by continuous dealing with people contribute to gynecologic disturbances. Irregular sleep periods, disruption of diurnal periodicity on transcontinental flights are stresses specific to flying occupations. Acceleration stresses, such as hypoxia, lowered atmospheric pressure, and heightened exposure to cosmic radiation are to be considered. Up to now a clear-cut direct effect of flying on the menstrual cycle has not been shown. With respect to pregnancy and abortion the prevailing opinion is that flight travel is harmless during normal pregnancy but is contraindicated in the presence of habitual abortion, eclampsia, motion sickness, or morning emesis. Noxious influences of radiation, hypoxia, noise, and vibration on the maternal endocrine system and the forming embryo have been found in animal experiments. Space stresses, particularly weightlessness, are still relatively unexplored with respect to the female organism.

A64-80522
MY DAY IN SPACE.
Gherman Titov.
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 68–75. $6.25.

A personal account of the condition of weightlessness and other influences in true orbital flight is given by Gherman Titov. It is related that: (1) hearing, breathing, and speech were not affected; (2) eating and drinking were normal; (3) relieving nature presented no problem; and (4) movement coordination was not disturbed. Titov suggests that the principal and primary result of the flight was proof that man can withstand a prolonged stay in weightless condition and retain his capacity for work during the period of a 24-hour flight.

A64-80523
GEMINI AND APOLLO.
K. W. Gatland.
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 76–95. $6.25.

The next major step in the United States manned spaceflight program is Project Gemini which has the objective of extending astronaut missions to 14 days with two men, continuing the researches into prolonged periods of weightlessness begun with Project Mercury, and to perform technical investigations in which men are required to participate. One of the most important man-monitored operations, of direct relevance to the coming lunar flight, will be the demonstration of rendezvous and docking with a target vehicle in earth orbit and to perform this on a regular basis until it has become acceptable as an operational technique. Another key objective is to demonstrate controlled reentry of the Gemini spacecraft into the earth's atmosphere and to achieve touchdown at a preselected point on land instead of in the sea. Once Gemini has been tested in orbit, the development program is scheduled to move on to the first experiments in orbital rendezvous, an essential prerequisite of the lunar program of Project Apollo. By the time Gemini is under way the first launchings should be taking place of the Apollo, a vehicle using the two-stage Saturn I. This will provide experience with the larger spacecraft in orbit, and later these experiments are to be extended to embrace circumlunar flight with Apollo B. It is the third vehicle of the series, Apollo C, which has the object of actually transporting an exploring party to the moon's surface. The function of the lunar excursion module (LEM) is described.

A64-80524
METEORS AND SPACEFLIGHT.
V. H. Langton (Natl. College of Rubber Tech., London, England).
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 99–116. 8 refs. $6.25.

Meteorites are important with respect to interplanetary flight because their presence in space forms one of the most obvious potential hazards to a vessel leaving the protection of the earth's atmosphere. The danger lies in the possibility of collisions between the rocket ship and the meteor particles, both of which would be traveling at high speeds. High speed collisions might result in penetration of the hull of the spaceship with subsequent loss of air, damage to the interior of the vessel, and maybe even injury to members of the crew. A method of protecting the rocket ship or artificial satellite against such collisions is discussed. It involves the use of a bumper screen giving protection against the smaller sized meteorites with which collisions are liable to occur about once every two years. Such a bumper screen will also give partial protection during flights in the solar system against the larger sized meteorites, which will lose some of their initial energy in penetration. It is only when an interstellar voyage is considered, with its correspondingly longer time in space and higher velocities, that there is need to worry about more violent collisions. In a manned space station, a few collisions between the satellite and larger meteorites would be expected. Protection, however, would be easier since weight would not be important and thicker screens could be used.

A64-80525
THE PROBLEM OF WEIGHTLESSNESS.
A. E. Slater.
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 117–125. 9 refs. $6.25.

The phenomenon of weightlessness is explained in terms of pioneer experiments to simulate zero-g in aircraft flown on carefully-controlled parabolic flights. The technique has played a large part in preparing man for orbital flight and is still a vital preflight training procedure for potential astronauts. The chief means by which the body knows which way gravity is pulling are: (1) vision, (2) bodily sensations (pressure on the skin where it takes the weight, tension of the muscles used in balancing, pressure of internal tissues on each other due to weight), and (3) balancing organs of the inner ear. In experiments using aircraft and rocket flights it has been established that any disorientation and other unpleasant sensations are probably due to the malfunctions of the otolith organs. The eyes can be trained to take over this orientating function. Different reactions (indifference, unpleasantness, motion sickness) have been reported by pilots exposed to weightlessness lasting between 10 and 30 seconds.

A64-80526
RADIATION AND THE ASTRONAUT.
T. F. Sandeman (Peter MacCallum Clinic, Melbourne, Australia).
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 126–149. 6 refs. $6.25.

One of the biological barriers to space flight which the first astronauts have just touched upon is the hazard of radiation exposure in the Van Allen belt and beyond. Various aspects of this problem are discussed including the following: (1) primary cosmic radiation, (2) solid particles, (3) the Van Allen belt, (4) the interaction of radiation and matter, (5) cellular biology, (6) radiobiology, (7) radiation effects on man, and (8) radiation protection. The dangers of hydrogen atoms in free space during interstellar voyages at speeds of light are mentioned briefly.

A64-80527
CONDITIONS ON MARS.
C. A. Cross.
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 192–203. $6.25.

The manner through which knowledge of the planet Mars can be deduced from astronomical observations is described. Aspects included are Martian topography and meteorology. The possibilities of the existence of vegetation on the surface of Mars and of the survival of man in the Martian atmosphere are discussed. In spite of the application of all the resources of modern astronomical technique, Mars still remains more the subject of speculation than of established fact. Only when vehicles from the earth have carried men or machines out to Mars will this situation be substantially changed.

A64-80528
WHAT IS ASTROBOTANY?
G. A. Tikhov.
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 215–222. $6.25.

Astrobotany is a combination of planetary astronomy and spectral analysis as applied to the study of plants on earth and on other planets. Various studies in this area are discussed, including those on the possibility of vegetable life on Mars and Venus, and on the newly discovered optic properties of plants. The discovery was made that flowers possess the property of emitting radiation or fluorescence as do plants. Moreover it was found that the fluorescence of plants increases rapidly with rise in temperature of the air and does not disappear even when the temperature drops to several tens of degrees below zero. In all probability fluorescence enables the plant to generate surplus warmth and emit it to the environment. On the other hand it enables the plant in early spring to thaw the snow around it and emerge onto the surface. The possibility is not excluded that with the perfection of methods of observation, areas of vegetation will be discovered on Mars possessing the property of emitting radiation in red and infrared rays, which permits them to withstand the sharp changes of temperature during the Martian day and night. Astrobotanical research suggests that vegetable life must be fairly widespread throughout the universe and in addition, possibly animal life, as in principle there is no difference between plants and animals.

A64-80529
THE CHEMICAL ORIGINS OF LIFE.
M. H. Briggs (California Inst. of Tech., Space Sciences Div., Bioscience Group, Pasadena, Calif.)
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 228–238. 29 refs. $6.25.

Possible chemical mechanisms by which life could have developed from the inorganic environment of primitive earth are discussed. One of the most striking discoveries of modern biochemistry is the close similarity between the chemistry of such simple organisms as bacteria, and that of the higher forms of life such as mammals. Before any organism, even the simplest, could have been formed, the following stages must have taken place: (1) the basic simpler substances must have been formed, (2) these must have been combined into the complex substances, and (3) the complex substances must have come together in aggregations and become organized and integrated into a system showing dynamic stability. Various aspects of these stages are discussed. It is concluded that life appears almost inevitably to be a consequence of certain atmospheric and geophysical properties of the planet earth. If there are other planets with similar conditions, the same type of reactions must occur. Considerations of theories of planetary origins and the observed properties of some stars allow the prediction that life must be very widespread in the universe.

A64-80530
TERRESTRIAL AND EXTRATERRESTRIAL LIFE.
M. H. Briggs (Calif. Inst. of Tech., Space Sciences Div., Bioscience Group, Pasadena, Calif.)
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 239–243. 12 refs. $6.25.

The alien intelligences hypothesis for the origin of life on earth is discussed. This hypothesis makes the following three basic assumptions: (1) that intelligent life existed elsewhere in the universe prior to the beginning of life on earth, (2) that interplanetary flight (travel between two planets) is possible and that the intelligent life of the first assumption was capable of making such journeys, and (3) that lifeless earth was visited by such extraterrestrial intelligences who either deliberately or accidentally left microbes behind them when they departed. The random forces of natural selection are all that is required for these organisms to evolve into the known terrestrial forms of biological complexity. Evidence for and against this hypothesis is discussed. At the moment, the chemical origin of life is the most favored; but this is largely because it is capable of being investigated experimentally in the laboratory while others are not. It may be that, if life in the universe is considered as a whole, life could have arisen on some planets by chemical evolution and then transferred to other planets by meteorites and intelligent races. All three hypotheses may be correct for the universe, but only one of them can be correct for a particular planet such as earth.

A64-80531
THE PSYCHOLOGY OF AGING.
James E. Birren (Natl. Inst. of Mental Health, Bethesda, Md.)
New York, Prentice Hall, 1964, 288 p. refs. $6.25.

Psychophysiological aspects of aging are reviewed. Among others, the following aspects are discussed: (1) the dynamics of the cell; (2) social and cultural determinants of aging; (3) biological influences; (4) perceptive and sensory functions; (5) psychomotor performance; (6) learning; (7) thinking and intelligence; (8) productivity and achievement; (9) aging as related to personality; and (10) maladjustment and psychopathology of the aged.

A64-80532
SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, viii + 254 p. $6.25.

The monograph contains several articles treating various problems affecting astronautical development. Articles pertinent to aerospace medicine and space exploration (e.g., weightlessness, radiation, meteoroids, extraterrestrial life) are abstracted separately.

A64-80533
AUTOMATIC PATTERN RECOGNITION OF PHYSIOLOGICAL SIGNALS BY COMPUTERS.
Anna Lea Weihrer, Robert Dobrow, and Cesar A. Caceres (U.S. Dept. of Health, Educ. and Welfare, Div. of Chronic Diseases, Heart Disease Control Program, Washington, D.C.)
(16th Annual Conference on Engineering in Medicine and Biology, Baltimore, Md., Nov. 18–20, 1963).
Proceedings of the Annual Conference on Engineering in Medicine and Biology, vol. 5, 1963, p. 20–21. $5.00.
Automatic computer recognition of various physiological signals such as electrocardiograms (EKG), pulmonary function curves, and first and second heart sounds and murmurs in phonocardiograms are discussed. Since the majority of work has been with EKGs, they are used to demonstrate the techniques used in automatic recognition. This work suggests that using relatively elementary mathematical techniques, all types of electrophysiologic waves can be evaluated without any type of human editing or selection. Expensive, fast arithmetic computers are not required.

A64-80534
THE EFFECT OF PROLONGED SOLAR RADIATION ON MELANOCYTES OF THE HUMAN EPIDERMIS.
R. E. Mitchell (Queensland U., Dept. of Anatomy, St. Lucia, Brisbane, Australia).
Journal of Investigative Dermatology, vol. 41, Oct. 1963, p. 199–212. 38 refs.
Melanocyte counts were made in 76 samples of human skin from various parts of the body, and a comparison with counts of other workers is given. Giant dendritic melanocytes, giant spindle-shaped melanocytes, and abnormal round adendritic melanocytes were found in skin exposed to prolonged solar radiation. Severe exposure resulted in the breaking up of the melanocyte dendrites and then of the cell body, and a reduction in the number of melanocytes in the epidermis. Changes of a similar nature were found in skin exposed to X-rays. The abnormal melanocytes did not appear to be able to transmit pigment to the epidermal cells. The unpigmented patches found in collagen degeneration are believed to be due partly to this blockage and cell destruction, and partly to the presence of areas of frequent melanocytes where the dopa oxidase system is defective. The question of the transfer of melanin to the dermal macrophages is discussed. Melanocyte dendrites passing downward through the basement membrane have been described, and it is suggested that macrophages pass up to the basement membrane to receive the melanin directly.

A64-80535
THE USE OF HALL'S EMF PICK-UP IN EXPERIMENTAL PSYCHOLOGY.
A. P. Koriagin, Iu. A. Labas, and A. S. Mirkin (Acad. of Sciences, USSR, Inst. of Psychol., Moscow, USSR).
(Biulletin' Eksperimental'noi Biologii i Meditsiny, vol. 54, Nov. 1962, p. 114–118.)
Bulletin of Experimental Biology and Medicine, vol. 54, Nov. 1962, p. 1293–1297. 19 refs. Translation.
In mechanographic recording of some physiological functions (masticating movements of small mammals, blinking reflex) it is difficult and undesirable to connect the object with the recording device. This connection may be avoided by attaching to the object a miniature permanent magnet (weighing about 50–100 milligrams) and conducting a remote recording of the shifts of the latter by means of the Hall's electromotive force pickup. The value of the galvanomagnetic electromotive force occurring in the pickup, which is proportional to the intensity of the magnetic flow crossing it, may be recorded on the oscillograph after amplification and transformation. Remote recording of the following was performed: the motions of the lower jaw of small rodents in chronic experimental conditions, respiratory motions of the freely moving fish, blinking reflex of man, mechanocardiogram of frog, etc.

A64-80536
CARBON DIOXIDE MANAGEMENT IN SPACECRAFT ATMOSPHERES.
C. S. Coe and G. Christensen (Garrett Corp., Los Angeles, Calif.)
Aerospace Medicine, vol. 35, Feb. 1964, p. 110–115.
The effect of low temperatures on the adsorption of carbon dioxide by synthetic zeolites was investigated. Carbon dioxide adsorption data were obtained at temperatures of 530°, 500°, 450°, 350°, and 300° Rankine. Most of the tests were performed with a Linde Type 5A molecular sieve because of its high adsorptivity for carbon dioxide and long history in such applications. A carbon dioxide concentration of 1 mole per cent was used for the majority of the tests since this concentration has been of most interest and has been specified as a suitable level for long-term exposure during space vehicle missions. The rate of adsorption or carbon dioxide removal from the airstream increases as the mass flow rate is increased. At zero per cent saturation the rate appears to be independent of temperature except for runs made at 530° R., in which case the rate of adsorption is lower. At the higher per cent saturation values, it is observed that the rate of adsorption reaches a maximum at a temperature of approximately 450° R., and as the temperature is lowered further, the rate decreases.

A64-80537
UTILIZATION OF BIOELECTRICITY AS POWER SUPPLY FOR IMPLANTED ELECTRONIC DEVICES.
L. W. Reynolds (Gen. Electric Co., Missile and Space Div., Philadelphia, Pa.)
Aerospace Medicine, vol. 35, Feb. 1964, p. 115–117.
Electrical energy capable of powering a transmitter was derived from an intact anesthetized rat by the implantation of two electrodes. The electrical energy (up to 115 microwatt) was obtained by taking advantage of the natural differences in oxidation-reduction potentials which exist in different parts of the anatomy, and enhanced by the use of one Pt-Black electrode which is a well-known catalytic material. The maximum time for continual operation of the transmitter was 8 hours, but because of the inert properties of the electrodes and the constancy of biological reactions, there is reason to believe that this system would last for many years or perhaps the lifetime of the animal. This type of life supply is also advantageous because the animals never have to be handled after implantation of the circuitry, and the possibility of subsequent infection is minimized because the skin is not pierced by wire leads.

A64-80538
MONITORING OF TRACE CONSTITUENTS IN SIMULATED MANNED SPACECRAFT.
T. B. Weber, J. R. Dickey, N. N. Jackson, J. W. Register, and J. P. Conkle (USAF School of Aerospace Med., Aerospace Med. Div., Brooks AFB, Tex.)
Aerospace Medicine, vol. 35, Feb. 1964, p. 148–152. 9 refs.
Innovations in instrumentation and cryogenics were employed in the isolation and detection of microconstituents in a manned spacecraft simulator. Since the isolation of materials is a tedious and time-consuming procedure, specialized units were constructed to collect the trace constituents and also to occlude extraneous contaminants from entering the system. Gas chromatography was employed for broad spectrum analysis of compounds and sample separation. Infrared spectrophotometry served as a parallel detection system. During normal operation, three to seven constituents consisting of nitrogen, oxygen, carbon dioxide, carbon monoxide, acetylene, acetone, and methane were normally found. A fire in the space cabin resulted in numerous compounds being liberated, several of which were tentatively identified. Many of these were probably pyrolysis products from the construction components aboard.

A64-80539
A MATHEMATICAL MODEL OF THE LUNG FOR STUDIES OF MECHANICAL STRESS.
April E. Holladay and I. Gerald Bowen (Lovelace Found. for Med. Educ. and Res., Dept. of Physics, Albuquerque, N. Mex.)
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 39–50. 12 refs.
Contract DA-49-146-X2-055.
A simple model of the thoraco-abdominal structures was conceived to predict the pressure response of the lung to applied mechanical stresses. The model consists of (1) a gas-filled cavity whose volume represents the volume of alveolar gas plus bronchial gas, (2) an orifice for gas flow which approximates the flow through respiratory passageways and openings, and (3) two piston systems which simulate the effect on lung volume of chest-wall and diaphragmatic action. Studies on man and animals using this model are presented. Stresses considered are explosive decompression and blast waves. A theoretical relation was derived between animal body mass and simulated pulmonary response to blast waves of constant amplitude: the lung responses of animals of all body masses are the same in magnitude, but differ in response time according to the cube root of body mass.

A64-80540
SPECTROPHOTOMETRIC MEASUREMENT OF THE CARDIAC OUTPUT BY MEANS OF A NEW DYE, PATENT BLUE (A).
H. A. Davis.
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 58–64. 6 refs.
A method is presented in which the Patent Blue (A) dye is used as the indicator substance for determination of the cardiac output. The results in normal dogs indicate that there is no significant difference between the values obtained by this dye dilution technic and those obtained by the simultaneously performed direct Fick method. The dye leaves the blood stream completely within 20 to 30 minutes after injection and can be injected repeatedly into the circulation without accumulation in the blood. The Patent Blue (A) dye is relatively innocuous even when given in large doses to rabbits and mice. Results indicate that a substance with rapid blood stream clearance can be used for determination of the cardiac output provided that no significant loss of the substance occurs during the first circulation between the

point of injection and the point of sampling. An equation has been derived which can be used to correct for hemolysis if it is present in the plasma-dye samples.

A64-80541
THE MEASUREMENT OF PHYSIOLOGICAL EVENTS BY IMPEDANCE CHANGE.
L. A. Geddes and H. E. Hoff (Baylor Med. College, Houston, Tex.)
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 115–122. 28 refs.

Much has been written on the impedance of various tissues and organs but little use is made of the change of impedance as an indicator of the function of tissues and organs. This paper describes studies in which the impedance between a pair of electrodes indicates seasonal variations, thyroid function, estrogenic activity, changes in the autonomic nervous system, respiration, blood flow, stroke volume of the heart, cardiac output, eye position, gastrointestinal motility, contraction of skeletal muscle, uterine motility, the position of the tongue, heart sounds, fetal respiration in a rat, arterial and venous pulses, tremor in the hand, and activity of nerve cells. The paper also describes a simple instrument with only two controls which can be used to detect many of these events.

A64-80542
RHEOLOGICAL BEHAVIOR OF TISSUES SUBJECTED TO EXTERNAL PRESSURE.
Kenneth E. Hickman, Olgierd Lindan, Robert W. Corell, James B. Reswick, and Robert H. Scanlan (Case Inst. of Tech., Cleveland, Ohio).
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 133–140. 10 refs.
Research Grant HEW-RD-695.

A detailed study is presented of the physiological and pathological response of human and animal tissues to external pressure, and of the dynamic physical behavior of such tissue. It is postulated that measurement of physical responses will reflect physiological changes occurring in tissues during application of pressure and after its release (e.g., closing and opening of various blood vessels, shifting of extracellular fluid, extravasation of blood components). It is also postulated that anatomical and functional variations in tissues due to aging, infection, edema, and nutritional, circulatory, and neurological disturbances will be reflected by alterations in physical responses to external pressure. Preliminary mathematical and analog models were developed to represent the observed behavior.

A64-80543
A STUDY OF BLOOD BY CHEMICAL ANALYSIS AND BY DIGITAL COMPUTER: A COMPARATIVE EVALUATION.
James C. DeHaven, Edward C. DeLand (RAND Corp., Santa Monica, Calif.) Gilbert B. Bradham, and James V. Maloney, Jr. (UCLA Med. Center, Los Angeles).
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 167–171. 8 refs.
USAF Project RAND; Grants PHS-G-H-2812; PHS-G-HTS-5357; and Jo' n and Mary R. Markle Foundation-supported research.

A mathematical model of blood chemistry is examined for validity in the experimental laboratory. In duplicate experiments, the model is found valid upon application of normal respiratory factors and application of chemical, physical, and physiochemical stress. As a corollary, the model is more precise than a single set of laboratory determinations, and is capable of directing attention to previously unrecognized physiological facts.

A64-80544
EVALUATION OF CARDIOVASCULAR PHYSIOLOGY IN ANIMALS DURING SPACE FLIGHT.
Julius T. Hansen and Nello Pace (Calif. U., Dept. of Physiol., Berkeley).
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 209–213.
Grant NsG-170-61.

The Pig-tailed Macaque, Macaca nemestrina, is the ideal animal for the study of the effects of prolonged space flight on the cardiovascular system. Techniques for the prolonged restraint of this animal in an acceleration couch are presented. A recently developed control circuit permits the repeated, automatic determination of cardiac output by the dye-dilution method with minimum disturbance to the animal. Block and circuit diagrams relating to the design of this apparatus are presented and discussed. Implementation of the dye-dilution method involves the surgical implantation of catheters in the aorta and vena cava. It is possible to acquire the electrocardiogram and measure the cardiac output, blood volume, arterial and venous pressures, hemoglobin, oxyhemoglobin, plasma protein concentrations, and respiration rate through the two catheters. A design is presented in block-diagram form which shows the relationship between the components of this system.

A64-80545
MOBILE SUPPORT FACILITIES FOR BIOASTRONAUTICS.
Seymour N. Stein and Baxter C. Madden, Jr. (Pacific Missile Range, Point Mugu, Calif.)
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 221–226.

The Mobile Bioastronautics Support Facilities provided by the Pacific Missile Range, Point Mugu, California, are described. The system of laboratory equipment consists of modular units having a maximum depth of twenty-four inches. Sinks, benches, cabinets, incubators, ovens, furnaces, refrigerators, relay racks, and other equipment are kept in a central storage area for ready installation in specially designed vans, ship compartments, and aircraft compartments. All these interchangeable pieces of gear fasten, with a minimum of effort, to uniformly spaced, hollow "T-bolt" struts located on the bulkheads of special mobile units. Flexibility is the watchword, and a complete change of configuration can be accomplished in several hours.

A64-80546
PSYCHOPHYSIOLOGICAL CORRELATION AND ANALYSIS FOR MAN-MACHINE SYSTEMS.
S. Kissin and P. H. Halpern.
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 284–298. 10 refs.

A performance-control and monitoring system the individual elements of which are currently within the state-of-the-art is described. This provides a closed-loop framework from which data can be obtained and correlated with performance. Any approach which merely gathers data for establishing relationships is one of brute force. Its purpose is to assist the theorist. Whereas the described techniques will be applicable to short-term prediction and in obtaining immediate improvements in man's performance, the actual performance-control system will include analytical formulation of the little that we do know to be well established concerning his psychophysiological dynamics. By observing relationships between parameters and performance (or critical states) one can stimulate a more fundamental understanding of the problem. When theories evolve which are consistent with these emptrical relationships, we will have progressed towards relatively long-term prediction.

A64-80547
THIRST: PROCEEDINGS OF THE FIRST INTERNATIONAL SYMPOSIUM ON THIRST IN THE REGULATION OF BODY WATER HELD AT THE FLORIDA STATE UNIVERSITY IN TALLAHASSEE, MAY 1963.
Edited by Matthew J. Wayner (Syracuse U., Syracuse, N.Y.)
Oxford, Pergamon Press, 1964, viii + 570 p. $20.00.

Included are various aspects of the effects of thirst, hunger, environmental temperature, and physical activity on the regulation of body water. Pertinent papers are abstracted separately.

A64-80548
REGULATION OF BODY WATER CONTENT THROUGH WATER INGESTION.
E. F. Adolph (Rochester U., Dept. of Physiol., Rochester, N.Y.)
IN: THIRST: PROCEEDINGS OF THE FIRST INTERNATIONAL SYMPOSIUM ON THIRST IN THE REGULATION OF BODY WATER HELD AT THE FLORIDA STATE UNIVERSITY IN TALLAHASSEE, MAY 1963.
Edited by Matthew J. Wayner (Syracuse U., Syracuse, N.Y.)
Oxford, Pergamon Press, 1964, p. 5–14; discussion, p. 14–17. 18 refs.

Water ingestion participates in the physiological regulation of body water contents as a fixed response to body water deficit. The differences in so-called mechanisms between water intake and water output need not obscure the comparable places the two activities occupy in water regulation. The nervous system is involved in water intake but not in water output. The various stimuli and modulators that influence drinking may be represented as functional dependences. No way has been found to predict their coefficients of multiple correlations or their equivalences. Hence it is concluded tentatively that multiple factors relate stimuli to drinking responses. Most of these factors regulate the state of the volume and dilution of the animal body.

A64-80549
MINIMAL WATER REQUIREMENTS UNDER CONDITIONS OF HEAT AND WORK.
Austin Henschel (U.S. Public Health Serv., Div. of Occupational Health, Cincinnati, Ohio).
IN: THIRST: PROCEEDINGS OF THE FIRST INTERNATIONAL SYMPOSIUM ON THIRST IN THE REGULATION OF BODY WATER HELD AT THE FLORIDA STATE UNIVERSITY IN TALLAHASSEE, MAY 1963.
Edited by Matthew J. Wayner (Syracuse U., N.Y.)
Oxford, Pergamon Press, 1964, p. 19–30. 18 refs.

The minimal water requirement as related to environmental and work conditions is discussed. The absolute minimum for inactive man under conditions of no sweat production is about 1 liter per day. When sweating occurs, additional water must be provided to prevent serious dehydration. However, on an hour-to-hour basis, the body water lost in sweating need

not be entirely replaced. In fact, there may be some advantage in not replacing it at all during the actual hours of working. A deficit of 2 liters appears to be reasonable, but with deficits greater than that increased physiological strain may result. With 24-hour sweat productions of 8 to 12 liters or even higher under hot environments, minimal water requirements, over a period of days, would not be less than sweat production. It has been suggested that the minimal water requirement is the amount needed to provide urine excretion of 900 cc per day. This would require from 1 to 20 liters per day.

A64-80550
PRACTICAL SOLUTIONS TO PROBLEMS OF THIRST IN CLOSED OR OPEN SPACES.
Julius Sendroy, Jr. (Natl. Naval Med. Center, Div. of Chem., Bethesda, Md.)
IN: THIRST: PROCEEDINGS OF THE FIRST INTERNATIONAL SYMPOSIUM ON THIRST IN THE REGULATION OF BODY WATER HELD AT THE FLORIDA STATE UNIVERSITY IN TALLAHASSEE, MAY 1963.
Edited by Matthew J. Wayner (Syracuse U., N.Y.)
Oxford, Pergamon Press, 1964, p. 31–44. 10 refs.

Various methods tested attempting to prevent thirst or provide an adequate water supply under conditions arising in shipwreck at sea or during confinement for prolonged periods in a space vehicle are discussed. Several physical and chemical procedures for the reclamation of potable water from sea water are included. With the former there were found disadvantages with respect to complexity, bulk, low yield, and impracticability. Of the chemical methods investigated, the Permutit modification was found to require fewer directions, less time, attention, and manipulation on the part of individuals requiring its use. In a sealed space under extraterrestrial conditions, the limitations of volume and weight will make the provision of water by transport almost impossible, except for flights of the shortest duration. The necessity of reclaiming water from products of body metabolism will be unavoidable. An approach to the ultimate solution of the problem of urine water recovery in the form of two laboratory methods (simple distillation of urine and freeze-drying or lyophilization) aimed at simplicity of operation with maximal percentage of yield and purity of product has emerged. It is suggested that lyophilization is the most promising method for use in space, particularly with respect to operation under conditions of weightlessness.

A64-80551
INTERACTIONS OF WATER, FOOD AND TEMPERATURE REGULATION IN THE MONKEY.
C. L. Hamilton (V. A. Hosp., Coatesville, Pa.; and Pennsylvania U., Philadelphia).
IN: THIRST: PROCEEDINGS OF THE FIRST INTERNATIONAL SYMPOSIUM ON THIRST IN THE REGULATION OF BODY WATER HELD AT THE FLORIDA STATE UNIVERSITY IN TALLAHASSEE, MAY 1963.
Edited by Matthew J. Wayner (Syracuse U., N.Y.)
Oxford, Pergamon Press, 1964, p. 45–56.
Grant PHS-M-3327.

Several parameters of energy balance in the rhesus monkey (Macaca mulatta) were investigated by measuring water and food intake and body temperature during heat and cold stress. When heat stressed the subject animal, like other mammals studied so far, reduces food intake and increases water consumption. The fact that food intake was not significantly elevated in the cold may indicate only that acute 24-hour stress is not sufficient to elicit cold hyperphagia in this species. The lack of a rise in body temperature when cold stressed may be related to the method used to determine body temperature, i.e., recording only 2 inches beyond the anal orifice. This procedure, together with the failure of the animals to increase food intake, may account for their not showing the rise in body temperature observed in acute cold stressed rats.

A64-80552
SOME PHYSIOLOGICAL CORRELATES OF ADAPTATION TO A WATER DEPRIVATION SCHEDULE.
Charles Kutscher (Syracuse U., Physiol. Psychol. Lab., N.Y.)
IN: THIRST: PROCEEDINGS OF THE FIRST INTERNATIONAL SYMPOSIUM ON THIRST IN THE REGULATION OF BODY WATER HELD AT THE FLORIDA STATE UNIVERSITY IN TALLAHASSEE, MAY 1963.
Edited by Matthew J. Wayner (Syracuse U., N.Y.)
Oxford, Pergamon Press, 1964, p. 257–269.

As the 23.5-hr water deprivation schedule progresses, the rat shows increased retention of water loads. Urine concentration of sodium decreases and then increases. Urine potassium concentration is low on the first three days of the schedule and then rises sharply. The early appearance of an upturn in body weight and water and food intake and the lack of change in adrenal size shows that the 23.5-hr water deprivation schedule is not particularly stressful for the rat. Although the physiological mechanisms are still obscure, the process of adaption seems to be reasonably complete within 10 days. The increased retention of water cannot be explained wholly on the basis of high plasma ADH as is the case with the kangaroo rat.

A64-80553
MYOELECTRIC SERVO CONTROL.
George H. Sullivan, Charles J. Martell, Gershon Weltman, and Dean M. Pierce.
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 276–283. 5 refs.
Contract AF 33(657)-7771.

Due to certain conditions such as high accelerative forces, muscular dystrophy, or polio it becomes extremely difficult for the subject physically to move his arms and hands to perform desired movements. By attempting to move his arms, the subject generates muscle action potentials, or myoelectric signals, which may be amplified and utilized as a control source. The basic arm movements and the muscles involved were determined, and the myoelectric activity patterns characteristic of the movements were measured. Transforms were performed on the "raw" signals and control logics which relate myoelectric signals to desired servoaction were written. A simulator trainer was constructed which accepts the myoelectric inputs from sets of three or four muscles, indicates the desired arm movement, performs the preset logic on the elicited myoelectric signals, provides success-failure feedback, and drives a splint in uniplanar up-down movement.

A64-80554
PILOT BIOMEDICAL AND PSYCHOLOGICAL INSTRUMENTATION FOR MONITORING PERFORMANCE DURING CENTRIFUGE SIMULATIONS OF SPACE FLIGHT.
Randall M. Chambers and John G. Nelson (U.S. Naval Air Develop. Center, Aviation Med. Acceleration Lab., Johnsville, Pa.)
IN: PROCEEDINGS OF THE SAN DIEGO SYMPOSIUM FOR BIOMEDICAL ENGINEERING, LA JOLLA, CALIF., 1963, p. 227–239. 29 refs.

Some results are presented of recent centrifuge acceleration research and training projects in which the biomedical (physiological), psychophysiological, and psychological performances of pilots and other volunteers were measured and monitored. Some of the monitoring and recording instrumentation techniques are described, and an attempt is made to identify and quantify some of the capabilities and limitations of pilot performance during exposure to accelerations which vary in magnitude, duration, direction, rate of onset, and profile complexity. Subjects in these training and research programs were the seven Mercury astronauts, six DynaSoar consultant pilots, about 35 other test pilots, and approximately 40 other military and civilian volunteers.

A64-80555
SOME EFFECTS OF RESTRICTED WATER INTAKE ON CONSUMMATORY BEHAVIOR OF THE RAT.
Robert C. Beck (Wake Forest Coll., Winston-Salem, N.C.)
IN: THIRST: PROCEEDINGS OF THE FIRST INTERNATIONAL SYMPOSIUM ON THIRST IN THE REGULATION OF BODY WATER HELD AT THE FLORIDA STATE UNIVERSITY IN TALLAHASSEE, MAY 1963.
Edited by Matthew J. Wayner (Syracuse U., N.Y.)
Oxford, Pergamon Press, 1964, p. 305–316.
Grants NIH-M-4050A; NIH-M-6234; and Graduate Council of Wake Forest Coll. Grant.

When the rat is put on a water deprivation schedule, it drinks less than under ad lib. intake, though its water intake increases for several days on the schedule. Food intake and fluid loss through excretion are proportionately reduced. Volume of water ingested appears to pace these changes. Two non regulatory variables were considered with regard to the question of the rat's adjustment to the schedule: learning to drink on the schedule and the effects of novel stimulation. The former seems of little importance in the case of the adult rat with many previous drinking experiences. The latter seems more important, there sometimes apparently being less inhibition of drinking as the novel stimuli of a new drinking environment cease to arouse responses incompatible with drinking. Water balance measurements of rats on restricted water intake are presented which suggest that the rat on the 23.5-hr water deprivation schedule has reduced its water output almost to the obligatory minimum. A function relating food intake to water intake is described.

A64-80556
THEORY AND RESEARCH ON THE EFFECTS OF WATER DEPRIVATION ON RANDOM ACTIVITY IN THE RAT.
Byron A. Campbell (Princeton U., N.J.)
IN: THIRST: PROCEEDINGS OF THE FIRST INTERNATIONAL SYMPOSIUM ON THIRST IN THE REGULATION OF BODY WATER HELD AT THE FLORIDA STATE UNIVERSITY IN TALLAHASSEE, MAY 1963.
Edited by Matthew J. Wayner (Syracuse U., N.Y.)
Oxford, Pergamon Press, 1964, p. 317-334.
Grants NSF-G-9979; NSF-GB-235; and NIMH-M-1562.

Albino rats deprived of water in stabilimeter-type activity cages show no increase in spontaneous activity at any time during terminal deprivation, while rats deprived of food in the same cages show a peak increase in activity of several hundred per cent under identical environmental conditions. Possible explanations of this difference, as well as a comparison of the amount

of activity elicited during food and water deprivation at different environmental temperatures in various types of activity-measuring devices (rectangular stabilimeter cages, round stabilimeter cages, running wheels, automated Dashiel maze) are attempted. Explanations are attempted through the application of the previous experience hypothesis, the temperature regulation hypothesis, and the lowered response threshold hypothesis. The already established principle that the type of activity-measuring instrument is a crucial determinant of the activity function during deprivation was confirmed. Further, the results of this study suggested that water deprivation selectively lowers response thresholds to movement-produced stimuli or to some other stimulus component common to both activity wheels and unstable, round stabilimeter cages.

A64-80557
"WHIPLASH" INJURIES.
John J. Dowling (Jefferson Med. School, Philadelphia, Pa.)
American Association of Industrial Nurses Journal, vol. 12, May 1964, p. 12–15, 34–35.

Various aspects of the mechanics of whiplash injury are discussed in the light of more recent information. Sites of injury in the neck and vertebral column are identified and discussed from a clinical point of view. Symptoms and specific effects in damaged areas are described. The significance of diagnosis by X-ray is stressed, and treatment by immobilization and rest recommended.

A64-80558
RESCUE—PAST, PRESENT AND FUTURE.
John L. Vandergrift (Headquarters, Air Rescue Service, Orlando, Fla.)
Mats Flyer, vol. 11, Jun. 1964, p. 6–10.

Air Rescue Service activities, embracing primarily search, location, and recovery of personnel or aerospace hardware in support of the United States Air Force's global and space operations, are described. Rescue activities not directly concerned with military operations are included. Descriptions are presented also of the Air Rescue Service's safety record, unit deployment, hurricane evacuation procedures, reserve rescue training, and pararescue activities. In the future, operations will be extended to include rescue in space.

A64-80559
THE EFFECT OF INTENSIVE NOISE ON CERTAIN FUNCTIONS OF THE BODY (O VLIIANII INTENSIVNOGO SHUMA NA NEKOTORYE FUNKTSII ORGANIZMA).
A. B. Strakhov.
Gigiena i Sanitariia, vol. 4, Apr. 1964, p. 29–37. 23 refs. In Russian.

Experimental long-term exposure to intensive high-frequency noise produced numerous shifts in the activities of the central nervous and cardiovascular systems. These shifts consisted of changes in conditioned reflex and electrical brain activity, considerable fluctuations of the arterial blood pressure level, and weakening of cardiac muscle contractions. As a rule, all these changes were of a temporary nature. On the basis of the data obtained, it may be concluded that all deviations from the normal occurring in the body due to noise action were connected with changes in the function of the reticular formation of the brain stem and gradually progressing alterations therein.

A64-80560
CERTAIN PROBLEMS OF THE BIOLOGICAL EFFECT OF ULTRASOUND IN CONNECTION WITH ITS USE IN INDUSTRY (NEKOTORYE VOPROSY BIOLOGICHESKOGO DEISTVIIA UL'TRAZVUKA V SVIAZI S EGO PRIMENENIEM V PROMYSHLENNOSTI).
S. I. Gorshkov, O. N. Gorbunov, and P. M. Nikol'skaia.
Gigiena i Sanitariia, vol. 4, Apr. 1964, p. 37–42. 9 refs. In Russian.

Exposure to ultrasound (1 hour) of 54 and 28 kilocycles/second at an intensity above 100 decibels, such as generated in industrial operations, had deleterious effects on rabbits and rats. Higher frequencies exert a relatively stronger effect. Noted were alterations in the functioning of the nervous system and of the thyroid gland, in the morphology of the peripheral blood, in tissue respiration and in the blood alkaline reserves. Most severe disturbances were produced by repeated exposures of the whole body surface of the animals.

A64-80561
RELATIVE SIZE IN ISOLATION AS A STIMULUS FOR RELATIVE PERCEIVED DISTANCE.
William Epstein and Stephen S. Baratz (Kansas, U., Lawrence).
Journal of Experimental Psychology, vol. 67, Jun. 1964, p. 507–513. 9 refs.
Grant PHS-MH 04153-03.

Two experiments examined the perceived relative distance produced by relative size in isolation. The hypothesis was that the subject assumes identity of physical size and interprets the difference in apparent size as a difference in distance. Experiment I examined this hypothesis by observing the effect of experimentally trained size assumptions on subsequent relative distance judgments. Experiment II used pairs of familiar objects which had known, normally invariant physical sizes. By varying the actual physical sizes of the standards it was possible to study the hypothesized effect of size assumptions on relative perceived distance. The results of Experiment I did not agree with the hypothesis. Experiment II did confirm the hypothesis. Both experiments were discussed in the context of the assumptive hypothesis.

A64-80562
DESCRIPTION AND CALCULATION OF PHYSIOLOGICAL TRANSPORTATION PROCESSES (BESCHREIBUNG UND BERECHNUNG PHYSIOLOGISCHER TRANSPORTVORGANGE).
K. G. Müller (Bonn U., Inst. für Theoretische Physik, Germany) and S. Ruff (Deutsche Versuchsanstalt für Luft- und Raumfahrt e. v., Inst. für Flugmedizin, Bad Godesberg, Germany).
Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 20, 1964, p. 337–355. In German.

Basic transport processes in the organism are discussed and their equations derived. Each transport process can be reduced to a system of transport elements, the mechanism of which is characterized by a transport symbol. The use of transport symbols permits the construction of an equivalent circuit for each transport process, which gives an exact description of the process. Transport symbols and equivalent circuits are chosen in analogy to the theory of electricity. The theory is applied to the interesting example of nitrogen elimination. It can be shown that the rate of elimination is governed by the two factors of blood flow through the organism and of solubility for nitrogen.

A64-80563
LIFE SUPPORT: THE NEXT GENERATION.
Michael G. Del Duca, Eugene B. Konecci, and A. Layton Ingelfinger (NASA, Office of Advanced Res. and Technol., Biotechnol. and Human Res. Div., Washington, D.C.)
Space/Aeronautics, vol. 41, Jun. 1964, p. 84–91. 5 refs.

Groundwork is being laid for life support systems to operate for periods of up to a year in orbital and exploratory missions to take place 10 to 15 years from now. Such a system can be broken down into three major subsystems: (1) an atmospheric control system to regulate the oxygen, carbon dioxide, and water partial pressures in suits, cabins, etc., to keep odors and particulate and gaseous contaminants at acceptable levels, and to recover carbon dioxide and water from cabin air. (2) The food, water, and waste subsystem to include everything from food selection, preservation, and preparation to waste collection and processing. (3) The thermal control subsystem to function as a strong bond running through all the subsystems of a life support system. All life support systems include instrumentation to monitor and control the various temperatures, pressures, flows, and chemical parameters for which the system is responsible. Furthermore, there are malfunction alarms, contaminant monitors, environment dump provisions for emergencies, etc. Subsystems available today could regenerate the necessary potable water and breathable air, but food regeneration methods are still in their initial stage of development.

A64-80564
A METHOD FOR SELECTING AN ORAL HYGIENE TECHNIC FOR USE IN SPACE CABIN SIMULATOR FLIGHTS.
Clarence M. McCall, Jr., Lucian Szmyd, Bryce O. Hartman, Billy E. Welch, and Richard E. McKenzie (USAF School of Aerospace Med., Aerospace Med. Div., Air Force Systems Command, Brooks AFB, Tex.)
Journal of Periodontology, vol. 35, Mar.–Apr. 1964, p. 64–70. 19 refs.

Five oral hygiene techniques were evaluated for use in the USAF space cabin simulator and, ultimately, in actual space missions. The control technique consisted of the use of toothbrush, dentifrice, dental floss, and water rinse. The oral hygiene methods evaluated were: (1) chewing gum only; (2) toothbrush only; (3) toothbrush and dental floss; and (4) toothbrush and water rinse. Each method was tested for ten days. By use of both objective and subjective measurements, the toothbrush and dental floss method was proved to be as effective as the accepted use of toothbrush, dentifrice, dental floss, and water rinse in maintaining good oral hygiene. The degree to which good oral hygiene is maintained depends on the individual.

A64-80565
NEW EVIDENCE OF MARTIAN LIFE.
M. H. Briggs (California Inst. of Tech., Space Sciences Div., Bioscience Group, Pasadena).
IN: SPACEFLIGHT TODAY.
Edited by K. W. Gatland.
London, Iliffe Books, Ltd., 1963, p. 223–227. 27 refs. $6.25.

Studies of the infrared spectra of Mars demonstrated the presence of absorption bands probably due to organic compounds. These absorptions are characteristic of the spectra from the dark areas of the surface. This evidence points to the existence of complex organic substances in these areas of Mars. Absorptions which are typical of carbohydrate molecules were found in the spectrum of a lichen and an algae. The presence of this type of plants on Mars would provide an explanation of the negative results of chlorophyll.

Although these studies do not demonstrate conclusively the existence of life on the surface of Mars, they make it appear very likely.

A64-80566
PREMATURE AGING AS A FUNCTION OF LONG-TERM ENVIRONMENTAL STRESS.
William P. Paré (Boston Coll., Dept. of Psychol., Chestnut Hill, Mass.)
Journal of Genetic Psychology, vol. 104, Jun. 1964, p. 185–191. 21 refs.
Grant NIMH-MH06920-01; and Boston College Faculty Research Council Grant.
The hypothesis investigated in this study is that chronic stress initiates premature physiological aging. Aging was defined in terms of basal metabolic rate (BMR) and size of the prostate gland. Male rats were subjected to tone-shock pairs 20 hr daily for 24 days. Blood differentials and BMR estimates were obtained during the stress period and compared to prestress measures. Upon termination of the experimental period, adrenal and prostate glands were weighed. Rats under stress demonstrate eosinopenia and lymphocythemia. Rats under stress also exhibit large adrenal-weight, body-weight ratios, and larger prostate glands than rats not under stress. BMR differentials are not significant.

A64-80567
EFFECTS OF CARBON DIOXIDE INHALATION UPON CEREBRAL BLOOD FLOW.
Robert A. Kuhn (Jersey City Med. Center, Seton Hall Coll. of Med., Dept. of Neurosurg., N.J.)
Clinical Pharmacology and Therapeutics, vol. 5, May–Jun. 1964, p. 277–280. 8 refs.
Council for Tobacco Research-supported research.
The method of indirect brachial artery injection was coupled with high-speed film changing to investigate the effects of inhaled CO_2 upon cerebral blood flow. One-minute inhalation of a mixture of 95% oxygen and 5% CO_2 results in increased arterial flow and increased numbers of visible vessels. The cerebral site of action of inhaled CO_2 appears to be the arteriole-capillary network.

A64-80568
ACOUSTIC TRAUMA.
G. B. Page.
Medical Services Journal Canada, vol. 20, Jan. 1964, p. 43–46.
A short review is presented of the history of acoustic trauma due to exposure to high intensity noise in various occupations. Among military occupations various aspects of hearing loss due to aircraft noise and small arms fire are discussed in relation to means of protection and prevention. Examples are taken from surveys made by the Canadian Armed Forces. A program in the Royal Canadian Air Force for combating hearing loss by adequate methods of personnel training and protection is elucidated. The use of the new NRC liquid-seal ear muff is discussed.

A64-80569
THE EFFECT OF HYPOTHERMIA UPON RESPIRATION AND ANAEROBIC GLYCOLYSIS OF DOG KIDNEY.
Horst K. A. Schirmer and Kenneth N. Walton (Johns Hopkins Hosp., James Buchanan Brady Urol. Inst., Baltimore, Md.)
Investigative Urology, vol. 1, May 1964, p. 604–609. 18 refs.
Respiration and anaerobic glycolysis were determined in dog kidney cortex and medulla. At 37° C cortical respiration was 9.09 μl of O_2 per mg of tissue per hour with an anaerobic glycolysis of 1.45 μl of CO_2 per mg of tissue per hour. Medullary respiration was 1.41 μl of O_2 per mg/hr. whereas glycolysis was 5.44 μl of CO_2 per mg/hr. Hypothermia effectively decreased respiration and glycolysis. At 27° C respiration in the cortex was reduced to one-third, at 17° C to one-sixth of normal, and at 7° C approached zero. The effects of hypothermia for 4 hr at each of these temperatures were reversible. Hypothermia significantly reduced the degree of permanent damage to respiration produced by prolonged interruption of the renal blood flow.

A64-80570
AUDIOMETRIC EXAMINATIONS ON MASSES OF DRAFTEES (MASOWE BADANIA AUDIOMETRYCZNE POBOROWYCH).
Kazimierz Najwer.
Lekarz Wojskowy, vol. 40, 1964, p. 92–96. 7 refs. In Polish.
Examinations were made using a simplified audiometer producing 3 frequencies (256, 1,024, 4,096 c.p.s.). Out of 2,468 examinees it was established that 12.3% had auditory disturbances. The recruits with the disturbances were subjected to detailed otorhinolaryngological and to precise audiometric examinations. The results were considered at the time of assignment to different services.

A64-80571
LEARNED RESPONSES TO TARGETS AT SUBCEPTUAL LEVELS.
Morris Aderman, Allen I. Sorkin, J. Enenstein, and Phil S. Shurrager (Illinois Inst. of Tech., Chicago).
Perceptual and Motor Skills, vol. 18, Jun. 1964, p. 773–782. 17 refs.
Eleven subjects were used in a study of absolute judgment as a function of light intensity subceptually and perceptually. After pretraining, size discrimination presentations were given at the detection threshold of illumination, at three levels above, and at three levels below it. Subception was obtained for the verbal report and galvanic skin response (GSR) systems, but not for motor conditioning. Judgment was independent of intensity for GSR. Learning for verbal report was greater below threshold than above it, while no learning was evidenced at the detection threshold. The total percentage of correct responses, however, was greater for supraliminal discrimination. Shock and non-shock targets for verbal report and GSR were differentiated more accurately at levels below awareness. The results are interpreted in terms of the central nervous system's capacity to respond to more components of the stimulus than the autonomic nervous system as well as its ability to compensate for deficits in stimulation.

A64-80572
REACTION TIME AND SERIAL RESPONSE EFFICIENCY ON AROUSAL FROM SLEEP.
Wilse B. Webb and Harman Agnew (Florida U., Gainesville).
Perceptual and Motor Skills, vol. 18, Jun. 1964, p. 783–784.
Twelve subjects received instructions and pretrials on a discrimination reaction time task and a serial response task. At 12:30 p.m. they were given a heavy meal and at 1:30 p.m. retested. Then the subjects were allowed to go to sleep while being monitored on an electroencephalograph. As soon as stage 4 sleep was reached, they were aroused and asked to perform the same tasks immediately and after a five minute interval. A significant decrement was noted on both tasks immediately after arousal.

A64-80573
STIMULUS CATEGORIZATION AND RESPONSE TIME.
Raymond S. Nickerson (Decision Sciences Lab., Bedford, Mass.) and Carl E. Feehrer (Tufts U., Medford, Mass.)
Perceptual and Motor Skills, vol. 18, Jun. 1964, p. 785–793. 12 refs.
Generally, in disjunctive reaction time experiments there is a one-to-one correspondence between the number of stimulus alternatives and the number of response alternatives. Consequently, the roles of stimulus recognition or categorization processes and response choice processes are confounded in the data. Two experiments were conducted in which the stimulus set was mapped onto the response set in a many-to-one fashion. In each case, the subject's task was to press a key in response to those stimuli designated as "critical" and not to press the key in response to stimuli designated as "non-critical." In the first experiment, reaction time increased monotonically as the number of different stimuli in the critical stimulus category was increased from one to four. In the second experiment, reaction time varied with the number of independent disjunctively combined attributes used to designate the critical category.

A64-80574
BUTTON-PRESSING FOR A TIME-OFF REWARD DURING SENSORY DEPRIVATION: III. EFFECTS OF VARIED TIME-OFF REWARDS.
Ascanio M. Rossi and Philip Solomon (Harvard Med. School, Boston, Mass; and Boston City Hosp., Mass.)
Perceptual and Motor Skills, vol. 18, Jun. 1964, p. 794–796.
Contract Nonr-1866 (29).
Subjects were given the opportunity to button-press for three different amounts of promised time-off reward during a three hour sensory deprivation (S-D) session. The promised rewards were 1 min, 2 min, and 3 min off the scheduled S-D session for every 200 button-presses. Subjects produced significantly more button-presses for greater amounts of promised time-off reward.

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