NASA SP-701 (11)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7011 (10)

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 March, 1965

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. **APRIL 1965**

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INTRODUCTION

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

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

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

a. NASA entries identified by their *STAR* accession numbers (N65-10000 series),
b. AIAA entries identified by their *IAA* accession numbers (A65-10000 series); and
c. LC entries identified by a number in the A65-80000 series.

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

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(continued)

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

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a continuing bibliography APRIL 1965

STAR ENTRIES

N65-14491# RCA Service Co., Inc., Camden, N.J.
TECHNIQUES OF PHYSIOLOGICAL MONITORING. VOLUME III: SYSTEMS
Richard W. Alnutt, Walter C. Becker, and Robert E. Barbiere, ed. Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs., Oct. 1964 152 p refs
(Contract AF 33(657)-9252)
(AMRL-TDR-62-98(III); AD-609481)

This volume is a discussion of monitoring systems. The primary concern is with viability monitoring, the use of a measurement system to obtain factual, quantitative information about the physiological responses of a subject in a stressful environment, in order to plan protective measures which will ensure the safety and functional capability of that subject in such environments. Included are a description of instrumentation required for the measurement of individual physiological parameters, a discussion of related problems in system design, including simultaneous measurement of several parameters, data transmission or telemetry, and the use of magnetic tape recording as a system adjunct. Basic guidelines of system troubleshooting and interference reduction are included. A brief survey, is given of additional measurement techniques and data handling considerations which, while not state-of-the-art or standard practice, will undoubtedly affect the field of physiological monitoring in the near future. Author

N65-14525# Air Force Systems Command, Bedford, Mass. Electronic Systems Div.
HUMAN ENGINEERING IN THE DESIGN OF INSTRUCTIONAL SYSTEMS
Sylvia R. Mayer Sep. 1964 17 p refs
(ESD-TDR-64-454; AD-609368)

A conceptual model is proposed for use in the application of human engineering principles and techniques to the design of instructional systems. The trainee and instructor are viewed as operators within an information system. To illustrate this model and its application, examples are drawn from the literature and from current research on instructional systems. A preliminary human engineering guide is outlined which presents factors critical to design decisions for instructional systems. The model and guide attempt to counteract current tendencies toward premature standardization of instructional system structure, and to bring instructional system development into the mainstream of the applied science of human engineering. Author

N65-14526# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEWS OF THE ACADEMY OF SCIENCES OF THE USSR. BIOLOGICAL SERIES Selected Articles
1 Oct. 1964 66 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 2, 1964 p 280-297, 306-311, 325-331)
(FTD-TT-64-534/1+2+4; AD-607121)

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1. THE DYNAMICS OF BLOOD CIRCULATION PARAMETERS OF THE CEREBRAL VASCULAR SYSTEM DURING LONGITUDINAL GRAVITATIONAL LOADS Yu. Ye. Moskalenko, O. G. Gazenko, A. A. Shurubura, I. I. Kas'yan, and O. V. Graunov p 1-32 refs (See N65-14527 04-04)
2. EMOTIONAL STRESS OF COSMONAUTS DURING SPACE FLIGHTS V. I. Yazdovskiy, G. V. Altukhov, V. Ye. Belay, A. D. Yegorov, and V. Y. Kopanev p 33-42 refs (See N65-14528 04-04)
3. A SYMPOSIUM ON APPLIED MICROBIOLOGY (IN STOCKHOLM, SWEDEN) Ye. N. Mishustin and N. D. Ierusalimskiy p 43-61

N65-14527 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE DYNAMICS OF BLOOD CIRCULATION PARAMETERS OF THE CEREBRAL VASCULAR SYSTEM DURING LONGITUDINAL GRAVITATIONAL LOADS
Yu. Ye. Moskalenko, O. G. Gazenko, A. A. Shurubura, I. I. Kas'yan, and O. V. Graunov *In its* News of the Acad. of Sci. of the USSR. Biol. Ser. 1 Oct. 1964 p 1-32 refs (See N65-14526 04-04)

The reactions of an organism to gravitational loads are a basic problem of space biology. One of the most sensitive systems to space flight is the cerebral blood circulation system, due to the peculiarities of its structure and the high intensity of cerebral blood flow. The general pattern of changes in the intracranial circulation system under gravitational loads and acceleration magnitudes was studied, emphasizing the dynamics of the circulation parameters of the cerebral vascular system. Under longitudinal gravitational loads, organs of the central nervous system functioned under conditions of insufficient blood supply, which caused definite compensatory reactions in the vascular system of the brain as well as reactions of an automechanical and chemical nature. R.W.H.

N65-14528 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EMOTIONAL STRESS OF COSMONAUTS DURING SPACE FLIGHTS

V. I. Yazdovskiy, G. V. Altukhov, V. Ye. Belay, A. D. Yegorov, and V. I. Kopanev *In its* News of the Acad. of Sci. of the USSR. Biol. Ser. 1 Oct. 1964 p 33-42 refs (See N65-14526 04-04)

The neuropsychological stress which arises in cosmonauts before launch, in different flight periods, and under the effect of acceleration on earth is analyzed. To determine the functional state of the organism, the pulse rate was measured. When an organism is subjected to acceleration of a different direction, substantial changes of pulse rate are observed. The degree of these changes depends directly on the magnitude and length of acceleration. When the cosmonauts were under weightlessness for an extended period of time, there was a decrease in their resistance to acceleration expressed in more significant shifts of the pulse rate. A certain dependence of these shifts on the time under weightlessness was noted. R.W.H.

N65-14557# Mount Holyoke Coll., South Hadley, Mass.

THE RANGE OF VISUAL SEARCH Final Report

John Volkmann, Horace H. Corbin, Nancy B. Eddy, and Carol Coonley Bedford, Mass., AFSC, Electron. Systems Div., Nov. 1964 105 p refs

(Contract AF 19(604)-3037)

(ESD-TDR-64-535; AD-608810)

The process of visual search in its early phases was studied. Individual human subjects searched in a projected matrix of elements for one element unlike the rest, e.g., for a triangle in a matrix otherwise composed of circles. In the method of lasting exposure, the matrix was exposed until the subject responded, and the dependent variable was the latency of the response. In the method of brief exposure, the exposure time was limited, and the dependent variables were the percentage of positive responses and the latency of the positive responses. Among the independent variables in various experiments were the following: (1) the total number of elements in the matrix; (2) the type of discrimination (form, area, color); and (3) the external form and internal pattern of the stimulus array. In analyzing the results of a typical experiment, the medium latency is plotted as a function of the number of elements in the stimulus array. Author

N65-14578# Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM *PROBLEMY KIBERNETIKI* (PROBLEMS IN CYBERNETICS), NO. 11, 1964

11 Dec. 1964 213 p refs Transl. into ENGLISH of 8 articles from Probl. Kibernetiki (Moscow), No. 11, 1964 p 5-24, 147-151, 153-187, 189-198, 215-244, 276-279

(JPRS-27792; TT-64-51913) OTS: $6.00

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1. G. V. SAVINOV A. Yu. Ishlinskiy p 1-10 refs

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3. THE BIOGEOCOENOLOGICAL LEVEL OF CONTROL WITHIN THE BIOSPHERE A. A. Lyapunov and I. V. Stebayev p 36-42 (See N65-14580 05-05)

4. THE PROBLEM OF REGULATION, INSPECTION AND CONTROL, VIEWED NEUROPHYSIOLOGICALLY G. I. Polyakov p 43-68 (See N65-14581 05-05)

5. DESCRIPTION OF THE PROGRAMS OF AN ALGORITHM FOR TRANSLATION FROM ENGLISH INTO RUSSIAN G. P. Bagrinovskaya p 69-109

6. FREQUENCY DISTRIBUTION OF INFLECTIONAL CLASSES OF RUSSIAN WORDS G. G. Belonogov p 110-130 refs

7. PROPERTIES OF CORRECT SYNTACTIC STRUCTURE AND AN ALGORITHM FOR ITS DETECTION (RUSSIAN-LANGUAGE MATERIAL) L. N. Iordanskaya p 131-195 refs

N65-14579 Joint Publications Research Service, Washington, D.C.

A MATHEMATICAL-MODELING STUDY OF THE INTERRELATIONSHIP BETWEEN THE NEURAL PROCESSES EXCITATION AND INHIBITION

G. V. Savinov, L. V. Krushinskiy, D. A. Fless, and R. A. Velershteyn *In its* Transl. from Probl. Kibernetiki (Probl. in Cybernetics), No. 11, 1964 11 Dec. 1964 p 11-35 refs (See N65-14578 05-05) OTS: $6.00

Mathematical modeling of the interrelationship between the fundamental processes of excitation and inhibition in neural activity is based on the following assumptions. The living organism has different circuits (pathways) for conducting signals. Along one circuit, the stimulus (input) causes the reaction (output). An amplifier with nonlinear characteristics to reflect inhibition is inserted into this circuit. Amplification of the excitation signal moves along the other, or positive feedback, circuit, which has to be integral (cumulative). Interaction of both circuits makes explanation of the phenomena possible. In principle, the model consists of circuits analogous to circuits of the nervous system. Impulses move along one circuit through a nonlinear amplifier to the output, corresponding to the specific afferent and efferent pathways to the appropriate nerve center. The positive feedback circuit integrally raises the voltage at input of the nonlinear amplifier. This circuit corresponds to the reticular formation with its tonic type of activation. Thus, an analogy can be drawn between the circuits of the model and the functional structures of the nervous systems. M.G.J.

N65-14580 Joint Publications Research Service, Washington, D.C.

THE BIOGEOCOENOLOGICAL LEVEL OF CONTROL WITHIN THE BIOSPHERE

A. A. Lyapunov and I. V. Stebayev *In its* Transl. from Probl. Kibernetiki (Probl. in Cybernetics), No. 11, 1964 11 Dec. 1964 p 36-42 (See N65-14578 05-05)

OTS: $6.00

From the viewpoint that a biogeocoenosis includes living organisms performing certain functions and inert matter creating the physicogeographical setting in which these organisms exist, conditions of existence depend on their interactions with each other. A synousia, or group of organisms, regulates the streams of matter distributed in strictly defined habitats of the same type. As each synousia converts a certain substance from one state to another and exploits this change for its own existence, it acts as an elemental control device in the biogeochemical cycle providing the material for a given biogeocoenosis. Although the species may be both homogeneous and inhomogeneous, or phylogenetically remote from one another, they must adapt to similar functions and possess specific characteristics to perform within the biogeocoenosis. Several examples of the effect which external conditions have on the

synousia and the performance of various synousia structures are given. M.G.J.

N65-14581 Joint Publications Research Service, Washington, D.C.
THE PROBLEM OF REGULATION, INSPECTION AND CONTROL, VIEWED NEUROPHYSIOLOGICALLY
G. I. Polyakov *In its* Transl. from Probl. Kibernetiki (Probl. in Cybernetics), No. 11, 1964 11 Dec. 1964 p 43-68 (See N65-14578 05-05) OTS: $6.00

Concrete definitions and analyses of the development of the nervous system during the evolution of animal organizations are presented, with particular emphasis on the functions of regulation, self-regulation, inspection, self-inspection, control, and self-control. As a result, six different functions with an anatomicophysiological mechanism corresponding to each function are obtained. The significance of the coordination mechanism and analyzers, and their relationship to the complexities of the nervous system, are also incorporated into the study. The influence on these six functions of the centralized ganglionic nervous system, the chief analyzer systems and their connections with the coordination mechanism, neuron organization of brain-sited portions of analyzers, correlation between neurons, anatomic correlations and connections of central nervous formations, transmission of voluntary control impulses from cerebral cortex to reflex centers of brain stem and spinal cord, and from different parts of the cerebral cortex to the analyzer-coordination mechanism (cerebellum), is also discussed. M.G.J.

N65-14598# Joint Publications Research Service, Washington, D.C.
MEDICAL AND BIOLOGICAL RESEARCH ON SPACE VEHICLES "VOSTOK" AND "VOSKHOD"
21 Dec. 1964 48 p refs Transl. into ENGLISH from 2 RUSSIAN monographs For NASA transl. see N65-14607 05-04 OTS: $2.00
(JPRS-27925; TT-64-51975) OTS: $2.00

CONTENTS:

1. MEDICAL RESEARCH CONDUCTED ON THE SPACE SHIPS "VOSTOK" AND "VOSKHOD" O. Gazenko p 1-26 (See N65-14599 05-04)

2. BIOLOGICAL RESEARCH CONDUCTED ON THE SPACESHIPS "VOSTOK" AND "VOSKHOD" V. V. Antipov p 27-40 (See N65-14600 05-04)

N65-14599 Joint Publications Research Service, Washington, D.C.
MEDICAL RESEARCH CONDUCTED ON THE SPACE SHIPS "VOSTOK" AND "VOSKHOD" [MEDITSINSKIYE ISSLEDOVANIYA NA KOSMICHESKIKH KORABLYAKH "VOSTOK" i "VOSKHOD"]
O. Gazenko *In its* Med. and Biol. Res. on Space Vehicles "Vostok" and "Voskhod" 21 Dec. 1964 p 1-26 (See N65-14598 05-04) OTS: $2.00

A brief survey of the principal results derived from medical (physiological) studies during manned flights aboard the Vostok and Voskhod spaceships is given. The aims of medical research included determining the effect of isolated and combined factors of space flight on physiological functions on the body, the efficiency and reliability of life support and life saving systems for maintaining medical control over the crew, the capacity and ability to carry out different operations in controlling the ship and methods for increasing human resistance to flight factors. Human beings given special training are able to endure the effects of all portions of an orbital flight. However, the individual reaction of the cosmonaut is an important factor and must be accorded special consideration for future training programs for the crews of spaceships. R.W.H.

N65-14600 Joint Publications Research Service, Washington, D.C.
BIOLOGICAL RESEARCH CONDUCTED ON THE SPACESHIPS "VOSTOK" AND "VOSKHOD" [BIOLOGICHESKIYE ISSLEDOVANIYA NA KOSMICHESKIKH KORABLYAKH "VOSTOK" I "VOSKHOD"]
V. V. Antipov *In its* Med. and Biol. Res. on Space Vehicles "Vostok" and "Voskhod" 21 Dec. 1964 p 27-40 (See N65-14598 05-04) OTS: $2.00

A brief survey of the main results of the biological investigations conducted during the flights of the Vostok and Voskhod satellite ships is given. Mammals, animal and human tissue cultures, fruit flies, seeds of higher plants, microspores, seaweed cultures, and microbiological and cytogenetic structures were used. The dynamics of spacecraft flight (acceleration, vibration, engine noise, and weightlessness), outer space environment (low barometric pressure, altered gaseous composition in the absence of molecular oxygen and ionizing radiation), and the prolonged life of the organism under the artificial conditions of a spaceship (limited space, features of microclimate, food, and rhythm) were investigated. Biological investigations give the fullest account of the physical features of the unique environment of outer space, and the process of physical investigations important for a successful development of the main trends of space biology. R.W.H.

N65-14606*# National Aeronautics and Space Administration, Washington, D.C.
RESULTS GAINED FROM INVESTIGATING THE BIOLOGICAL EFFECTIVENESS OF A NUMBER OF SPACE FLIGHT FACTORS [REZUL'TATY ISSLEDOVANIYA BIOLOGICHESKOY EFFEKTIVNOSTI RYADA FAKTOROV KOSMICHESKOGO POLETA]
V. V. Parin, V. V. Antipov, B. I. Davydov, G. A. Chernov, and E. F. Panchenkova Nov. 1964 17 p Transl. into ENGLISH of a paper presented at the 15th Intern. Astronautical Congr., Warsaw, Sep. 7-12, 1964
(NASA-TT-F-9157) OTS: HC $1.00/MF $0.50

Four series of animal experiments on the effects of vertical vibration, accelerations of 10 and 30 G, lethal-dose gamma rays, and a combination of these three factors were made to study the mechanism of compensatory defensive reactions of the organism. Bioassays and spectrophotometric measurements showed decreases in the blood serotonin level by up to 71%, and ceruloplasmin activity was decreased by ionizing radiation and increased by acceleration. Exposure to acceleration or vibration some time before irradiation diminishes the radiation damage and may increase the survival rate. Bone marrow transplants prevented death in some of the animals. Author

N65-14607*# National Aeronautics and Space Administration, Washington, D.C.
MEDICAL STUDIES ON THE COSMIC SPACECRAFTS "VOSTOK" AND "VOSKHOD"
O. Gazenko Dec. 1964 41 p Transl. into ENGLISH of the publ. "Meditsinskiye Issledovaniya na Kosmicheskikh Korablyakh 'Vostok' i 'Voskhod' " Moscow, Akad. Nauk SSSR, 1964 p 1-38 For JPRS transl. see N65-14598 05-04
(NASA-TT-F-9207) OTS: HC $2.00/MF $0.50

A brief summary of the basic results derived from medical (physiological) studies carried out during the flights is presented. The medical studies were concerned with the following: (1) the effect of individual and complex conditions and factors of cosmic flight upon the physiological functions of the organism and the processes by which man adapts to these conditions; (2) the effectiveness and reliability of the life-support systems for rescue and medical monitoring of the atmosphere and the condition of the crew; (3) the efficiency and capabilities of man to carry out different work operations in handling the spacecraft, its systems, and the scientific apparatus; (4) the means and methods by which the resistance of man to the effect of flight factors could be increased; and (5) the value of the criteria and the effectiveness of the methods for selecting cosmonauts and their preparation for flight. P.V.E.

N65-14679# Washington School of Psychiatry, D.C.
FURTHER WORK ON THE USE OF TRACKING TASKS AS INDICATORS OF STRESS Final Report, Jul. 1962–Jan. 1964
Norman K. Walker, Fred Shectman, and Elizabeth De Socio Oct. 1964 141 p refs
(Contract DA-49-193-MD-2369)
(AD-450861)

It is shown that zero input tracking analysis provides a reliable measure of tracking performance, that tracking degrades severely under the stress of auditory shadowing, but that the sensitivity of subjects differs considerably. Auditory shadowing appears to produce similar effects as in combat, possibly in both cases due to an information overload, and hence auditory shadowing may well be a suitable laboratory substitute for combat. Auditory shadowing can thus be used to define the sensitivity of any control system to combat degradation using a given group of subjects, or using a given system to examine the sensitivity of the subjects. Mild electric shocks on the other hand were quite ineffective stressors. Author

N65-14709# Joint Publications Research Service, Washington, D.C.
THE USE OF ULTRASONICS IN MEDICINE
12 Jan. 1965 18 p refs Transl. into ENGLISH from Vorp. Kurortol., Fizioterapii i Lecheb. Fiz. Kul't. (Moscow), v. 29, no. 4, Jul.–Aug. 1964
(JPRS-28255; TT-65-30118) OTS: $1.00

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1. SOME ASPECTS OF THE MEDICAL USE OF ULTRASONICS A. A. Pushkareva p 1–8 refs
2. THE USE OF ULTRASONICS IN OPHTHALMOLOGY L. Ya. Shereshevskaya p 9–15 refs

N65-14710# Joint Publications Research Service, Washington, D.C.
SOME INDIVIDUAL DIFFERENCES IN THE ACTIVITY OF A SPORTSMAN-ACROBAT AND THEIR CONSIDERATION IN TEACHING AND TRAINING EXERCISES
B. I. Yakubchik 13 Jan 1965 19 p refs Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 5, 1964 p 20–30
(JPRS-28276; TT-65-30122) OTS: $1.00

An attempt is made to single out and describe the (individual) features of three sportsmen-acrobats which would most likely depend on the general typological properties of their nervous system. The possibility of using these observations in formulating a method of individualized approach in the process of training sportsmen of the highest caliber is discussed. P.V.E.

N65-14747# Joint Publications Research Service, Washington, D.C.
STUDIES ON THE HUMAN VISUAL ANALYZER AND HEART
11 Jan. 1965 46 p refs Transl. into ENGLISH of 4 articles from Nervnaya Sistema (Leningrad), no. 5, 1964 p 105–122, p 151–158
(JPRS-28234; TT-65-30108) OTS: $2.00

CONTENTS:

1. AN ELECTRORETINOGRAPHIC INVESTIGATION OF THE CRITICAL INTERVAL OF DISCRETENESS OF THE HUMAN VISUAL ANALYZER K. A. Bykov p 1–9 refs
2. INVESTIGATION OF THE INFLUENCE OF EMOTIOFACTORIAL ACTION ON THE EXCITABILITY OF THE VISUAL ANALYSOR OF A HUMAN O. A. Ryabov p 10–17 refs
3. BIOPHYSICS OF THE INTERACTION OF BRIEF COLOR STIMULI IN THE VISUAL ANALYSOR OF A HUMAN E. P. Shaytor p 18–28 refs
4. ELECTRONIC MODEL OF THE HEART V. I. Zabotin p 29–40 refs

N65-14748# Joint Publications Research Service, Washington, D.C.
NEURODYNAMICS OF THE HUMAN AUDITORY SYSTEM
S. N. Gol'dburt 14 Jan. 1965 33 p refs Transl. into ENGLISH from the book "Neurodinamika Slukhovoy Sistemy Cheloveka" Leningrad, Publishing House of Leningrad Univ. 1964 p 167–192, 211–212
(JPRS-28308; TT-65-30133; AD-450346) OTS: $2.00

The dynamic characteristics of the nervous system measure its ability to reflect a variety of external stimuli which are continuously changing according to various parameters. To these dynamic measures, P.O. Makarov added the measurement of various thresholds (intensity, time, and space) of a stimulated structure under condition that the measurement is conducted at the shortest intervals after the preceding stimulus, i.e., in a stimulated state. (Thus arose the conception of the dynamic threshold, and a measurement was made of the dynamic chronaxy of a nerve to various fragments of the excitation process.) On the basis of tests on an altered nerve, N. Ye. Vvedenskiy came to the conclusion in 1901 that, in addition to a running wave of excitation, there exists a slow, gradual excitation, and that this second form of excitation is more general and vital than the first. This report is a broad review of the work in auditory neurophysiology of many investigators in support of the theory of N. Ye. Vvedenskiy as initially stated. R.W.H.

N65-14761# Washington U., Seattle. School of Medicine
FUNCTIONAL ATELECTASIS AND HYPERINFLATION Annual Progress Report, Oct. 1, 1963–Oct. 15, 1964
John J. Bonica, Richard J. Ward, Fred Danziger, Gerald D. Allen, and John B. Bowes [1964] 12 p
(Contract DA-49-193-MD-2231)
(AD-450346)

Arterial oxygen tensions were determined on a group of healthy young patients breathing oxygen who had been supine for over one hour. The control average oxygen tension was 515 mm Hg. The patients were asked to take a deep breath to the maximum possible, and 5 seconds after the peak of inhalation a second arterial blood sample was withdrawn. A 5-minute period of rest was given and the patients were asked to take a deep breath to the maximum possible and hold it for 5 seconds. Again 5 seconds after peak of inhalation, an arterial blood

sample was withdrawn. After a 5-minute rest period, the patients were requested to take 12 deep breaths to the maximum possible. A single deep breath raised the oxygen tension 20-mm Hg. A single breath which was held raised the oxygen tension 64-mm Hg. Twelve maximum deep breaths raised the oxygen tension 48-mm Hg. Author

N65-14797# American Inst. for Research, Palo Alto, Calif.
STUDY OF TRAINING PERFORMANCE EVALUATION TECHNIQUES
David Angell, James W. Shearer, and David C. Berliner 16 Oct. 1964 82 p refs
(Contract N61339-1449)
(NAVTRADEVCEN-1449-1; AD-609605)

The report discusses performance evaluation in the training environment, specifically in training situations involving the use of simulators and other complex training equipment. The important variables involved in developing a system of performance evaluation are seen as types of behaviors, types of measures or mensural indices, and types of instruments for recording performance. Factors relating to these variables are discussed, and some of their interrelationships are delineated. Matrices which facilitate the consideration of interrelationships among the three variables are presented. An illustrative application of an automatic training-evaluation system is given. Author

N65-14803*# Stanford Research Inst., Menlo Park, Calif. Physics Div.
MAGNETIC PROPERTIES OF SOME MACROMOLECULES OF BIOLOGICAL INTEREST Final Report
B. S. Deaver, Jr., J. B. Swedlund, and H. J. Bradley Nov. 1964 49 p refs
(Contract NASr-49(16); SRI Proj. PHU-4644)
(NASA-CR-60122) OTS: HC $2.00/MF $0.50

A new superconducting circuit, together with superconducting magnetic shields and persistent current magnets, was constructed. This apparatus is capable of measuring the magnetic susceptibility of small organic samples at temperatures between 1° and 300° K in fields up to 40 000 G. It can detect flux changes of 10^{-7} G-cm^2, which is equivalent to the capability of detecting a change in specific susceptibility of 10^{-9} *in a 100-mg sample under an applied* field of 10 kG. Several hundred preliminary measurements were made on samples of coronene. The most reliable of these were in agreement with published values of the magnetic susceptibility of coronene. Experience during these measurements led to changes which have resulted in an apparatus well suited to the measurements on macromolecules. An improved version of the superconducting circuit shows promise of a further improvement in sensitivity by a factor of more than a thousand. Author

N65-14829# Republic Aviation Corp., Farmingdale, N.Y. Paul Moore Research and Development Center
DETERMINATION OF AEROBIC AND ANAEROBIC MICROFLORA OF HUMAN FECES Final Report
Lorraine S. Gall and Phyllis E. Riely Wright-Patterson AFB, Ohio, AMRL, Oct. 1964 87 p refs
(Contract AF 33(615)-1748)
(AMRL-TR-64-107; AD-609325)

Fecal specimens from four young men confined in an experimental activity facility were cultured both aerobically and anaerobically thirteen times during a 6-week period. During certain periods the men wore space suits. Two of the men were on an experimental space-type diet which was freeze-dehydrated. During this same time period the other two subjects were on a "control" diet which contained identical foods, fresh and canned, to duplicate as nearly as possible the dehydrated diet from a nutritional viewpoint. Midway in the experiment the diets of the subjects were switched. The procedures used emphasized the anaerobic isolation of the predominating microorganisms using Gall's specialized technique. The aerobes were isolated and identified by standard procedures. Although the obligately anaerobic character of the flora remained constant, a shift was found in the types of anaerobic organisms isolated. Author

N65-14848*# Space Technology Labs., Inc., Redondo Beach, Calif.
A STUDY OF MODEL MATCHING TECHNIQUES FOR THE DETERMINATION OF PARAMETERS IN HUMAN PILOT MODELS
G. A. Bekey, H. F. Meissinger, and R. E. Rose Washington, NASA, Jan. 1965 170 p refs
(Contract NAS1-2582)
(NASA-CR-143) OTS: HC $5.00/MF $1.00

The study departs from conventional approaches where the pilot is characterized by transfer functions or quasi-linear describing functions, *progressing into the domain of time-variant* and nonlinear operations and representative models of this type. Manual tracking in two axes where the operator is modeled as a multiple input-multiple output system is discussed. The emphasis has been placed primarily on development of computational methods and, hence, model matching experiments on synthetic pilots with known parameters were required. The resulting methodology was successfully applied to actual pilot tracking data and provided new insight into the pilot's dynamic response. The experimental results are presented. A part of the study was devoted to the comparison of continuous and iterative parameter adjustment methods. In addition, significant analytical results were derived pertaining to the nature of parameter optimization by the gradient method. Author

N65-14941# Naval Training Device Center, Port Washington, N.Y. Human Factors Lab.
BIOLOGICAL EFFECTS OF LASERS: SAFETY RECOMMENDATIONS AND A COMMENT ON THE CONCEPT OF OCULAR DAMAGE
Paul A. Cirincione 28 Jul. 1964 13 p refs
(NAVTRADEVCEN-IH-15; AD-607718)

Since lasers are being increasingly employed and because the laser beam is the most intense artificial light available, questions concerning health hazards to personnel become most important. Several of the most prominent effects, the concept of ocular damage, and proposed safety procedures are presented. The following safety rules are given for laser work: (1) Laser laboratories should be clearly marked as eye hazardous areas. (2) All laser light, regardless of the nature of the laser, should be considered dangerous. (3) Laser laboratories should be brilliantly illuminated to constrict the size of the pupil of the eye. (4) Protective goggles such as the Jena color glass should be worn by all personnel. (5) Interlock systems should be incorporated into lasers so they will not function if anyone is in the light path. E.E.B.

N65-14945*# National Aeronautics and Space Administration, Washington, D.C.
MEMORY OF ANIMALS, ITS NATURE AND ORIGIN [PAMYAT' ZHIVOTNYKH, YEYE KHARAKTERISTIKA I PROISKHOZHDENIYE]

I. S. Beritashvili Jan. 1965 9 p Transl. into ENGLISH of a paper presented at the 10th Congr. of the I. P. Pavlov All-Union Physiol. Soc., Yerevan, 22–28 Oct. 1964
(NASA-TT-F-304) OTS: HC $1.00/MF $0.50

Three types of memory in animals are discussed, a delayed reaction of short duration, a delayed reaction of longer duration, and the long-term memory phenomena associated with conditioned reflexes. Short-term delayed reaction is explained by a closed nerve circuit in which the stimulus from a perception may continue to travel for some time. Delayed reactions of the second type are based on the molecular or submolecular changes in the cytoplasm of the cell and presynaptic endings of the associative pyramidal neurons. The third type of memory is caused by the development of the synaptic endings in the projected pyramidal cells of the pyramidal and extrapyramidal paths. Experiments with removal of the regions of the cortex showed that the prefrontal region is necessary for the retaining and reproduction of images but not for the formation and preservation of conditioned reflexes. The ability at delayed reactions is impaired after bilateral removal of the posterior core from the basal ganglia and the cerebellum. Conditioned reflex activity is disrupted only temporarily by both operations. Author

N65-14946*# National Aeronautics and Space Administration, Washington, D.C.
THE CONDITIONED REFLEX AND PRESENT-DAY NEUROPHYSIOLOGY [USLOVNYY REFLEKS I SOVREMENNAYA NEVROFIZIOLOGIYA]
E. A. Asratyan Jan. 1965 8 p refs Transl. into ENGLISH of a paper presented at the 10th Congr. of the I. P. Pavlov All-Union Physiol. Soc., Yerevan, 22–28 Oct. 1964
(NASA-TT-F-306) OTS: HC $1.00/MF $0.50

This lecture is devoted to a review, a critical analysis, and an evaluation of the factual data of present-day neurophysiology based on the physiology of the conditioned reflex. These data were obtained mainly with the aid of electrophysiological methods, both with and without various modifications on the classical methodology of conditioned reflexes. Moreover, these data concerned three interdependent problems: the process of formation of the conditioned reflex; the characteristics of the functional state of the nerve structures, which are the basis of the closing of the conditioned connection; and the macro- and micro-structural basis of this connection. Author

N65-14947*# National Aeronautics and Space Administration, Washington, D.C.
INVESTIGATION OF THE NEUROPHYSIOLOGICAL MECHANISMS IN THE PROCESS OF EXTERNAL SIGNAL DISCRIMINATION [ISSLEDOVANIYE NEUROFIZIOLOGICHESKIKH MEKHANIZMOV PROTSESSA RAZLICHENIYA VNESHNEGO SIGNALA]
G. V. Gershuni Jan. 1965 8 p Transl. into ENGLISH of a paper presented at the 10th Cong. of the I. P. Pavlov All-Union Physiol. Soc., Yerevan, (USSR) 22–28 Oct. 1964
(NASA-TT-F-307) OTS: HC $1.00/MF $0.50

The effect of the duration of a signal consisting of broadband noise on human and animal discrimination was studied. Discrimination was measured by psychophysical methods, by conditioned reflex methods, by electrical recording from the auditory cortex, and by recording from single cells in the cochlear nucleus. The results suggested three time boundaries which affect the process of discrimination. The first, with an upper limit of 10 to 20 msec, shows little effect of duration on the relation between signal intensity and the measures of discrimination. The second, from 10 to 20 to 80 to 100 msec, has the characteristic reciprocal intensity-duration relationship. The third, above 100 msec, again shows no effect of signal duration on discrimination involving signal intensity. The results are interpreted in terms of short-term memory and evolutionary development. Author

N65-14948*# National Aeronautics and Space Administration, Washington, D.C.
THE SUPPLY OF ENERGY FOR PHYSIOLOGICAL FUNCTIONS [ENERGETICHESKOYE OBESPECHENIYE FIZIOLOGICHESKIKH FUNKTSIY]
S. Ye. Severin Jan. 1965 9 p Transl. into ENGLISH of a paper presented at the 10th Congr. of the I. P. Pavlov All-Union Physiol. Soc., Yerevan, 22–28 Oct. 1964
(NASA-TT-F-300) OTS: HC $1.00/MF $0.50

The provision of energy for physiological functions is described as the result of the accumulation of energy in high-energy bonds, the most important of which is ATP. The various mechanisms of formation of these high-energy bonds are discussed. Glycolysis is considered to be the least efficient method, while oxidative phosphorylation, which is discussed at length, is pointed out to be much more efficient, especially that accompanying the transfer of electrons. The hypotheses recently put forward by Boyer and Skulachev as to the mechanism of oxidative phosphorylation are discussed, as is the role of high-energy phosphate in the mechanisms of muscular contraction. Author

N65-14988# California U., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology
SHORT TERM RETENTION OF STRONTIUM-85 AND ESTIMATION OF INITIAL STRONTIUM-90 BODY BURDENS IN HUMANS
Norman S. Mac Donald, William G. Figueroa, and Marshall R. Urist Dec. 1964 26 p refs
(Contract AT(04-1)-GEN-12)
(UCLA-12-538)

Following a single intravenous injection, body burdens were measured in a total-body-counter facility at frequent intervals over periods ranging up to several months. Eleven subjects were on metabolic balance regimens in the hospital so that urines and stools were collected and assayed for Sr^{85} and Ca. This group included examples of the extremes of skeletal calcium metabolism including those with avid retention of Ca, normal or balanced cases, and those with large daily loss of endogenous Ca. The amounts of Sr^{85} excreted soon after administration varied widely among individuals and reflected the state of Ca metabolism for each person. Methods for estimating human body burdens of Sr^{90} from bioassay data were reviewed briefly. Applicable data on Sr^{85} urinary excretion vs retention were collected, combined with the present series, and evaluated for utility in estimating Sr^{90} burdens from single urine measurements. Author

N65-15031 Tracor, Inc., Austin, Tex.
BINAURAL INTERACTION Summary Report, 1 Apr. 1963–1 Apr. 1964
Bruce H. Deatherage 8 Jun. 1964 34 p refs
(Contract Nonr-4193(00))
(TRACOR-64-199-U; AD-603766)

Widely divergent theories on binaural interaction, both in localization of external sources and lateralization of earphone-delivered dichotic stimuli, are examined, with the review

centering mainly on post-World War II literature in this field. The interrelating characteristics of anatomy, physiology, and psychology are also discussed. To determine what form binaural interaction takes to sounds as different as tone bursts and clicks, several experiments were conducted, with rather inconclusive results. One significant point is that the data for the high-frequency band-pass click are not different from those for the high-frequency low-pass click, despite the expectations that low frequencies in the low-pass click would delay the synchronous timing signal. Listening under equal sensation level conditions, instead of equal sound pressure level, changed the details but not the overall results. Unexplained data are discussed, and it is recommended that the search for equivalence for frequency-disparate stimuli be continued. M.G.J.

N65-15036# Joint Publications Research Service, Washington, D.C.

GENERAL OBSERVATIONS ON SPACE MEDICINE

V. Fomin 22 Jan. 1965 6 p Transl. into ENGLISH from Starshina-Serzhant (Moscow), v. 51, no. 11, Nov. 1964 p 2-3 (JPRS-28417; TT-65-30181) OTS: $1.00

The medical science problems posed by group space flights and interplanetary flights are under study, and some solutions have been reached. The choice of physiological parameters to be measured and the development of a fixation system for numerous sensors needed are discussed, as well as ship-to-earth transmission of high information signals used to relay the condition and dynamics of the physiological functions of the crew members. Under development are the programing of clinical-physiological studies aboard spacecraft and the selecting of crew members on the principle of psychophysiological compatibility. M.G.J.

N65-15039# Brown Engineering Co., Inc., Huntsville, Ala. Research Labs.

PHYSIO-MECHANICAL EFFECTS OF ACCELERATIONS ON HUMAN BEINGS WORKING IN A ROTATING ENVIRONMENT

Harry C. Crews, Jr. Nov. 1964 38 p refs Revised
(R-63)

The study was initiated because of concern that routine maintenance of radar equipment located in a large rotating room might be impossible. A mechanical analysis was made of accelerations on an object in a rotating enclosure. The results of an experimental program of the Navy are summarized. The results of the mechanical analysis agreed well with the experimental results. The primary object of this report is to provide a method of analysis that can lead to methods and procedures for reducing ill effects on humans. While the study was limited to rotation about one fixed axis, it can be extended to apply to a generally rotating environment. The review of applicable acceleration equations starts from the most general case. Author

N65-15045# Joint Publications Research Service, Washington, D.C.

AN ANALYSIS OF DRUGS ACTING ON THE CENTRAL NERVOUS SYSTEM USING ANIMAL EXPERIMENTS—ASSOCIATION AND DISSOCIATION BETWEEN EEG AND BEHAVIOR

Kenichi Yamamoto and Ryonosuke Kido 22 Jan. 1965 28 p refs Transl. into ENGLISH from No to Shinkei (Tokyo), v. 16, no. 1, Jan. 1964 p 44-58
(JPRS-28419; TT-65-30183) OTS: $2.00

Electroencephalographic and behavioral analysis of central nervous system (CNS)-acting drugs on cats, dogs, and monkeys are described. There were no essential differences in the normal EEG patterns between acutely and chronically affected animals, but deep sleep patterns and activated sleep patterns were not seen in acute animals. These patterns, due to differences in experimental conditions, were also observed after administration of some CNS-acting drugs. However, these results show the danger of misunderstanding consciousness levels if only acute EEG patterns are used as the criteria for judgment. After administration of reserpine, meprobomate, and barbiturates, differences of EEG and behavior among cats dogs, and monkeys were not observed. However, "rage-like behavior" was observed only in cats following administration of chlorpromazine. Also, after administration of morphine, cats showed continuous arousal; dogs showed narcosis; and monkeys showed intermediate responses between cats and dogs. R.R.D.

N65-15057*# National Aeronautics and Space Administration, Washington, D.C.

EXPERIMENTAL FORMATION OF BIO-LIKE STRUCTURES [EKSPERIMENTAL'NOYE FORMIROVANIYE BIOPODOBNYKH STRUKTUR]

V. O. Kalinenko Jan. 1965 15 p Transl. into ENGLISH from Mikrobiologiya (Moscow), v. 33, no. 2, 1964 p 356-363 (NASA-TT-F-9239) OTS: HC $1.00/MF $0.50

Bio-like structures having the shape of discs, cigars, caudate rockets, etc., are formed in distilled water and on an agar gel in the presence of an electric field. The conditions for the formation of these structures, their behavior, and the nature of their constituent material are discussed. Author

N65-15105# Human Factors Research, Inc., Los Angeles, Calif.

GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: EXPERIMENTAL STUDIES OF TWO CARTOGRAPHIC VARIABLES

James J. Mc Grath, William E. Osterhoff, and Gail J. Borden Nov. 1964 56 p refs
(Contract Nonr-4218(00))
(TR-751-3; AD-609092)

Two experiments were conducted to study the influence of cartographic variables on geographic orientation performance of pilots of light attack aircraft. A cinema method was used to simulate the visual aspects of low-altitude, VFR, navigation. The results of the first experiment showed that the removal of place names from a sectional aeronautical chart produced no significant change in orientation performance. The second experiment showed that a change in chart scale, when information content remained the same, produced no significant change in orientation performance. However, a comparison of performances using the sectional aeronautical chart and using the USAF Operational Navigation Chart showed that a change in scale, when accompanied by a change in information content, produced a significant change in orientation performance. Implications of the results for navigation display design were discussed. Author

N65-15112# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SIMULATION OF TOUCH BY MEANS OF SURFACE ULTRASOUND WAVES

L. L. Myasnikov 15 Oct. 1964 6 p refs Transl. into ENGLISH from Tr. Leningr. Korablestroitel'nogo Inst. (Leningrad), no. 36, 1962 p 103–105
(FTD-TT-64-225/1; AD-607496)

The method of simulating touch is based on the use of surface ultrasonic waves of the megacycle range that are radiated in the form of impulses and that pass around the surface of an "artificial finger." The intensity and the sequence of the perceived impulses change, depending upon the contact with the "feeling" object, the degree of pressure, and the form of the object. By changing the ultrasonic impulses into electrical ones and by using scanning and resolution, an image characterizing the result of the "feeling" is obtained on the screen of an electronic oscillograph. R.R.D.

N65-15129# Pennsylvania State U., University Park.
THE INFLUENCE OF BODY CHARACTERISTICS ON HUMAN TEMPERATURE RESPONSES TO HIGH ALTITUDE COLD Progress Report
Paul T. Baker 1 Nov. 1963 32 p refs
(Contract DA-49-193-MD-2260)
(AD-422588) OTS: $2.60

To determine the possible role of body characteristics in man's ability to adapt and acclimatize to high altitude cold, the physical characteristics of four groups of individuals were correlated to their body temperature responses when exposed to an ambient temperature of 14° C for two hours at an altitude of 3760 m. The body characteristics chosen for analysis were age, standing height, sitting height, weight, % body fat, fat-free weight, and sum of skinfold. The four groups were U.S. Whites, University of Cuzco White, and Indian students and native Indian villagers. The results showed significant association between body characteristics and body temperatures in all groups. Fat acted as insulation in all groups and fat-free weight had very significant positive effects on total body heat content. The total body heat content of native Indian villagers was more significantly affected by age than in other groups and fat-free weight in this group had a strong effect on peripheral body temperatures. The result agrees with the previous progress report that native Indian villagers have a higher metabolic response to cold stress. Author

N65-15139*# Naval School of Aviation Medicine, Pensacola, Fla.
HISTOPATHOLOGIC EVALUATION OF A LABORATORY PRIMATE: THE SQUIRREL MONKEY (SAIMIRI SCIUREUS) Report No. 1
Donald E. Furry 15 Aug. 1964 23 p refs Joint report with NASA
(NASA Order A-34681)
(NASA-CR-60193) OTS: HC $1.00/MF $0.50

Tissues from the major organ systems of 15 squirrel monkeys were prepared for microscopic evaluation. Eleven of these primates, initially classified as essentially normal animals, were found to have numerous alterations of tissue structure, reflecting various types of inflammatory and degenerative lesions. The attention of investigators utilizing the squirrel monkey as an experimental animal is directed to the possible existence of acute and chronic lesions in apparently normal animals. Interpretation and evaluation of subtle alterations in function or structure of this primate must be meticulously conducted, and careful histopathological evaluation of major organ systems is an essential requirement for the proper interpretation of a cause-effect relationship. Author

N65-15148*# Army Biological Labs., Fort Detrick, Md. Physical Defense Div.
THE LEVEL OF MICROBIAL CONTAMINATION IN A CLEAN ROOM DURING A ONE YEAR PERIOD Protection Branch Report of Test No. 11-65
Dorothy M. Portner 4 Dec. 1964 20 p
(NASA Order R-35)
(NASA-CR-60184) OTS: HC $1.00/MF $0.50

A study to determine the level of microbial contamination in a clean room was undertaken in order to establish a basis for deciding whether it is advantageous from a minimal microbial contamination standpoint to assemble a spacecraft in such an area. To increase the probability of obtaining a sterile spacecraft with a given sterilization procedure, precautions must be taken to keep the initial microbial population as low as possible. The level of aerobic microbial contamination that accumulates on surfaces from aerial fallout and also from handling was previously investigated, but a more extensive study was needed under clean room conditions. Author

N65-15163*# Consultants and Designers, Inc., Arlington, Va.
DISTURBANCES OF THE MITOSIS MECHANISM IN MICROSPORES OF TRADESCANTIA PALUDOSA INDUCED BY DIFFERENT FLIGHT LENGTHS ON SPACESHIP VOSTOK-5 [VOZNIKNOVENIYE NARUSHENIY MEKHANIZMA MITOZA V MIKROSPORAKH TRADESCANTIA PALUDOSA POD VLIYANIYEM RAZLICHNOY PRODOLZHITEL'NOSTI POLETA NA KORABLE SPUTNIKE VOSTOK 5]
N. L. Delone, V. F. Bykovskiy, and V. V. Antipov 15 Jan. 1965 9 p ref Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Biofiz. (Moscow), v. 159, no. 2, 1964 p 439–441
(Contract NAS5-3760)
(NASA-TT-F-9627; ST-SB-10275) OTS: HC $1.00/MF $0.50

Five types of disturbances of the mitosis mechanisms in the microspores of tradescantia paludosa were observed after various lengths of exposure to orbital space flight. Type 1 disruptions kept the nucleus at the cell edge, the nucleus cycle was not disturbed, and a uninuclear cell formed in place of the binucleate pollen. Type 2 disruptions shifted the nucleus in the prophase toward the center of the cell and also formed a uninuclear cell. Type 3 disruptions changed the direction of the spindle axis, and the nuclei of the binucleate pollen were disposed in a plane other than the usual. Type 4 disruptions introduced a nondisjunction of the chromosomes and a lag in telophase. Type 5 disruptions are those at which tripole and quadrupole mitoses occur. The number of cells with mitosis disturbances increased with the duration of the flight. G.G.

N65-15169# Federal Aviation Agency, Washington, D.C. Georgetown Clinical Research Inst.
STUDIES ON AGING IN AVIATION PERSONNEL
Arthur E. Wentz Aug. 1964 16 p
(AM-64-1)

Investigative work is in the cardiovascular, neurological, pulmonary, vision and auditory, and biochemical systems. Behavioral tasks are incorporated in the individual survey. Subjects for studies are selected from aviation personnel. Significant numbers for each 10-year age group will be examined annually for buildup of individual profiles. Consecutive studies at the Institute should develop techniques for rating physiological aging in individuals; for evaluating and detecting pathological states at earliest age; and to aid in formulating physical standards by physiological rather than chronological age, in aviation personnel. Author

N65-15171# Joint Publications Research Service, Washington, D.C.
STUDIES IN SPACE FLIGHT AND PHYSIOLOGY
7 Jan. 1965 14 p Transl. into ENGLISH from Med. Gazeta (USSR), 20 Oct. 1963 p 3
(JPRS-28183; TT-65-30087) OTS: $1.00

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2. THE PERSONAL HYGIENE OF AN ASTRONAUT L. V. Levashev p 4-6 (See N65-15173 05-04)
3. ADVANCED TRENDS IN THE DEVELOPMENT OF PHYSIOLOGY L. Voronin p 7-11 (See N65-15174 05-04)

N65-15172 Joint Publications Research Service, Washington, D.C.
THE PSYCHOLOGY OF GROUP SPACE FLIGHT
B. Alyakrinskiy *In its* Studies in Space Flight and Physiol. 7 Jan. 1965 p 1-3 (See N65-15171 05-04) OTS: $1.00

Psychological pressures during manned space flight result from sensory deficiencies induced by prolonged weightlessness, from depression due to confinement and isolation in a relatively small restricted enclosure, and from tensions and irritations experienced by a group of people under constant, prolonged, and compulsory communal living. The selection of a crew with similar general peculiarities of temperament and character for greater psychological compatibility in conjunction with a strict regulation of the crew's working and living cycle will increase the stability of the personal relationships and thus ensure a successful performance. G.G.

N65-15173 Joint Publications Research Service, Washington, D.C.
THE PERSONAL HYGIENE OF AN ASTRONAUT
Laureate V. Levashev *In its* Studies in Space Flight and Physiol. 7 Jan. 1965 p 4-6 (See N65-15171 05-04) OTS: $1.00

The personal hygiene of men in space flight is related to the variations in the metabolic processes, the level of human defensive capability, and the biological properties of various microorganisms. The elimination or curtailment of the usual toilet facilities can induce alterations of the human skin and even actual illness. Tests proved that prolonged limitations of the spacemen's mobility changed their skin elasticity in certain areas of the body by a factor of 1 1/2 to 2 in relation to its initial level, and increased the fat deposits on their skin which led to a multiplication of skin microbes and a lowered disinfection mechanism. Variations of the biological equilibrium between the spacemen and the microbes must be avoided by securing hygienic facilities that operate efficiently during prolonged weightlessness in a limited environment. G.G.

N65-15187*# United Aircraft Corp., Farmington, Conn. Corporate Systems Center
ENGINEERING MAN FOR SPACE. THE CYBORG STUDY Final Report
Robert W. Driscoll 15 May 1963 188 p refs
(Contract NASw-512)
(NASA-CR-60273) OTS: HC $5.00/MF $1.25

A study has been conducted to gather data pertaining to limitations on man's adaptability to long-term space flights and to possible methods for considerably reducing life support problems during such flights. Specifically the applicability of artificial organs, drugs, and hypothermia during such flights is considered in detail. In addition, the study on the development of a mathematical and dynamic model of the human heart and cardiovascular system in a space environment is included. Author

N65-15209# Federal Aviation Agency, Oklahoma City, Okla. Neurophysiology Labs.
PHYSIOLOGICAL RECORDING FROM PILOTS OPERATING AN AIRCRAFT SIMULATOR
Carlton E. Melton, Jr. Sep. 1964 12 p refs
(AM-64-18)

Ten physiological records were obtained from each of six pilots performing simulated flight problems in a C-97 aircraft simulator. The pilots were given therapeutic doses of either a tranquilizer (meprobamate) or an antihistamine (chlorpheniramine) during three of the simulated flights, the others being training or control flights. Records were made of electrocardiogram, heart rate, respiratory rate, galvanic skin response, electroencephalogram (parietal-occipital), electroencephalogram (frontal-central) and lateral eye movements (electrooculogram). None of the variability of the above parameters, with the exception of the electroencephalograms (to be separately published), was ascribable to drug treatment. The techniques developed during this study are suitable for physiological recording from subjects in the work situation. Author

N65-15262# Air Force Systems Command, Brooks AFB, Tex. Aerospace Medical Div.
HIGHLIGHTS OF FOREIGN BIOASTRONAUTICS, VOLUME 1, NO. 15, 16 JUNE 1964
[1964] 24 p refs Presented at COSPAR Symp., Florence, 8-20 May 1964
(AMD-TR-64-10; AD-450336)

A survey of the results of a number of bioscience experiments performed in Soviet spaceships is presented. Described are the fixing of biological specimens in space flight, the biopackages on board the Vostolk -5 and -6 vehicles that included Lysogenic culture E. coli K-12 (λ), seeds of higher plants, Tradescantia paludosa, different strains of Chlorella, fruit flies, and HeLa cell cultures. The total absorbed radiation dose of the cosmonauts was studied and found biologically insignificant (< 1 mrad/2 hrs). Observed changes at the cellular level of Tradescantia paludosa appeared to be related to prolonged weightlessness. It was concluded that weightlessness of a 5-day duration does not affect the life functions of several different organisms. The probable need of artificial induced gravity for long-duration manned space flights should be investigated. G.G.

N65-15269# Air Force Systems Command, Brooks AFB, Tex. Aerospace Medical Div.
HIGHLIGHTS OF FOREIGN BIOASTRONAUTICS, VOLUME 2, NO. 4
8 Oct. 1964 15 p refs
(AMD-TR-64-16; AD-450339)

Presented is a program of experiments by the Soviets which is designed to establish the biological basis for man's long-term survivability in space. The program includes both ground-based laboratory research and experiments performed in high-altitude rockets and orbital vehicles. The effects of acceleration, vibration, noise, high temperature, reduced gravity, prolonged isolation, and ionizing radiation on numerous biological specimens were studied. Dogs were selected as the principal biological specimens for investigating the effects of space flight. Test results showed that blood circulation and respiration parameters returned to initial values within

5 to 6 minutes after exposure to weightlessness. It was concluded that the stresses of space flight can be tolerated by animals. Also included in this study is a bibliography of published Soviet reports on the results of satellite biological experimentation. R.R.D.

N65-15277# Naval School of Aviation Medicine, Pensacola, Fla.
QUANTITATIVE INTERPRETATION OF THE EXERCISE ELECTROCARDIOGRAM: USE OF COMPUTER TECHNIQUES IN THE CARDIAC EVALUATION OF AVIATION PERSONNEL
Raphael F. Smith 4 Nov. 1964 21 p refs
(Rept.-3; AD-609444)

Exercise stress tests improve the sensitivity of the ECG as a method of detecting coronary heart disease, but a high diagnostic error rate has been associated with currently accepted methods. This report describes a system of quantitating ECG changes after exercise, which utilizes a special purpose analog computer (integrator) and calculation of mean VCG parameters by digital computer. Highly significant changes in the direction of the T vector appear three minutes after exercise and allow separation of the normal subjects from patients with mild angina pectoris. The quantitative output of this system is being used in an epidemiological approach to the problem of coronary disease in the aviator. Author

N65-15308# Federal Aviation Agency, Oklahoma, City, Okla. Psychology Labs.
AVIATION MEDICINE TRANSLATIONS: ANNOTATED BIBLIOGRAPHY OF RECENTLY TRANSLATED MATERIALS, II
Jerry V. Tobias, William E. Collins, and Mary Ellen Allen Oct. 1964 13p refs
(AM-64-16)

An annotated bibliography of translations of foreign-language research articles is presented. The 27 listed entries are concerned with studies of auditory fatigue, auditory malingering, voluntary nystagmus, vestibular function, objective and subjective fatigue, drugs, and forensic science. Procedures for obtaining copies of the translations are included. Author

N65-15317# System Development Corp., Santa Monica, Calif.
METHODOLOGY FOR USE IN CONJUNCTION WITH OPERATIONS SIMULATION FOR IDENTIFYING AND DEFINING CRITICAL TASK-PERFORMANCE VARIABLES
Paul R. Christensen 8 Sep. 1964 14 p refs
(SP-1761/000/00; AD-450710)

Research methodology to discover critical task-performance variables that are meaningful, measurable, independent, and relatable to task and operator performance and skills, is used to analyze the deghosting function of the passive tracking subsystem in SAGE. Three studies in sequence are necessary. The first entails an analysis of the task elements and subsystem variables, and synthesis of these elements with the task dimensions and subsystem variables. This serves as a basis for the second, in which the redefined task skills and elements are analyzed. The resulting dimensions are synthesized so that they converge as nearly as possible to a hypothesized set of skills. In the third study, the task, skills and subsystem variables are reanalyzed, with synthesis accomplished by using a sample of subsystem personnel skills and operations simulation. The common ingredients from tasks, skills, and subsystem variables are then drawn together M.G.J.

N65-15346# Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine
EFFECTS OF BILATERAL CALORIC HABITUATION ON NYSTAGMUS RESPONSES OF THE CAT
Mary Jayne Capps and William E. Collins Sep. 1964 24 p refs
(AM-64-14)

Transfer of bilateral caloric nystagmus habituation to unilateral calorization was investigated in a group of 60 cats. Habituation to bilateral caloric irrigations markedly reduced responses to both less intense and more intense unilateral stimulation. Subsequent testing provided information concerning the effects of caloric habituation on directional specificity of response, retention of the response decline, and optokinetic nystagmus. Statistical analyses also indicated a sex difference in response magnitude. Author

N65-15352# Joint Publications Research Service, Washington, D.C.
ANTITUMOR ALKALOIDS OF VINCA ROSEA LINN
A. Ya. Krashilina 25 Jan. 1965 16 p refs Transl. into ENGLISH from Probl. Gematol. i Pereliv. Krovi (Moscow), v. 9, no. 12, Dec. 1964 p 26-33
(JPRS-28448; TT-65-30197) OTS: $1.00

The properties of vincaleukoblastin and vincrystine, antitumor alkaloids of vinca rosea linn, were discussed, and the results of clinical tests and animal experiments in treating leukemia and some forms of tumors were given. Vincaleukoblastin proved most effective in cases of acute leukemia, lymphogranulomatos and chorioncarcinoma, which did not respond to usual therapy. However, the therapeutic result was relatively brief, and an effective dose bordered on toxic levels. Vincrystine showed some effectiveness in treating resistant forms of acute lympholeukemia in children, and some promise for resistant forms of lymphogranulomatosis. A brief literature survey of other antitumor plant derivatives was also given. M.G.J.

N65-15353# Joint Publications Research Service, Washington, D.C.
THE EFFECT OF GRAVITATIONAL STRESS ON THE ARTERIAL WALL
R. A. Bardina 26 Jan. 1965 8 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. i Embriol. (Leningrad), v. 47, no. 11, Nov. 1964 p 41-44
(JPRS-28476; TT-65-30204) OTS: $1.00

Experiments to study the structure of the femoral arterial wall were conducted on rabbits, revolving on an electric centrifuge with the head directed to the center. Speed was 70 to 75 rpm, with a stress of 5 to 6 g in the head-pelvis direction. The influence of marked single stress and prolonged stress on the vascular wall structure was studied, and the arterial wall was examined at intervals to investigate the reversibility of these vascular changes. It was shown that stress exerts a strong, lasting effect on intramuscular arterial walls, and that although macroscopic changes in neural vessels disappear several days after termination of stress, microscopic changes persist for a considerably longer period. M.G.J.

N65-15355# Joint Publications Research Service, Washington, D.C.
NEW STRESS FACTORS FOUND IN 120-DAY SEALED CHAMBER TESTS

A. L. Lebedinskiy et al 27 Jan. 1965 7 p Transl. into ENGLISH from Krasnaya Zvezda (Moscow), 9 Oct. 1964 p 4 (JPRS-28490; TT-65-30210) OTS: $1.00

Sealed chamber tests lasting from 10 to 120 days were performed to study the physiological effects of a closed simulated space system on man. The carbon dioxide content in the cabins rose from 10% to 20% above normal, and changes developed in the human respiratory-cardiovascular mechanism. Disturbances of the nocturnal sleep pattern, reduction in work efficiency, and inhibition of the cerebral cortex processes took place. The addition of radiation and noise factors to the test pattern increased the human excretion of amino-acid compounds to 80%. Ventilation of the chamber with external air eliminated almost all physiological changes. The additional purification of the air from bacteria and harmful chemical impurities, the ultraviolet irradiation of the skin of the subjects, the intake of increased amounts of vitamins, the performance of special physical exercises, and the use of various medicinal agents promoted a substantial reduction of undesirable effects. G.G.

N65-15368*# Texas U., Dallas. Southwestern Medical School
[INFLUENCE OF GRAVITY ON UNICELLULAR ORGANISMS AND OPTIMIZATION OF THE ULTRAVIOLET FLYING-SPOT MICROSCOPE FOR LIVING CELL OBSERVATIONS] Semiannual Status Report, Apr. 1–Sep. 30, 1963
Dale Jenkins [1963] 5 p
(Grant NsG-210-63)
(NASA-CR-51799) OTS: HC $1.00/MF $0.50

Research progress is reported in studies of gravitational and radiation effects on unicellular organisms and in the development of microscopic techniques for observing living cells. Preliminary investigations of the cell enlargement and the failure of cell division noted in bacteria subjected to 110000 g for 24 hours indicate that these gravitational changes are of a genetic nature. Bacteria subjected to 24 hours of continuous X-irradiation from a cobalt-bomb source, which delivers 2 r per minute, show ultrastructural changes that appear to be identical to those induced by gravity. Centrifuge microscope studies of amoeba subjected to continuous 20 or 40 g for as long as 5 weeks indicate that no change occurs in growth rate or ability to trap and ingest food. The design of equipment for inflight studies is proceeding with the establishment of optimum media mixtures and cell populations for each culture chamber. A new amplifier improved the signal-to-noise ratio and the stability of the ultraviolet flying spot television microscope. M.P.G.

N65-15369*# Dartmouth Coll., Hanover, N.H.
EFFECTS OF PLANT GROWTH HORMONES ON PLANT DEVELOPMENT IN THE ABSENCE OF GRAVITATIONAL EFFECTS Third Semiannual Status Report, Sep. 1, 1963–Feb. 29, 1964
Charles J. Lyon 6 Mar. 1964 4 p
(Grant NsG-231-62)
(NASA-CR-53405) OTS: HC $1.00/MF $0.50

Techniques of extraction and radioassay were used to demonstrate the unbalanced supply of auxin to the convex and concave sides of a leafy plant whose axis exhibited growth curvature due to absence of gravity. More auxin moved into the tissues that became the convex side of the curvature. Similar experiments were performed to provide evidence for the downward transport of auxin within the stem system of a mature, branched plant. R.L.K.

N65-15372*# Oklahoma City U., Okla.
METABOLIC STUDIES ON ANIMALS IN OXYGEN AT A SIMULATED ALTITUDE OF 26,000 FEET
John Patrick Jordan, John B. Allred, Charles L. Cahill, and Robert T. Clark [1963] 23 p Presented at the Aspen Conf. on Adaptation to Unusual Atmospheres, Colo., 12–15 Jun. 1963
(Grant NsG-300-63)
(NASA-CR-60338) OTS: HC $1.00/MF $0.50

The effect of a 93% oxygen environment at an atmospheric pressure of 5.22 psi on the metabolic activity of rats was investigated. After daily 8-hour exposures to this environment for 34 days, the experimental and control animals were sacrificed. No differences in body weight, organ weight, or gross body composition were noted. The serum proteins from each group were pooled by aliquot, and quantitative analysis indicated that the experimental animals contained only one-half the amount of lipoprotein that the controls contained. Radiocarbon tracer techniques indicated that the experimental animals metabolized progressively slower than the controls as the experiment progressed. An analysis of liver lipids suggests that fatty acid synthesis is drastically reduced with a corresponding increase in total tissue lipid. It was concluded that metabolism in general is reduced by 10% or more, that no metabolic adaptation to the oxygen environment occurred, and that metabolic alterations could not be repaired during the 16 hours in a normal environment. Author

N65-15373*# Maryland U., College Park. Space Research Labs.
BEHAVIORAL RESEARCH AND EXPERIMENTAL ANALYSIS OF COMPLEX BEHAVIORAL REPERTOIRES UNDER FULL ENVIRONMENTAL CONTROL Semiannual Status Report, Aug. 1, 1963–Jan. 31, 1964
Joseph V. Brady and William Hodos [1964] 13 p refs
(Grant NsG-189-61)
(NASA-CR-53475) OTS: HC $1.00/MF $0.50

In the studies of the neurophysiological correlates of behavior, EEG data that were collected during complex performances by monkeys were processed by a computer to yield an analysis of the number and percent of zero crossings of the EEG. A stereotaxic atlas of a pigeon's brain was prepared, and a technique was devised for photographing wet, unstained brain sections in preparation for a study of the effects of brain lesions and stimulation on the performance level. In investigations of behavior under conditions of total environmental control, a study of pigeons indicated that the effects of confinement did not impair the performance of a complex behavioral sequence. Ways of assessing behavior and performance changes during space flight are also being developed with the Nimestrina monkey, cats, and pigeons. Studies with chimpanzees indicated that there are no impairments of performance during long-term isolation. R.L.K.

N65-15378*# Northrop Space Labs., Hawthorne, Calif.
INVESTIGATION OF *PEROGNATHUS* AS AN EXPERIMENTAL ORGANISM FOR RESEARCH IN SPACE BIOLOGY Progress Report, 1 Oct. 1963–31 Dec. 1964
R. G. Lindberg and J. J. Gambino [1964] 129 p refs
(Contract NASw-812)
(NASA-CR-60319; NSL-64-29-5) OTS: HC $4.00/MF $1.00

The pocket mice *Perognathus longimembris* that received lethal whole-body gamma irradiation at two different times of a day showed different responses to irradiation. Those irradiated in the morning during their period of low metabolism had an ST_{50} of 11 days. Those irradiated at night during their metabolic high period had an ST_{50} of 15 days. The morning-irradiated animals were all dead by the 18th day of postirradiation. Several night-irradiated animals were alive at

30 days of postirradiation. The relationships of radiation sensitivity to metabolic activity, mitotic activity, and cell population kinetics of critical regenerative tissues are discussed. Studies on the following subjects are also presented: (1) mechanisms of radiation resistance in mice; (2) measurement of the rate of oxygen consumption of *Perognathus longimembris* under different conditions of ambient temperature, lighting, food supply, composition of the atmosphere, and physiological conditioning; and (3) prolonged orbital flight effect on the circadian rhythms of pocket mice. R.R.D.

N65-15416# Defense Atomic Support Agency, Washington, D.C. Training Div.
RADIOLOGICAL EMERGENCY PROCEDURES FOR THE NON-SPECIALIST
Karl F. Oerlein Washington, AEC, May 1964 40 p Prepared for the Interagency Comm. on Radiological Assistance
GPO: $0.35

Described are the radiological hazards due to the increased applications of radioactive materials for peaceful as well as defense purposes. Despite strict regulations designed to insure the safe handling and shipping of such materials, there always is the possibility that someone not associated with radioactive substances may find himself at the scene of an accident involving such materials. This report provides fundamental and reliable information that the ordinary layman can use for guidance in taking immediate action in case of an accident of this type. Discussed are familiar and unfamiliar hazards, the understanding of nuclear radiation, conventional and nuclear weapons, accidents involving radioactive materials, emergency measures, and the sequence of emergency procedures. R.R.D.

N65-15445 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE INFLUENCE OF PROLONGED WEIGHTLESSNESS ON THE AUTOMATISM OF CARDIAC MUSCLE
R. M. Bayevskiy and K. I. Zhukov *In its* Cosmic Res. 13 Jan. 1965 p 199-204 refs (See N65-15432 06-30)

It is established by statistical analysis of the dynamic interval series of the RR-electrocardiogram that there are characteristic changes in the automatism function of cardiac muscle under the conditions of weightlessness. These changes are associated with an amplification of tonus of the vagus nerve, which is one of the links in the process by which the circulatory apparatus adapts to the new conditions. Thus, instability of the cardiac rhythm in orbital flight is one of the regular physiological reactions to weightlessness. Author

N65-15446 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COMBINED EFFECT OF LOW-FREQUENCY VIBRATION AND X-RAYS ON MAMMALIAN BONE-MARROW CELLS
Yu. S. Demin *In its* Cosmic Res. 13 Jan. 1965 p 205-216 refs (See N65-15432 06-30)

The frequency of abnormal mitoses in the bone marrow of mice, following vertical vibration at a frequency of 70 cycles, X-irradiation with a dose of 50 R, and the combined effects of vibration and irradiation, was made the object of study. In the animals, vibration causes an increase in the frequency of abnormal mitoses, chiefly as a result of increased incidence of chromosome adhesion. Vibration, when administered before irradiation, does not increase the frequency of abnormal mitoses as compared with the abnormality frequency when radiation is used alone. There are, however, differences in the spectrum of the abnormal mitoses—a slight decrease in the frequency of chromosomal rearrangements and an increase in the frequency of adhesions as a result of the combined disturbance. Author

N65-15537# Rocketdyne, Canoga Park, Calif.
SOURCES OF INFORMATION IN HUMAN FACTORS ENGINEERING, INCLUDING ASSOCIATED AREAS IN SYSTEM SAFETY, MAINTAINABILITY, PERSONNEL SUBSYSTEM, LIFE SCIENCES, QUALITY ASSURANCE, AND RELIABILITY ENGINEERING
George A. Peters and Frank S. Hall 1 Jan. 1965 168 p refs (RH-3398-H)

The 380 reference sources listed include bibliographies, directories, abstract services, journals and textbooks of technical information in the field of human factors engineering. There are 371 regulatory and guidance documents referred to, including various regulations, specifications, standards, manuals, instructions, and program requirements that attempt to define the character of the contractor's human factors functions. Ninety descriptive publications are a sampling of government agency reports that attempt to describe how various functions might be accomplished, review the state-of-the-art in a given area, present new methods, or list basic data which might be useful in human factors analyses. Sixty-five illustrative reports are a cross section of contractually required or data submittal reports that are representative of what was actually accomplished, how it was done, and the type of organization or approach that was utilized. R.L.K.

N65-15538# Academy of Sciences (USSR), Moscow.
ON THE BIOLOGICAL ROLE OF GRAVITY (SOME RESULTS AND PROSPECTS OF SPACE RESEARCH ON SATELLITES AND SPACESHIPS)
O. G. Gazenko and A. A. Gurjian [1964] 27 p refs Presented at the COSPAR 7th Plenary meeting and 5th Inter. Space Sci. Symp., Florence, May 1964

Reviewed are the effects of gravity on biological and physiological processes, especially those of weightlessness, as studied in space flights. The effects of prolonged exposure to accelerations upon the development of organisms are also discussed. Definite changes in organisms are observed under conditions of weightlessness and prolonged acceleration. R.E.S.

N65-15546*# Lafayette Clinic, Detroit, Mich.
DEVELOPMENT OF A SELECTION TEST FOR MOTIVATIONAL APTITUDE
A. F. Ax, P. G. S. Beckett, N. A. Fretz, and J. S. Gottlieb Washington, NASA, Jan. 1965 49 p refs
(Contract NAS2-1031)
(NASA-CR-156) OTS: HC $2.00/MF $0.50

Described is the development of a test for motivational aptitude. It is based on the hypothesis that the aptitude for acquiring the social motives ranges widely, from the lowest in the schizophrenia and the hobo types, to the highest in the most productive people. The procedure used was the acquisition of a conditioned (learned) response of the automatic nervous system, namely, the classical conditioning of the palmar sweating response (GSR). It was concluded that Physiologic Learning Aptitude (PLA), which is believed to be a measure of the ability to acquire the secondary or social motives, can be measured by this conditioning procedure. With further documentation and streamlining, this procedure should have a valuable application for the selection of highly adaptable persons who can be readily trained or conditioned for high-stress tasks, such as space flight. Author

N65-15558# Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.
EFFECTS OF POSITIVE G ON CHIMPANZEES IMMERSED IN WATER
Kenneth R. Coburn, P. H. Craig, and E. L. Beckman 17 Sep. 1964 41 p refs
(NADC-MA-6139; AD-453263)

A concept for the prevention of the deleterious effects of high accelerative forces upon animals by submersing them in water in a constant volume G capsule was proposed. A series of experiments were carried out to evaluate the accuracy of this concept by subjecting primates to accelerations of up to $+31G_z$ in such a constant volume system. The pathological and physiological findings of these experiments demonstrated that mediastinal emphysema and air embolism were produced in all animals by overpressurization of the lungs in the constant volume G capsule either during the acceleration period, or by pressurization of the lungs prior to centrifugation, or by both mechanisms. In addition, circulatory failure occurred at the higher magnitudes of acceleration. Author

N65-15577 Defence Research Board, Ottawa (Canada). Directorate of Scientific Information Services
ON THE STATE OF THE CARDIOVASCULAR SYSTEM UNDER CONDITIONS OF EXPOSURE TO CONTINUOUS NOISE
N. N. Shatalov, A. O. Saitanov, and K. V. Glotova Sep. 1964 5 p refs Transl. into ENGLISH from Higiena Tr. i Professional'-nyye Zabolevaniya (Moscow), no. 6, 1962 p 7, 10–14
(T-411-R; AD-607705)

In persons exposed to the effect of continuous industrial medium-frequency and high-frequency noise of intensity 85 to 120 dB, functional disturbances of the cardiovascular system were frequently observed. Very often, the subjects exhibited an instability of the arterial blood pressure. The electrocardiographic data showed bradycardia with a tendency to retardation of the intravesicular conductivity, plus a depression of the T-wave that was most frequently observed after physical stress and at the end of the work period. In a group of workers subjected to noise of high intensity, functional changes in the cardiovascular system were encountered more often and were more strongly expressed. The above deviations seem due to disturbance of neuroreflex regulation developing under the influence of noise. Author

N65-15580# Martin Co., Baltimore, Md.
ORBITAL SPACE STATION STUDY. VOLUME III: TEST OPERATIONS PLAN. APPENDIX I, PART B: EXPERIMENT DEFINITIONS FOR BIOASTRONAUTIC TESTS
[1964] 291 p
(Contract AF 04(695)-561)
(SSD-TDR-64-213, V. 3, App. I-B; AD-448396)

A complete summary of the various tests to be used for the bioastronautical orbital evaluation of man is presented. Each test is described and analyzed for its importance, operational factors, manning operations, data and communications requirements, logistics, support equipment requirements, and its procedure and sequence. G.G.

N65-15594*# Webb Associates, Yellow Springs, Ohio.
BIOASTRONAUTICS DATA BOOK
Paul Webb, ed. Washington, NASA, 1964 404 p refs Sponsored by NASA
(NASA-SP-3006) GPO: HC $2.25; OTS: MF $2.00

A revised summary of quantitative and qualitative human data is presented to fullfill the basic design requirements for the bioastronautical engineer. Considered are: *Toxicology, Atmosphere and Pressure, Temperature, Breathing, Acceleration, Size and Motion, Food, Human Operator, Radiation, Vestibular System, Weightlessness, Impact and Vibration, Energy, Combined Stresses, Water, Waste, Vision, Hearing,* and *Units and Conversions.* G.G.

N65-15598# California U., Los Angeles. Biotechnology Lab.
UPPER EXTREMITY PROSTHETICS RESEARCH. HUMAN TRACKING. SENSORY MOTOR CONTROL Progress Report, Jun. 15–Dec. 15, 1964
John Lyman 15 Dec. 1964 30 p ref
(Contracts N123(60530)-32857A; V1005p-9779; Grant VRA-RD-1201M-64)
(Rept.-64-58)

A performance study of the Heidelberg pneumatic prosthesis indicated that, while useful, it involved less accurate, slower performance with more errors than a conventional prosthesis, and required more maintenance. A custom-made pneumatic arm is being evaluated. Functional muscle isolation and breathing control investigations were carried out to facilitate abdominal and pectoralis control of arm prostheses. An externally powered electronic hand, applying automatic control theory, is being developed and evaluated; it relieves the amputee of some of the decisions necessary for voluntary guidance of control motions. For the tracking simulator, a method of generating trajectories was devised which allows position, velocity, and acceleration in azimuth and elevation each to be electrically programed. A program for reducing the analog tapes produced by the Sampled Error Scoring System was completed. A two-part experiment related to problems of initial target acquisition and reacquisition was designed to determine the capabilities and limitations of human predictive processes in tracking, and to assess the utility of various modes of target acquisition. R.L.K.

N65-15615*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TRAINING FOR A FLOATING-POINT DISPLAY OF NUMBERS
Robert J. Randle, Jr. and Clayton R. Coler Washington, NASA, Feb. 1964 18 p refs
(NASA-TN-D-2634) OTS: HC $1.00/MF $0.50

An automatic typewriter was programed for use in evaluating the response of subjects to floating- and fixed-point numbers. The task of receiving and returning numbers to a digital computer was simulated, i.e., the subjects typed a fixed-point number on the machine or converted it to a floating-point number before typing it. Output was the reverse operation, i.e., the floating-point form was converted to fixed-point, and fixed-point remained in fixed-point form. The results indicated that, under the conditions of the experiment, the high initial error rates in converting numbers decreased with training and became comparable to those made in simply repeating the fixed-point numbers. It was concluded that intensive training of inexperienced subjects on this task element is advantageous. The design of displays for digital computers which read out in floating-point form may not seriously affect performance if the subject is trained specifically for the task. The computer itself may be programed to provide the initial practice and subsequent refresher exercises. Author

N65-15627# Argonne Cancer Research Hospital, Chicago, Ill.

SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION

Leon O. Jacobson and Margot Doyle ed. Sep. 1964 170 p refs

(Contract AT(11-1)-69)

(ACRH-22) OTS: $5.00

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3. *IN VITRO* STUDIES ON THE EFFECT OF ERYTHROPOIETIN ON GLUCOSE AMINE-1-C^{14} INCORPORATION INTO RAT BONE MARROW CELLS P. P. Dukes, F. Takaku, and E. Goldwasser p 29-38 refs

4. *IN VITRO* STUDIES OF CELL TYPES RESPONSIVE TO ERYTHROPOIETIN F. Takaku, P. P. Dukes, and E. Goldwasser p 39-44 refs

5. HEMOGLOBIN SYNTHESIS IN MARROW CELL CULTURE: THE EFFECT OF RAT PLASMA ON RAT CELLS O. Gallien-Lartigue and E. Goldwasser p 45-47 refs

6. THE ERYTHROPOIETIC EFFECT OF TESTOSTERONE IN THE POLYCYTHEMIC MOUSE W. Fried, R. De Gowin, and C. W. Gurney p 48-52 refs

7. H^3-THYMIDINE UPTAKE BY A RING X-CHROMOSOME IN A HUMAN FEMALE J. Rowley, S. Muldal, J. Lindsten, and C. W. Gilbert p 53-61 refs

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10. BIOLOGIC PROPERTIES OF POLYNUCLEOTIDES. II: THE ANTICOAGULANT PROPERTIES OF POLYNUCLEOTIDES S. Yachnin p 82-97 refs

11. BIOLOGIC PROPERTIES OF POLYNUCLEOTIDES. III: THE ANTICOMPLEMENTARY PROPERTIES OF POLYRIBOGUANYLIC ACID S. Yachnin p 98-100 refs

12. BIOLOGIC PROPERTIES OF POLYNUCLEOTIDES. IV: STUDIES ON THE MECHANISM OF COMPLEMENT INHIBITION BY POLYINOSINIC ACID TOGETHER WITH OBSERVATIONS ON THE *IN VIVO* EFFECT OF POLYINOSINIC ACID ON COMPLEMENT ACTIVITY S. Yachnin and D. Rosenblum p 101-113 refs

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N65-15634# Atomic Energy of Canada Ltd., Chalk River, Ontario

PHYSIOLOGICAL PROBLEMS OF PLASTIC PROTECTIVE CLOTHING

J. R. Brown (Toronto U.) Nov. 1964 30 p refs

(AECL-2123) Available from Atomic Energy of Canada, Chalk River $1.00

A study was carried out on the physiological stresses imposed by the wearing of impermeable clothing and the effect of ventilating such clothing. Under conditions of a hot thermal environment, the heat stress to the wearer imposed by impermeable clothing was greatly reduced by ventilation. The value of the "vortex tube cooler" was examined, and it proved to be satisfactory in the four tests carried out. Author

N65-15664# Chicago U., Ill. Committee on Mathematical Biology

AN INTRODUCTION TO THE THEORY OF ADAPTIVE PATTERN RECOGNITION

Hugo M. Martinez 1 Oct. 1964 66 p refs

(Contract AT(11-1)-614; Grant AF-AFOSR-370-63)

(AD-608157)

An introduction to the theory of adaptive pattern recognition is presented, having a scope intended to serve as a bridge between the general type of survey and the specialized works. Little or no experience of the field is assumed. There are three sections. The first is devoted to the concepts of adaptive system, pattern and pattern recognition, with due attention to establishing a relevant framework and terminology. The next section discusses in detail some of the analytical problems inherent to the generic pattern recognition devices known as adalines, perceptrons, matched filters, and stochastic classifiers. The final section gives a brief resume of the notion of separability and of the establishment of certain conditions for its attainment by means of linear and quadratic discriminant functions. Author

N65-15666# Joint Publications Research Service, Washington, D.C.

RESEARCH ON BIOCHEMISTRY AND IMMUNOLOGY

29 Dec. 1964 93 p refs Transl. into ENGLISH from Usp. Sovrem. Biol. (Moscow), v. 58, no. 2, Sep.-Oct. 1964 p 177-200, 242-252, 262-271, 307-320

(JPRS-28016; TT-65-30005) OTS: $3.00

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1. CHEMICAL AND MACROMOLECULAR STRUCTURE AND BIOLOGICAL FUNCTIONS OF "SOLUBLE" RIBONUCLEIC ACIDS L. L. Kiselev p 1-33 refs

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4. THE FIRST ALL-UNION BIOCHEMICAL CONGRESS AND THE PROBLEMS IN PRESENT-DAY BIOCHEMISTRY R. A. Zarembskiy and I. I. Ivanov p 64-90

N65-15667 Joint Publications Research Service, Washington, D.C.

CURRENT TRENDS IN RADIATION IMMUNOLOGY

R. V. Petrov *In its* Res. on Biochem. and Immunol. 29 Dec. 1964 p 50-63 refs (See N65-15666 06-04) OTS: $3.00

Trends in Russian immunological research are noted, especially in regard to radiation immunology. Techniques of various research groups are discussed, including the use of cell cultures in vivo, the study of radiation chimeras (action of the graft against the host), the study of ways to influence the fate of the cellular graft, and the use of radiobiology to clarify the principles of immunology. D.E.W.

N65-15676# Joint Publications Research Service, Washington, D.C.
RADIATION EFFECTS ON PLANTS AND GRAVITY EFFECTS ON THE ANIMAL ORGANISM
22 Jan. 1965 52 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 6, Nov.-Dec. 1964 p 827-860, 913-915
(JPRS-28405; TT-65-30180) OTS: $3.00

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1. CYTOPHYSIOLOGICAL AND BIOCHEMICAL INVESTIGATIONS OF MICROORGANISMS DURING THEIR RESTORATION FOLLOWING RADIATION INJURY M. N. Meysel et al p 1-32 refs (See N65-15677 06-04)
2. METHODS OF QUANTITATIVE ANALYSIS OF CHANGES ARISING AFTER EXPOSURE TO IONIZING RADIATION G. N. Shangin-Berezovskiy p 33-43 refs (See N65-15678 06-04)
3. EFFECTS OF GRAVITATION IN THE FORMATION OF FUNCTIONS OF THE ORGANISM P. K. Isakov, Ye. M. Yuganov, and I. I. Kas'yan p 44-49 refs (See N65-15679 06-04)

N65-15677 Joint Publications Research Service, Washington, D.C.
CYTOPHYSIOLOGICAL AND BIOCHEMICAL INVESTIGATIONS OF MICROORGANISMS DURING THEIR RESTORATION FOLLOWING RADIATION INJURY
M. N. Meysel, et al *In its* Radiation Effects on Plants and Gravity Effects on the Animal Organism 22 Jan. 1965 p 1-32 refs (See N65-15676 06-04) OTS: $3.00

An extensive and detailed review is given of previous work on the effects of ionizing radiation on living organisms, and the techniques of counteracting these effects. Cultures of different yeast organisms, representatives of the genera *Saccharomyces, Saccharomycodes, Schizosaccharomyces, Endomyces, Candida,* and *Torulopsis,* were grown on malt-agar. Two-day-old cultures were used to prepare yeast suspensions in sterile tap water, which were then irradiated with X-rays. Irradiated and control yeast suspensions were diluted with sterile tap water, transferred to vials, and incubated at 28° to 30° C in a thermostat for several days. Daily inoculations were made from these suspensions, incubated in water, onto Petri dishes of malt-agar medium, for a count of cells capable of unlimited reproduction. Cytological, physiological, and biochemical investigations are described. It was concluded that irradiation-initiated processes of injury and of restoration are intimately related to cellular metabolism. D.E.W.

N65-15678 Joint Publications Research Service, Washington, D.C.
METHODS OF QUANTITATIVE ANALYSIS OF CHANGES ARISING AFTER EXPOSURE TO IONIZING RADIATION
G. N. Shangin-Berezovskiy *In its* Radiation Effects on Plants and Gravity Effects on the Animal Organism 22 Jan. 1965 p 33-43 refs (See N65-15676 06-04) OTS: $3.00

It was concluded that estimation of the rate of the mutation process, either from the percentage of altered plants or from the percentage of families involved in variability, can be replaced by a general evaluation of the variability level that encompasses both the emergence of mutations and their manifestation in the population. A formula is suggested for the calculation of variability that involves the percentage of altered plants, the number of families containing mutants, and the number of types of variability of a certain character observed in the experiment. D.E.W.

N65-15679 Joint Publications Research Service, Washington, D.C.
EFFECTS OF GRAVITATION IN THE FORMATION OF FUNCTIONS OF THE ORGANISM
P. K. Isakov, Ye. M. Yuganov, and I. I. Kas'yan *In its* Radiation Effects on Plants and Gravity Effects on the Animal Organism 22 Jan. 1965 p 44-49 refs (See N65-15676 06-04) OTS: $3.00

Previously published experimental data are reviewed and analyzed. It is concluded that the physiological equivalence of changes in body weight and altered gravitation (from the terrestrial value) was substantiated. One of the first responses of the organism to weight change is the readjustment of muscle tone in order to retain the original position of the body parts. This response was confirmed by studies on the bioelectrical activity of muscles, gas exchange, and venous pressure. D.E.W.

N65-15709# Winzen Research, Inc., Minneapolis, Minn.
REPORT ON LOW LEVEL BALLOON PILOT TRAINING AND QUALIFICATION FLIGHTS
J. R. Nelson 14 Feb. 1964 49 p
(Contract N123(61756)32762A(PMR))
(Rept.-1282-R; AD-430755)

A series of low-level balloon pilot training flights were conducted. Balloons, associated flight equipment, and flight operation services were supplied. The objective of the program was to qualify and obtain FAA licenses for Navy personnel as free balloon pilots. Three flights were conducted using the Skycar II, and one operation using one-man jump balloon harness and seat. The qualification and licensing of three pilots were completed. Author

N65-15710# Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.
THE NATURE OF RADIATION FROM NUCLEAR WEAPONS IN RELATION TO FLASHBLINDNESS
J. H. Hill and Gloria T. Chisum 17 Aug. 1964 20 p refs (NADC-ML-6412; AD-453622)

The minimum information about a weapon flash necessary for research and development purposes in regard to the problem of flashblindness is luminance, duration, and visual angle subtended by the source, whether it is a fireball or a surface illuminated by the fireball. The estimation of these parameters is discussed. Author

N65-15719# Joint Publications Research Service, Washington, D.C.
ARTICLES FROM THE 1964 USSR MEDICAL ENCYCLOPEDIA
27 Oct. 1964 205 p refs Transl. into ENGLISH from Bol'shaya Med. Entsiklopediya (Moscow), v. 35, 1964 Columns 162-175, 261-275, 277-301
(JPRS-27112; TT-64-51368) OTS: $6.00

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14. EPIDEMIC DISEASES p 109-110 refs
15. EPIZOOTIC DISEASES p 111-116 refs
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N65-15720 Joint Publications Research Service, Washington, D.C.
ELECTROMYOGRAPHY
In its Articles from the 1964 USSR Med. Encyclopedia 27 Oct. 1964 p 1-13 refs (See N65-15719 06-04) OTS: $6.00

The electromyograph used to record the electrical responses of skeletal muscles consists of an amplifier and recording element. The ac-operated amplifier has a wide range, low noise, and, with the use of needle electrodes, a high input resistance. The chief methods of recording include the use of skin and needle electrodes. The recording is made on paper or film by means of a cathode or loop oscillograph. Electromyography is particularly valuable for patients with slight motor disturbances because it detects the disturbance in the electrical muscle activity before the clinical signs of pathology appear. An accumulation of factual data permits the recognition of the basic types of normal and pathological electric muscle activity. The use of electromyography is an aid in diagnosing, in determining the localization and severity of injury to the nervous system and muscles, and in furnishing objective documentation of the course of pathological and rehabilitational processes. G.G.

N65-15721 Joint Publications Research Service, Washington, D.C.
ELECTRONARCOSIS
In its Articles from the 1964 USSR Med. Encyclopedia 27 Oct. 1964 p 14-15 refs (See N65-15719 06-04) OTS: $6.00

Electronarcosis is a state of general immobility and absence of defense reactions to pain stimuli and is induced in animals and man by the action of electric currents on the central nervous system. The extensiveness of the symptoms depends on the strength of the applied electric current. Electronarcosis is produced by the action of an intermittent galvanic pulse current or an alternating sinusoidal current with bitemporal, fronto-occipital or fronto-sacral positioning of the electrodes. The applied power has to exceed the production threshold of electronarcosis but must not be so high as to produce electroconvulsive seizures. The mechanism of electronarcosis is associated with the parabiotic inhibition of the cerebral cortex, mainly in the motor sensory zone. G.G.

N65-15722 Joint Publications Research Service, Washington, D.C.
ELECTROPHORESIS
In its Articles from the 1964 USSR Med. Encyclopedia 27 Oct. 1964 p 16-36 refs (See N65-15719 06-04) OTS: $6.00

Electrophoresis is an electrokinetic phenomenon of displacement in an electric field of particles or coarse suspensions, or of colloid particles and micromolecules suspended in liquid. The displacement of one phase in relation to the other under the influence of an external electrical field is only possible when both phases are oppositely charged. The electrostatic interaction in the liquid phase around the charged particles leads to a diffuse accumulation of ions of the opposite charge, and a double electric layer arises. The differences in electrophoretic mobility lead to the utilization of zone electrophoresis in porous media that are saturated with a buffer solution. This method is used in electrophoresis of blocks, on columns, in flow-through devices and on paper strips. Short summaries are given on electrophoresis in physiotherapy; electrodermal tests; electrophoretic local anesthesia; and electrophoretic examinations. G.G.

N65-15723 Joint Publications Research Service, Washington, D.C.
ELECTROENCEPHALOGRAPH
In its Articles from the 1964 USSR Med. Encyclopedia 27 Oct. 1964 p 37-41 refs (See N65-15719 06-04) OTS: $6.00

The electroencephalograph records the electric activity of the brain through the external or imbedded application of electrodes to different regions of the brain. It consists of an input device with a commutator; preamplifiers; output amplifiers; recording devices; a power pack; and a calibrator. The frequency characteristics of the various electrical brain impulses are transferred by an ink tracer onto a readout tape. The characteristics of each component are described. G.G.

N65-15724 Joint Publications Research Service, Washington, D.C.
ELECTROENCEPHALOGRAPHY
In its Articles from the 1964 USSR Med. Encyclopedia 27 Oct. 1964 p 42-65 refs (See N65-15719 06-04) OTS: $6.00

Electroencephalography is used to record the electrical potentials that appear in the nerve cells of the brain during their activity. This study discusses the following: history, a survey of electroencephalographic methods, general EEG characteristics, the mechanisms of production of electric activity in the brain, higher nervous activities, electroencephalography in cases of exposure to radiation and in the clinical practice of neurology and psychiatry, and electroencephalography in children. G.G.

N65-15725 Joint Publications Research Service, Washington, D.C.
ELECTROENCEPHALOSCOPE
In its Articles from the 1964 USSR Med. Encyclopedia 27 Oct. 1964 p 66-69 refs (See N65-15719 06-04) OTS: $6.00

The electroencephaloscope permits the simultaneous examination of electric activity in many points of the central nervous system. The spatial distribution of the electrical activity of the brain is transmitted onto the screen of an electron beam tube by modulation of the brightness of the ray, and the quantitative values of all recorded activities are shown concurrently in the form of columns. Tracings of the electrical activities are usually made from 16 to 25 leads and are fed through an amplifier to an oscillograph cathode. The combination of electroencephaloscopy with electronic computer techniques leads to new electrophysiological observations of the normal and pathological conditions in the nervous system of man. G.G.

N65-15728# Human Factors Research, Inc., Los Angeles, Calif.

A STUDY TO DETERMINE THE EFFECTS OF PLACEBOS UPON PERFORMANCE IN A VIGILANCE TASK

J. O'Hanlon, Jr., E. A. Schmidt, and C. H. Baker Jan. 1964 23 p refs

(Contract Nonr-4120(00))

(TR-750-3; AD-428565)

An experiment was undertaken to determine the effects of ingested placebos upon signal detection performance in a vigilance task. The observers were given to understand that the placebos (pills) had certain specific, though alleged, effects upon human alertness. One placebo, colored white, was alleged to contain chemicals which affected performance in an unknown manner. Another placebo, colored orange, was alleged to make people more alert. A third placebo, yellow, was alleged to make people less alert. Eighty observers undertook a conventional vigilance task, 20 assigned to each condition of white pill, orange pill, and yellow pill; and 20 performed the task without a pill. There were no differences in detection performance among the four conditions. It was concluded that in a conventional vigilance task, the ingestion of placebos which observers believe to be drugs having definite positive, negative, or unknown effects upon signal detection performance does not affect performance. Author

N65-15738# George Washington U., Washington, D.C. Human Resources Research Office.

ARMY AVIATION HUMAN RESEARCH UNIT QUARTERLY PROGRESS REPORT, APRIL–JUNE 1964

30 Jun. 1964 18 p refs

(Contract DA-44-188-ARO-2)

Work is reported on the improvement of aerial gunnery training in the armed helicopter, the improvement of navigation training for low-level flight, synthetic flight training programs and devices, the design of rotary wing training devices considering aircraft characteristics and task difficulty, the improvement of methods of training aerial surveillance personnel, and integrated contact-instrument training. D.E.W.

N65-15779# Michigan U., Ann Arbor. Mental Health Research Inst.

STUDIES IN BEHAVIORAL ASPECTS OF GRAMMAR AND SEMANTICS Final Report

John L. Mc Namara Griffiss AFB, N.Y., RADC, Oct. 1964 206 p refs

(Contract AF 30(602)-3042)

(RADC-TDR-64-146; AD-609807)

Investigations were made of natural and simulated language behavior. The first investigation concerned the question of how syntactic language behavior is related, if at all, to modern theories of grammar. In order to develop a mechanical syntactic analyzer to replace an ordinary literate reader of a text, it is necessary to understand how the latter comprehends a text. In other words, a syntactic analyzer should be modeled on principles similar to those used by a human reader. The second investigation covered a number of approaches to the study of a "semantic space." These experiments are essentially word association experiments, in which the controls are stricter than free association experiments, but not as strict as in Osgood's semantic differential techniques. Author

N65-15788# North American Aviation, Inc., Los Angeles, Calif.

MOMENTS OF INERTIA AND CENTERS OF GRAVITY OF THE LIVING HUMAN BODY ENCUMBERED BY A FULL-PRESSURE SUIT Final Report, Jul.–Dec. 1963

J. Du Bois, W. R. Santschi, D. M. Walton, C. O. Scott, and F. W. Mazy Wright-Patterson AFB, Ohio, AMRL, Nov. 1964 63 p refs

(Contract AF 33(657)-11619)

(NA-64-527; AMRL-TR-64-110; AD-609863)

The center of gravity and the moments of inertia of each of 19 male subjects, representative in stature and weight of the U.S. Air Force population, were determined. Two body positions—sitting and relaxed; and three modes of dress—nude, suited-unpressurized, and suited-pressurized—were investigated. The theoretical accuracy of the experimental procedures, based on a compound pendulum, ranged from 2% to 8%, depending on body position and axis. The moments of inertia were found to vary significantly between body positions and between nude and suited conditions. Correlation coefficients between the moments of inertia and stature and weight exceeded 0.9. Fifty anthropometric dimensions and frontal and profile photographs were obtained on each subject to serve as the basis for additional biodynamic analyses. Author

N65-15790*# Federation of American Societies for Experimental Biology, Washington, D.C.

BIOLOGY DATA BOOK

Philip L. Altman and Dorothy S. Dittmer ed. Wright-Patterson AFB, Ohio, AMRL, Oct. 1964 653 p Supersedes WADC-TR-56-273, AD-110501

(Contract AF 33(657)-10802; Grants NIH GM-06533; AD-GN-255)

(AMRL-TR-64-100; WADC-TR-56-273; AD-110501; AD-454590)

This publication was compiled to present numerical data of biology and medicine in a convenient and accessible form for reference, and to standardize accepted constants as a basis for correlation, to establish common standards for statistical studies, and to provide normal values for research. The biology data are organized in the form of tables, diagrams, charts, and graphs, arranged under the following headings: *Genetics and Cytology, Reproduction, Development and Growth, Morphology, Nutrition and Digestion, Metabolism, Respiration and Circulation, Blood, Biological Regulators and Toxins, Biophysical and Biochemical Characteristics, Environment and Survival, Parasitism,* and *Materials and Methods.* Seven appendixes provide information concerning estimated number of species, taxonomic classification for living plants and animals, geologic distribution, atomic weights, as well as logarithms and antilogarithms. A detailed index completes the book. Author

N65-15801*# Maryland U., College Park.

A STUDY OF PHYCOPHYSIOLOGY IN CONTROLLED ENVIRONMENTS Ninth Semiannual Status Report, 1 Apr.–30 Sep. 1964

Robert W. Krauss 1 Oct. 1964 206 p refs *Its* Tech. Rept.-1009

(Grant NsG-70-60)

(NASA-CR-60396) OTS: HC $6.00/MF $1.25

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4. A PHYSIOLOGICAL EXAMINATION AND TAXONOMIC REVISION OF SPECIES OF CHLORELLA ISOLATED FROM MARINE HABITATS R. E. Gross 98 p refs (See N65-15805 06-04)

N65-15802 Maryland U., College Park. Agricultural Experiment Station
PHOTOSYNTHESIS IN CELL DEVELOPMENT
Constantine Sorokin *In its* A Study of Phycophysiol. in Controlled Environments 1 Oct. 1964 26 p refs (See N65-15801 06-04) OTS: HC $6.00/MF $1.25

Nonsynchronized suspensions of the green, high-temperature alga Chlorella 7-11-05 were subjected to fractional centrifugation, and two size groups of cells were separated. The small-cell fraction was presumed to consist largely of younger cells and the large-cell fraction predominantly of older cells. Manometric measurements in phosphate buffer at pH 4.5, in bicarbonate buffer at neutral pH, and in carbonate-bicarbonate buffer at pH 9.3 indicated that younger cells invariably possessed higher photosynthetic activity than older cells, provided the separation of cells into size fractions was reasonably good and the large cells were prevented from dividing during the process of separation. The superior activity of younger cells was ascertained at various light intensities and at different temperatures. Author

N65-15803 Maryland U., College Park.
VAN SLYKE'S BUFFER VALUES FOR CELL SECRETIONS
Constantine Sorokin *In its* A Study of Phycophysiol. in Controlled Environments 1 Oct. 1964 17 p refs (See N65-15801 06-04) OTS: HC $6.00/MF $1.25

Van Slyke's buffer indexes (β) were determined for secretions of synchronized cells of the green, high-temperature alga, Chlorella 7-11-05. The change in pH and the value of the buffer index were found to depend on initial pH, duration of observation, and population density. The major component of the secreted buffer system was identified as bicarbonate, and the major cation, as potassium. Author

N65-15804 Maryland U., College Park.
COMPARATIVE STUDIES OF STEROLS IN *CHLORELLA*
Glen W. Patterson (Ph.D. Thesis) *In its* A study of Phycophysiol. in Controlled Environments 1 Oct. 1964 53 p refs (See N65-15801 06-04) OTS: HC $6.00/MF $1.25

The characteristics of the sterols naturally occurring in six species of *Chlorella* were examined. The algae were grown heterotrophically on glucose. Sterols were extracted and isolated from the lipid fraction, and were characterized by means of chemical and physical tests. *Chlorella vannielii, C. nocturna,* and *C. sorokiniana* were found to contain ergosterol as their principal sterol and 25% as much of another sterol identified as 22-dihydroergosterol. *Chlorella ellipsoidea* and *C. saccharophila* contained a sterol mixture similar to that of higher plants; and poriferasterol was the principal sterol. Gas chromatographic data indicated that the sterols of *C. protothecoides* differed from the others, but their characterization was not achieved. In an attempt to determine the role of these sterols, cells of *C. sorokiniana* were grown autotrophically in the presence of triparanol concentrations that were strongly inhibitory to growth. D.S.G.

N65-15805* Maryland U., College Park.
A PHYSIOLOGICAL EXAMINATION AND TAXONOMIC REVISION OF SPECIES OF *CHLORELLA* ISOLATED FROM MARINE HABITATS
Rudolph E. Gross (M.S. Thesis) *In its* A Study of Phycophysiol. in Controlled Environments 1 Oct. 1964 98 p refs (See N65-15801 06-04) OTS: HC $6.00/MF $1.25

One hundred samples of sea water and brackish water were collected from widely separated areas of the Atlantic and Pacific coasts and examined for species of the genus *Chlorella*. Twenty-nine unialgal isolates were freed from contaminants by standard bacteriological techniques. Included in this study were four previously isolated salt water species from Europe. A series of physiological tests were applied to determine relationships between the different isolates. The tests included growth on selected sugars in the light and darkness, determination of the ability to use NO_3, NH_3 or casein hydrolysate as nitrogen sources, the toxicity or suitability of acetate as a carbon source, and the identification of vitamin requirements. The effects of enriched natural sea water on growth rates were studied employing a group of fresh water species for comparison. Author

N65-15860# Hanford Atomic Products Operation, Richland, Wash. Biology Lab.
PROGRESS IN BIOLOGICAL RESEARCH: A SUMMARY OF HANFORD LABORATORIES ACHIEVEMENTS IN THESE PROGRAMS UNDER GENERAL ELECTRIC, 1956–1964
H. A. Kornberg Nov. 1964 44 p
(Contract AT(45-1)-1350)
(HW-83613) OTS: $2.00

The following subjects were studied: *Metabolism and Toxicity Studies in Small and Large Animals, Metabolism and Toxicity of Inhaled Radionuclides, Molecular and Cellular Level Studies, Studies with Aquatic Organisms, Ecological Studies, Analytical and Pathological Services,* and *Educational and Training Activities.* G.G.

N65-15865# Atomic Energy Commission, New York, N.Y. Environmental Studies Div.
FALLOUT PROGRAM Quarterly Summary Report, Sep. 1–Dec. 1, 1964
Edward P. Hardy, Jr. and Joseph Rivera 1 Jan. 1965 316 p refs (HASL-155) OTS: $4.00

This report presents current data from the HASL Fallout Program, the New Zealand Department of Scientific and Industrial Research, the National Radiation Laboratory in New Zealand, Argonne National Laboratory, and Service de Protection, C.C.R. EURATOM, Ispra, Italy. Radionuclide levels in fallout, milk, tap water, and upper air samples are given in tabular form. Also included are interpretive reports and notes dealing with estimated 1964 Sr-90 deposition in New York City, effect of precipitation on Sr-90 deposition, use of limited number of soil sites for estimating worldwide deposition, measurements of Na-22 in fallout, herbage, and milk, effect of wheat stripping on radionuclide levels in flour and Pu-238 measurements in air at high altitude. A bibliography of recent literature pertinent to fallout studies is given. Author

N65-15867# Joint Publications Research Service, Washington, D.C.
SOME RESULTS AND PROBLEMS OF OBSERVATION UNDER SPACE FLIGHT CONDITIONS

M. M. Kasenkov and A. P. Kuz'minov 5 Feb. 1965 6 p Transl. into ENGLISH of the monograph "O Nekotorykh Rezul'tatakh i Problemakh Nablyudeniya v Usloviyakh Kosmicheskogo Poleta" Moscow, 1964 p 3-6
(JPRS-28646; TT-65-30282) OTS: $1.00

Soviet specialists in engineering psychology and medical ophthalmology used the launchings of the spaceships Vostok and Voskhod to investigate the condition of the visual analyzer in space flight under various unfavorable circumstances. The spectral sensitivity of the eye under conditions of weightlessness was close to the values measured on earth. Up to accelerations of about 2 g's, the drop in the sharpness of vision was insignificant. At greater accelerations, there was a deterioration in vision sharpness and a reduction of the angle of the visual field. Sharpness of vision was rapidly restored in orbit. Visual observation from space of different earth formations was possible for objects having an angular size on the order of 20 to 15 feet. To study the vestibular organ and central nervous system, a written electro-oculargram was made of the motor activity of the eye. Optimum lighting conditions in the ship's cabin were also considered. R.L.K.

N65-15872# Joint Publications Research Service, Washington, D.C.
STUDIES IN THE BIOCHEMISTRY AND CHEMOTHERAPY OF NERVOUS AND PSYCHIC DISEASES
28 Jan. 1965 200 p refs Transl. into ENGLISH from Zh. Vses. Khim. Obshch. (Moscow), v. 9, no. 4, 1964 p 374-380, 395-443, 448-455
(JPRS-28527; TT-65-30226) OTS: $6.00

CONTENTS:

1. CERTAIN ASPECTS OF THE BIOCHEMISTRY OF CATECHOLAMINES IN THE PHYSIOLOGY AND PATHOLOGY OF THE NERVOUS SYSTEM A. M. Utevskiy and A. M. Baru p 1-19 refs

2. CONTEMPORARY PRESENTATIONS ABOUT THE BIOCHEMISTRY OF PHYSIOLOGICALLY IMPORTANT DERIVATIVES OF INDOLE N. N. Suvorov p 20-46 refs

3. ABOUT THE NATURE, THE MECHANISM OF ACTION, AND THE SPECIFIC INHIBITION OF MITOCHONDRIAL MONOAMINOOXIDASES V. Z. Gorkin p 47-66 refs

4. THE PRESENT-DAY CONCEPTS CONCERNING EXCHANGE OF GAMMA-AMINOBUTYRIC ACID IN THE CEREBRAL TISSUE AND THE PHYSIOLOGICAL AND PHARMACOLOGICAL ACTION OF THIS ACID G. Kh. Bunyatyan p 67-80 refs

5. THE CHEMICAL MECHANISM OF THE PHYSIOLOGICAL ACTIVITY OF ACETYLCHOLINE AS A BASIS FOR THE INVESTIGATION OF NEW MEDICINAL SUBSTANCES M. Ya. Mikhel'son and N. V. Khromov-Borisov p 81-116 refs

6. BIOCHEMICAL PHARMACOLOGY AND THE ROLE OF HYDRAZINE DERIVATIVES IN THERAPY OF PSYCHIC DISEASES M. D. Mashkovskiy p 117-128 refs

7. BIOCHEMICAL PHARMACOLOGY AND USE OF NONHYDRAZINE ANTIDEPRESSANTS FOR TREATMENT OF DISEASES OF THE NERVOUS SYSTEM I. P. Lapin p 129-159 refs

8. PSYCHOMIMETIC SUBSTANCES N. N. Yarovenko p 160-178 refs

9. THE SIGNIFICANCE OF PHARMACOLOGICAL PREPARATIONS USED IN THE PSYCHIATRIC CLINIC AND INFLUENCING THE INTERCHANGE OF BIOGENOUS AMINES p 179-199 refs

N65-15959# American Inst. for Research, Palo Alto, Calif.
LEARNING VIA PROGRAMED READING AND CUE VERSUS RESPONSE IN PROGRAMED READING Technical Report Nos. 5, 6
Wayne Hershberger Jul. 1963 61 p refs
(Contract Nonr-3077(00))
(AIR-C28-7/63-TR; AD-415936)

It was found that discursively written texts that were programed to include heterogeneous typography highlighting essential core content, and self-evaluational response items quizzing the reader on the core content, were considerably more effective in teaching the essential material than discursively and tersely written texts incorporating neither program characteristic. A follow-up study was designed to assess the relative effectiveness of typographical cueing versus self-evaluational responding on the learning and retention of essential lesson content in both discursively and tersely written texts. Results indicated that under no conditions did typographical cueing increase either the efficiency or effectiveness of the texts. On the other hand, irrespective of lesson topic, writing style, typography, or reading ability, self-evaluational responding facilitated both the learning and retention of the content over which the reader was quizzed. R.L.K.

N65-15963# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTIVITY OF CYTOCHROMEOXIDASE IN BODILY ORGANS OF RATS ADAPTED TO HIGHER AND LOWER TEMPERATURES
L. Janskiy 1 Dec. 1964 4 p ref Transl. into ENGLISH from Cesk. Fysiol. (Prague), v. 11, 1962 p 447-448
(FTD-TT-64-444/1+2; AD-454385)

Experiments conducted revealed that adaptation to cold not only influenced the relative cytochromeoxidase activity, but also increased the weight of livers, hearts, lungs, and kidneys, while the weight of skin and muscles dropped. The influence of high temperatures in general activity compared with that of cold; however, the organs in vivo showed values about 100% higher. The conclusion reached is that adaptation to much higher temperatures led to the development of a mechanism making total utilization of the metabolic capacity of the tissue impossible. R.E.S.

N65-16009# Indiana U., Bloomington.
LINGUISTIC TRANSFORMATIONAL ANALYSIS Final Report, 1 Jan.-31 Dec. 1963
J. P. Thorne and J. Lyons Griffiss AFB, N.Y., RADC, Oct. 1964 125 p
(Contract AF 30(602)-2951)
(RADC-TDR-64-200; AD-608747)

The feasibility and utility of a kernelization procedure for purposes of information retrieval are presented. The leading section discusses the problems involved in the kernelization of complex English sentences. Appendix I contains a detailed report of the kernelization procedure. Appendix II reports on a series of experiments to determine to what extent information was preserved in kernelized versions of sentences. Appendix III reports on a frequency count of the transformations exhibited by a stretch of running text. Appendix IV contains a list of transformational rules that have actually been written, with reference to significant published (and some unpublished) material. Author

N65-16027*# Naval School of Aviation Medicine, Pensacola, Fla.
VESTIBULAR PROBLEMS IN RELATION TO SPACE TRAVEL
Ashton Graybiel [1964] 26 p refs Presented at the Intern. Vestibular Symp., Philadelphia, 10–12 Sep. 1964
(NASA Order R-93)
(NASA-CR-60419) OTS: HC $2.00/MF $0.50

Current knowledge concerning the effects of high G loading, weightlessness, and artificial gravity on the semicircular canals and otolithic organs is reviewed. Additional studies needed in these areas are pointed out. Investigations are described in which subjects were exposed briefly in a rotating environment (slow rotation room) to estimate their susceptibility to illusions and canal sickness, and, for a more prolonged period of exposure, to study summation and adaption effects. In the first category, normal persons experienced definite symptoms of canal sickness at some velocity between 5 and 20 rpm. Subjects with varying degrees of loss of function of the sensory organs of the inner ear did not experience such symptoms. Animal experiments indicated that unilateral destruction of the labyrinth abolishes canal sickness only temporarily, but that occluding two ducts bilaterally abolishes all sickness permanently. Under longer exposure, the higher the rpm, the more severe were the symptoms and the slower was the adaptation. R.L.K.

N65-16028*# Allied Research Associates, Inc., Concord, Mass.
REVIEW OF BIOLOGICAL MECHANISMS FOR APPLICATION TO INSTRUMENT DESIGN Third Quarterly Report
Janet Healer 9 Dec. 1964 4 p
(Contract NASw-535)
(NASA-CR-60434; ARA-211-3) OTS: HC $1.00/MF $0.50

The clarification of the mechanisms responsible for the electric field sensitivity of biological organisms could have application to a number of detection systems, such as the underwater detection devices which could detect missile-carrying nuclear submarines. It was found that electric currents are directed to certain areas of plant surfaces. Some animal organisms were found to migrate toward certain electrically charged areas. Chemoreceptor responses in insects and other arthropods were studied, and it was found that the role of olfactory responses involving odor memory and spontaneous responses to odor would be valuable in a sophisticated navigational system. Photoreceptors in the plant and animal kingdoms play a significant role in the orientation of growth or locomotion. Many aquatic animals showed some activity response to the increase or decrease of light at extremely low intensities. A comparative investigation of vertebrate otoliths was reviewed. R.E.S.

N65-16106# Otis Elevator Co., Brooklyn, N. Y. Defense and Industrial Div.
ADAPTIVE TRAINING AND NONVERBAL BEHAVIOR
Edwin M. Hudson Jul. 1964 136 p refs
(Contract N61339-1395)
(NAVTRADEVCEN-1395-1; AD-610572)

Seventy-three male subjects were trained for at least 10 hours each in tasks which varied in either the dynamic nature of the controlled plant or in the level of difficulty during practice. Subjects were tested both during and at the end of practice on four dynamic tracking tasks of widely different levels of difficulty and plant characteristics. The results were that nearly all groups of subjects trained in the adaptive modes displayed greater transfer from practice to the test conditions than did those subjects who practiced only on the test conditions themselves. Author

N65-16136# Joint Publications Research Service, Washington, D.C.
EFFECT OF OXYGEN STARVATION AND ACCELERATION ON THE CONTENT OF GLUTAMIC AND GAMMA-AMINOBUTYRIC ACIDS IN BRAIN TISSUE
Ye. D. Avenirova, B. M. Savin, and I. A. Sytinskiy 3 Feb. 1965 10 p refs Transl. into ENGLISH from Vopr. Med. Khim. (Moscow), v. 10, no. 6, Nov./Dec. 1964 p 595–600
(JPRS-28630; TT-65-30276) OTS: $1.00

The object of the experiment was to establish the similarities and differences in the variation of the glutamic and gamma-aminobutyric acid (GABA) contents in brain tissue under the influence of overloads or oxygen starvation. The results of the experiments indicated that: (1) In acute oxygen starvation (corresponding to a stay at an altitude of 5000 to 10000 meters for 1 min) the content of GABA in the rat cerebrum increased by 30%, and in the cerebellum by 40% in comparison with the norm. In cases of acute hypoxia, a great increase in the amount of GABA was noted. (2) In the case of overloads in the head-pelvic and pelvic-head directions at values of 18 g for 1 min, the GABA content remained within normal limits. (3) Various changes in the GABA content in the brain tissue under the influence of overloads and phenomena of acute oxygen starvation showed evidence of a difference in the factors leading to the change in the amount of this substance. R.E.S.

N65-16161# Federal Aviation Agency, Oklahoma City, Okla. *Office of Aviation Medicine*
THE EFFECT OF PHYSICAL CONDITIONING OF AN INDIVIDUAL BEFORE AND AFTER SUFFERING A MYOCARDIAL INFARCTION
John Naughton, Bruno Balke, and Francis Nagle Jan. 1964 12 p refs
(Grant PHS HE-06286-03)
(AM-64-2)

Personnel engaged in aviation activities are not exempted from the development of coronary heart disease. A 54-year-old white male suffered an acute inferoseptal myocardial infarction after he had voluntarily taken part in a regular exercise program designed to improve the conditions of existing hypertension, overweight, and hypercholesterolemia. The postinfarct recuperation was uncomplicated. Four weeks later, physical activities were slowly increased from day to day. A remarkable progress in restoring cardiorespiratory efficiency was observed when the training was switched from dull types of exercises to simply competitive ball games. The training response was similar to that observed in normal individuals. Twenty and twenty-three weeks postinfarct, this individual was normotensive, had a normal serum cholesterol concentration, and a near-normal body weight. In addition, his capacity for making cardiorespiratory adjustments to high metabolic demands exceeded the originally established level. Author

N65-16173# Ohio State U., Columbus. Aviation Psychology Lab.
EXPERIMENTS ON TEAM TRAINING IN A CIC-TYPE TASK ENVIRONMENT
George E. Briggs and James C. Naylor Jun. 1964 39 p refs
(Contract N61339-1327)
(NAVTRADEVCEN-1327-1; AD-608309)

Three separate but related laboratory experiments were performed with three-man teams in a simulated radar-control interception task. Experiment I investigated the influence of a replacement of one team member with a new operator, the latter having either more or less on-the-job experience than

the man replaced. Also investigated was the influence of task organization and task complexity. In Experiment II the influence of training task fidelity, training task organization, and transfer task organization was examined. Finally, Experiment III examined the influence of different amounts of experience on two kinds of training task organization and of transfer task organization. Replacement effects were significant but of short duration, but transfer task organization effects were of longer duration with performance on an independent task organization superior to that on an interaction version except when preceded by individual training and/or training specifically on communication procedures. Author

N65-16185# Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine
THE SIZE CUE TO VISUALLY PERCEIVED DISTANCE
Walter C. Gogel Jan. 1964 27 p refs
(AM-64-13)

Evidence indicates that both perceived size S' and retinal size θ are involved in both the relative and familiar size cue to relative depth. There is also evidence to indicate that the familiar size cue cannot be subsumed under the relative size cue. But both types of size cues can be included under the concept of perceived size per unit of retinal size (S'/θ). It is asserted that the perceived depth between objects, as determined by the size cue, is a function of the value of S'/θ associated with each of the objects. Evidence relevant to specifying the relation between values of S'/θ and perceived depth is evaluated with respect to methodological problems involved in the use of comparison fields. Author

N65-16207# Joint Publications Research Service, Washington, D.C.
INVESTIGATIONS IN INDUSTRIAL HYGIENE AND OCCUPATIONAL PATHOLOGY [ISSLEDOVANIYA PO GIGIYENE TRUDA I PROFESSIONAL'NOY PATOLOGII]
Ye. Te. Andreyeva-Galanina 11 Feb. 1965 145 p refs Transl. into ENGLISH from the Trans. of the Leningrad Sanit.-Hyg. Med. Inst. (Leningrad), v. 75, 1963 p 7-56, 62-68, 74-90, 94, 101-118, 132-143, 231-251
(JPRS-28721; TT-65-30312) OTS: $4.00

Papers are presented on a variety of subjects related to vibration sickness, the effects of local and total vibration on different animal and human subjects, the vibration damage to tissues as an occupational hazard, the use of vibration absorbers to protect workers, and the toxicology of various freon gases. D.E.W.

N65-16215# Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.
THE GRADATIONAL STEP TEST FOR ASSESSING CARDIORESPIRATORY CAPACITY: AN EXPERIMENTAL EVALUATION OF TREADMILL AND STEP TEST PROCEDURES
Francis Nagle and Bruno Balke Jan. 1964 14 p refs
(AM-64-3)

A suitable stepping device and a feasible testing procedure evolved for the assessment of functional adaptive capacity. This test provides for minute-by-minute increments of energy expenditure in multiples of the basal metabolic rate (Mets), ranging from 2.5 to 15 Mets within a 25-minute period in tests with normal individuals. A modified test (slower stepping rate and different step increments) is suggested for the evaluation of patients or other individuals with severely reduced work capacity. In this test the energy demands progress from 2.5 to 9 Mets within a 20 to 22-minute period. Author

N65-16216# Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.
DESIGN AND PERFORMANCE CHARACTERISTICS OF A MECHANICALLY DRIVEN VESTIBULAR STIMULATOR
William E. Collins and Harlie W. Huffman Oct. 1964 11 p
(AM-64-15)

A mechanical-drive angular acceleration device was designed and constructed for use as a vestibular stimulator. Calibration data obtained with a tachgenerator, an angular accelerometer, and an electronic counter indicate that accelerations at all rates below 25° /sec^2 and to all terminal velocities less than 25 rpm are linear, and that maximum trial-to-trial variability between 0.25° /sec^2 and 20° /sec^2 does not exceed ±0.02° /sec^2 or ±1.0% of the acceleration rate, whichever is larger. Thus, the stimulator may be used for a large number of vestibular experiments where rates of acceleration and terminal velocities are not required to exceed 20° /sec^2 and 25 rpm, respectively. Author

N65-16276*# Resources Research, Inc., Washington, D.C.
RADIOISOTOPIC BIOCHEMICAL PROBE FOR EXTRATERRESTRIAL LIFE Quarterly Progress Report No. 11
Gilbert V. Levin et al 15 Jan. 1964 58 p
(Contract NASr-10)
(NASA-CR-55529) OTS: HC $3.00/MF $0.50

Four remote field tests, conducted at sites selected for adverse environmental conditions, were successful in detecting life within very short time periods. The sites tested were: Orange, Virginia, which provided a hard, clay soil of high iron content at the surface; Sheep Mountain in White Mountains, California, which provided an altitude of 12 200 feet, an area above the tree line, and extremely rocky terrain; Death Valley, California, which provided an arid, sandy region; and the Salton Sea area of the Imperial Valley, also in California. This last site provided a surface soil that was hard, rocky, and of high salt content. In spite of some minor operational and mechanical problems, metabolic responses were positive, rapid, and distinct. Studies were also conducted to enhance the growth of pure culture and mixed populations from soils. R.T.K.

N65-16278*# Stanford U., Calif.
THE FLUOROMETRIC ASSAY OF SOIL ENZYMES
Lawrence Hochstein Jan. 1962 41 p
(Grant NsG-81-60)
(NASA-CR-50919) OTS: HC $2.00/MF $0.50

Fluorometric assays of phosphatase and leucyl aminopeptidase (peptidase) are described. In general, the enzymic activities were detectable after short incubation times and required relatively small quantities of soil. The assays are complicated by the native fluorescence of soil, by an apparent quenching of fluorescence by soil in the phosphatase assay, and by the association of enzymic activity with soil particles. A total of 59 soil samples was screened for phosphatase activity. There seem to be two kinds of phosphatase activity in soil, one that exhibits maximum activity in an alkaline environment and one that is more active in an acidic environment. The presence of soil aminopeptidases was assayed using L-leucyl-β-naphthyl-amide as the substrate. Thirty-five soils were surveyed for peptidase activity. Results are presented in tables and graphs. D.E.W.

N65-16287# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE STAND OF MUDR. J. STEPANEK IN THE DISCUSSION ABOUT NATURAL AND SOCIAL ASPECTS IN HUMAN PSYCHOLOGY

J. Beranek and V. Tlusty 5 Dec. 1964 8 p Transl. into ENGLISH from Cesk. Psychiat. (Czechoslovakia), v. 59, no. 1, 1963 p 66–68
(FTD-TT-64-65/1; AD-451788)

A detailed rebuttal is presented to discredit the comment of Stepanek on a paper by Monert that had been given at a conference held at the Faculty of General Medicine in Prague. The argument stems from an identification of human psychology with physiological processes, i.e., the assumption that psychic laws are independent of social conditions. D.E.W.

N65-16291# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ADAPTATION OF PHYSIOLOGICAL HOMOISOTHERM PROPERTIES TO COLD
L. Jansky 8 Dec. 1964 44 p refs Transl. into ENGLISH from Cesk. Fysiologie (Czechoslovakia) v. 12, no. 2, 1963 p 105–125 Presented at the Seminar of Physiolog. Inst. of Czech. Acad. of Sci., Liblice, 10 Oct. 1962
(FTD-TT-64-445/1+2; AD-455488)

Acclimation and acclimatization changes were investigated in order to define clearly the changes that occur in an organism under the effect of artificial and natural cold stimuli. Male rats were acclimated to cold temperatures (+6° C) and were then studied for acclimation mechanisms and cold resistance. Cold adaptation was found to be primarily a metaboblic adaptation, coupled with the gradual development of a new chemical thermoregulation component that promotes heat generation in the muscles. An extensive discussion of shivering and nonshivering thermogenesis is given. Other discussions are given of changes in weight, in physiological properties of the circulatory system, in hormones, and hormone production, in tissue metabolism, and in peripheral zones directly exposed to the cold, and of pathological changes after exposure to cold. Acclimation and its relation to acclimation changes are briefly treated, and a few experiments studying cold adaptation in human beings are reported. D.E.W.

N65-16299# School of Aerospace Medicine, Brooks AFB, Tex. Environmental Systems Dept.
BACTERIOLOGIC POTABILITY OF CONDENSATE WATER FROM HEAT EXCHANGERS OF PRESSURE SUITS
James E. Moyer and Y. Z. Lewis Nov. 1964 10 p refs
(SAM-TDR-64-66; AD-455390)

The possibility of utilizing water condensates recovered from the heat exchangers of pressure suits as an emergency source of drinking water was investigated. Five-hour condensate samples were collected and subjected to quantitative and qualitative bacteriologic analysis. Results indicate that condensate water may serve as an emergency source of potable water provided it is consumed within a short period of time after collection. Storage of the condensates results in a water of an unacceptable bacteriologic purity for imbibition purposes. Author

N65-16303*# National Aeronautics and Space Administration, Washington, D.C.
BIO-LIKE STRUCTURES [BIOPODOBNYYE STRUKTURY]
V. O. Kalinenko Jan. 1965 12 p Transl. into ENGLISH from Nauka i Zhizn' (Moscow), no. 8, 1963 p 67–70
(NASA-TT-F-9244) OTS: HC $1.00/MF $0.50

This article deals with the origin and creation of primary organisms. It describes the natural method of the formation of cells. Experiments carried out by Russian scientists are explained, in which electrical currents are used to create living organisms. A process referred to as energobiosis is described. Photographs are given showing the various stages of development of these organisms. Author

N65-16304*# National Aeronautics and Space Administration, Washington, D.C.
HYDREMIA AND HYDREMIC EDEMA [UEBER HYDRAMIE UND HYDRAMISCHES OEDEM]
J. Cohnheim and L. Lichtheim Feb. 1965 49 p refs Transl. into ENGLISH from Arch. Pathol. Anat. Physiol. (Berlin), v. 69, 1877 p 106–143
(NASA-TT-F-9247) OTS: HC $2.00/MF $0.50

Experiments were made by injecting large amounts of salt solution into the jugular vein of dogs and rabbits without damaging the red corpuscles. No trace of skin edema was found. Changes in the bloodstream velocity of frogs, dogs, and rabbits were determined from observations of the mesenterium, the tongue, and the skin under the microscope. Hydremic plethora leads to a considerable increase in the transudation into the tissue of many organs. The organs found to be edemic were not those observed in this state in hydropic kidney patients. A new interpretation of hydrops in kidney patients is attempted. Author

N65-16319*# Florida State U., Tallahassee. Inst. for Space Biosciences
THE CATALYTIC DECOMPOSITION OF GLUCOSE IN AQUEOUS SOLUTION BY THERMAL PROTENOIDS
Sidney W. Fox and Gottfried Krampitz [1964] 14 p refs Submitted for Publication
(Grant NsG-173-62)
(NASA-CR-60569) OTS: HC $1.00/MF $0.50

The catalytic activity reported is related to the decomposition of uniformly labelled C^{14}-glucose to $C^{14}O_2$ at a low rate of conversion. Experimental evidence indicates that at least a small fraction of the glucose is first converted to glucuronic acid, which is then decarboxylated, and that each of these two reactions is catalyzed in aqueous solution by proteinoid prepared by thermal condensation of dry amino acids mixed in appropriate proportions. D.E.W.

N65-16326*# Stanford U., Calif. Medical School
MEMBRANE SEPARATION
Jerry Lundstrom May 1963 34 p refs
(Grant NsG-81-60)
(NASA-CR-51103) OTS: HC $2.00/MF $0.50

Methods of determining the permeability coefficient in gas-membrane-gas systems from the permeability curves are reviewed; these curves show the accumulated moles of solute in the downstream chamber as a function of time. As a result of a literature search for permeability coefficient values for CO_2 and conversion of these values to common units of cm^2/sec, a table comparing the permeability of the following membranes is presented: silicone rubber, polyvinyl chloride with 20 parts of di(2-ethyl hexyl) phthlate plasticizer, natural rubber, Teflon, polyethylene, and porous glass. Preliminary results of dye permeability studies are presented in which silicone rubber, Teflon, and polyethylene were measured for their permeability to disodium fluorescein. Experiments involving disodium fluorescein and disodium eosin permeabilities to cellophane are also reported. An approximation is made of the separation that a silicone rubber membrane would provide in a life-detection device using the permeability data for carbon dioxide and for disodium fluorescein as a crude approximation to the permeability of organic metabolites. D.S.G.

N65-16328*# Stanford U., Calif. Instrumentation Research Lab.

CYTOCHEMICAL STUDIES OF PLANETARY MICROORGANISMS—EXPLORATIONS IN EXOBIOLOGY Status Report, Mar. 1, 1962–Apr. 1, 1963

Joshua Lederberg and Elliott Levinthal [1963] 63 p refs (Grant NsG-81-60)

(NASA-CR-51096) OTS: HC $3.00/MF $0.75

Exobiological and related cytochemical discussions are presented as follows: (1) the general problem of the quest for signs of life; (2) the multivator—an attempt to generalize the instrumental requirements of exobiological experiments; (3) assays being developed for inclusion in the multivator—hydrolytic assays and techniques of membrane separation to measure the production of molecules with membrane transmission properties differing widely from those of the substrate; (4) the application of video-scanning techniques to biological problems; (5) the exploitation of the possibilities of computer technology as applied to the problems of exobiology. Also presented is a list of papers and seminars presented by members of the Instrumentation Research Laboratory. I.v.L.

IAA ENTRIES

A65-14150
DETECTION OF MARKOVIAN SEQUENCES OF SIGNALS.
Morton P. Friedman and Edward C. Carterette (California, University, Dept. of Psychology, Human Communication Laboratory, Los Angeles, Calif.).
(Acoustical Society of America, Meeting, 67th, New York, N.Y., May 6-9, 1964.)
Acoustical Society of America, Journal, vol. 36, Dec. 1964, p. 2334-2339. 17 refs.
Research supported by NASA, Navy, and U. S. Public Health Service.

Investigation of the influence of constrained stimulus sequences upon detection in a two-alternative temporal forced-choice task with feedback. In the experiment, three observers listened to a weak pure tone embedded in noise whose probabilities of occurrence and repetition in an interval were governed by a first-order Markov process. Each observer listened to examples of each of nine different Markov chains. It is found that (1) a single function relating detections to false alarms fits individual sets of data well, in agreement with the theory of signal detectability, except that (2) detection is higher for more extreme repetition probabilities; (3) responses depend strongly on the previous stimulus with (4) the dependence being peculiar to a given chain; (5) detection probabilities increase during runs of signals in the same interval; however, (6) probability of detection on the first trial of a run in a given interval does not depend on the length of the preceding run in the other interval.
(Author) V. P.

A65-14157
CO_2 REBREATHING STUDY.
Gilbert Moser and P. J. Holsberg (Electronic Associates, Inc., Princeton; Rutgers University, College of Engineering, New Brunswick, N.J.).
Instruments and Control Systems, vol. 37, Dec. 1964, p. 122-124.

Description of a specialized human-body simulation made to determine the degree of correlation existing between a subject's mixed, venous, CO_2 partial pressure and the CO_2 partial pressures existing in a bag of fixed volume from which the subject rebreathes for a specified time. The derivation of the mathematical model is given and the physical constants needed for the simulation are presented. Illustrations include: system response for above-, near-, and below-normal, initial, CO_2 partial pressure; and a system diagram of the analog simulator. D.H.

A65-14237
CHANGES IN LUNG VOLUMES OF EMPHYSEMA PATIENTS UPON SHORT EXPOSURES TO SIMULATED ALTITUDE OF 18,000 FEET.
R. L. Yanda (Hospital of the Good Samaritan, Inhalation Therapy Dept. and Hyperbaric Research and Therapy Unit, Los Angeles, Calif.) and H. L. Herschensohn (Douglas Aircraft Co., Inc., Santa Monica, Calif.).
Aerospace Medicine, vol. 35, Dec. 1964, p. 1201-1203.

Discussion of the effect of hypobaric exposure upon chronic obstructive pulmonary emphysema. Eight exposures of four emphysema patients to altitude levels of 18,000 ft (one-half atmosphere) on the basis of a specific sequence and type of exposure resulted in both clinical benefit and significant statistical change in residual volume (4 out of 4); in vital capacity (3 out of 4); a statistical change in expiratory reserve (3 out of 4); and no change in resting oxygen consumption per minute (4 out of 4). These findings paralleled results from hyperbaric exposures to 2 atm. These findings are considered to be further probable verification of the theory of pressure gradient effect, and further amplified and more detailed studies are indicated. F.R.L.

A65-14240
HUMAN CHORIORETINAL BURNS FOLLOWING HIGH ALTITUDE NUCLEAR DETONATIONS.
James F. Culver (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Ophthalmology Dept., Brooks AFB, Tex.), Norris L. Newton (USAF Hospital, Carswell AFB, Tex.), Robert Penner (U.S. Army, Tripler General Hospital, Honolulu, Hawaii), and Robert W. Neidlinger (U.S. Army, Walter Reed Army Medical Center, Walter Reed General Hospital, Washington, D.C.).
Aerospace Medicine, vol. 35, Dec. 1964, p. 1217-1220. 8 refs.
Research supported by the Defense Atomic Support Agency.

Discussion of two cases of centrally located chorioretinal burns. These, the first two known cases occurring from high altitude thermonuclear detonations, occurred during Operation Fishbowl in October, 1962, when chorioretinal burns were accidentally sustained by a U.S. Air Force sergeant and a U.S. Navy petty officer. The incidents occurred at night from a very high altitude missile-delivered device. Neither subject had his protective goggles in proper position at time zero. The initial subjective symptoms reported by each subject involved a transient blinding which cleared rather rapidly, leaving a central "glowing" positive scotoma followed by a small central negative scotoma. The results of various examinations are extensively described. Comment is made that these unfortunate incidents presented an unusual opportunity for careful and detailed study of centrally located chorioretinal burns, and well illustrate that the exact size and position of such lesions are most significant. An important lesson to be drawn from a study of these cases is that chorioretinal burns do not ordinarily result in complete blindness, and incapacitation depends upon the exact location and size of the lesion. F.R.L.

A65-14364
RELIABILITY AND THE MAN SUBSYSTEM.
D. Amorelli, J. T. Celentano, and B. G. Peters (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 5TH, TOKYO, JAPAN, SEPTEMBER 2-7, 1963, PROCEEDINGS. [A65-14290 05-31]
Edited by Tsuyoshi Hayashi.
Tokyo, AGNE Corp., 1964, p. 931-942. 7 refs.

Discussion of the concept of reliability and the relationship of man to total system reliability. Techniques of determining reliability are considered. Examples of man's contribution to the reliability of aircraft and spacecraft systems are discussed. The following conclusions are stated: (1) actual reliability of space systems without man will not be the same as predicted reliability; (2) man as a subsystem provides the means by which predicted reliability will be obtained; (3) although man's role as an operator and decision maker is vital, his ability to manually override in the event of system malfunction, and his ability to maintain and repair are vital components that will assure mission success; and (4) a space vehicle in which man is included should utilize his capabilities to the fullest and not be designed as an automatic system with man as a passenger only. M.M.

A65-14380
WATER SOURCES DURING MANNED SPACE MISSIONS. I.
Frank J. Hendel (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 5TH, TOKYO, JAPAN, SEPTEMBER 2-7, 1963, PROCEEDINGS. [A65-14290 05-31]
Edited by Tsuyoshi Hayashi.
Tokyo, AGNE Corp., 1964, p. 1101-1106.

Description of a system of water recovery from human waste. The subjects considered are catalytic waste recovery and water recovery from fuel cells. It is stated that the average water requirement for a moderately active man is at least 7 lb/day. This includes a minimum amount of water for washing. Waste and water management systems for spacecraft on long missions must be self-sufficient. One method that will recover potable water from all

human wastes, leaving a negligible amount of clean residue, will assure the astronauts of necessary water supply. Other methods of water recovery from human metabolic waste are possible. In case hydrogen-oxygen fuel cells are used for secondary power generation, water in substantial quantities will be the by-product. It is pointed out that Moon raw materials, heated in solar or nuclear furnaces, will provide additional water for men on the Moon M.M.

A65-14381
GASEOUS ENVIRONMENT PROBLEMS DURING MANNED SPACE MISSIONS. II.
Frank J. Hendel (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 5TH, TOKYO, JAPAN, SEPTEMBER 2-7, 1963, PROCEEDINGS. [A65-14290 05-31]
Edited by Tsuyoshi Hayashi.
Tokyo, AGNE Corp., 1964, p. 1107-1114.

Discussion of atmospheric environment problems for manned space missions. It is stated that the oxygen required for man in a space cabin can be as much as 2.25 lb/day. Due to unavoidable leaks, this figure is often increased to 4.0 lb/day. Oxygen can be stored in tanks kept at room or cryogenic temperatures, or it may be generated by electrolysis from chemicals or by exchange between exhaled CO_2 and chemicals or algae (or higher plants). The algal system, which could fully close the ecological cycle, is the least developed. It is stated that, while the Russians have used air at 14.7 psia in their spaceflights, the Americans have used pure oxygen at 5 psia. The latter environment has greater simplicity, but it also has a slightly greater fire hazard. It has been proven that man can tolerate such an atmosphere well for at least two weeks. However, for longer missions, a two-gas atmosphere at pressures between 7 and 10 psia is advisable. The second gas may be nitrogen, helium, or perhaps neon. M.M.

A65-14382
A GAS EXCHANGER FOR CLOSED SYSTEM BY USING EXCRETA-FERMENTATION PROCESS AND ALGAE.
Masahito Takahashi (Kobe University, Biological Institute, Kobe, Japan).
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 5TH, TOKYO, JAPAN, SEPTEMBER 2-7, 1963, PROCEEDINGS. [A65-14290 05-31]
Edited by Tsuyoshi Hayashi.
Tokyo, AGNE Corp., 1964, p. 1115-1120. 6 refs.

Experimental investigation of the cultivation of algae in the digestion liquor of night soil as a gas exchanger for the respiration of the crew of a spacecraft in a closed ecological system. It is stated that the assimilatory quotient of Chlorella is about 0.85 in the night soil digestion liquor, which represents the ideal value and is equal to the respiratory quotient of the crew. In the test performed, air from a vessel in which mice were enclosed was bubbled into the cultivation medium prepared from the night soil digestion liquor. The respiration of the animal was adequately supported by the gas produced from the growth of the algae; therefore, it is stated that the algae cultivated in the fermented excreta of the crew yield sufficient oxygen for crew respiration. M.M.

A65-14383
THE EFFECTS OF HIGH TEMPERATURE ON THE GERMFREE LIFE UNDER THE ENCLOSED ENVIRONMENT.
Masasumi Miyakawa and Yutaka Uno (Nagoya University, School of Medicine, Laboratory of Germfree Life Research, Nagoya, Japan).
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 5TH, TOKYO, JAPAN, SEPTEMBER 2-7, 1963, PROCEEDINGS. [A65-14290 05-31]
Edited by Tsuyoshi Hayashi.
Tokyo, AGNE Corp., 1964, p. 1121, 1122.

Experimental investigation of the resistance of the germ-free rats to high temperature. It is stated that the results showed that germ-free adult rats were so resistant to high temperatures that some of them could withstand serious lesions of the kidney. It is pointed out that germ-free young rats were more resistant to such a stress and remained alive for 129 days after exposure, although affected with chronic severe damage of the kidney. M.M.

A65-14384
A STUDY ON THE PHYSIOLOGICAL EFFECTS OF HIGHLY OXYGENATED ENVIRONMENT. I.
Hisashi Saiki (Tokyo Jikei-kai Medical University, Aeromedical Laboratory, Tokyo, Japan).
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 5TH, TOKYO, JAPAN, SEPTEMBER 2-7, 1963, PROCEEDINGS. [A65-14290 05-31]
Edited by Tsuyoshi Hayashi.
Tokyo, AGNE Corp., 1964, p. 1123-1128. 8 refs.

Experimental investigation of the dynamic process of the biological effects of fairly long exposure of mice to pure O_2 at 1 atm. The following results are indicated: (1) the lethal effect on mice of high oxygen environment at normal pressure was confirmed; (2) the effects were observed in body weight decrease, survival time, and morphological changes; (3) definite morphological changes were found, not only in the respiratory organs, but also in the central nervous tissues and in liver tissues; and (4) the effects vary according to age and environmental conditions of the subjects. To explain all the dynamic phases of O_2 stress, the investigation was divided into three stages: (1) the initial few days, (2) the following several days, and (3) the last part of the investigation. M.M.

A65-14385
RETINAL DETACHMENT IN ADULT DOGS RESULTING FROM OXYGEN TOXICITY.
Cecil C. Beehler, Norris L. Newton, James P. Culver (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Clinical Sciences Div., Depts. of Experimental Surgery and Ophthalmology, Brooks AFB, Tex.), and Thomas J. Tredici (Armed Forces Institute of Pathology, Ophthalmic Pathology Section, Washington, D.C.).
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 5TH, TOKYO, JAPAN, SEPTEMBER 2-7, 1963, PROCEEDINGS. [A65-14290 05-31]
Edited by Tsuyoshi Hayashi.
Tokyo, AGNE Corp., 1964, p. 1129-1134. 5 refs.

Experimental investigation of the effects of chronic exposure to high oxygen tensions on the visual mechanism of adult dogs. The results are said to show that prolonged exposure to high oxygen environments can cause severe ocular damage in the adult dog. The lesions appear in as little as 48 hours and include retinal detachment, retinal hemorrhage, hypotony, and iritis. These changes appear to be at least partially reversible. Histologic sections revealed retinal degeneration and ciliary cyst in some eyes. It is pointed out that, as with other types of oxygen poisoning, the mechanism by which these changes occur is not known. It is not known whether these findings have any relation to changes occurring in man's eye during exposure to high partial pressures of oxygen. However, in the light of the fact that permanent eye damage occurs regularly in experimental animals, this possibility should be fully evaluated. (Author) M.M.

A65-14386
BIODYNAMIC RESPONSES ON RETINAE OF ANIMALS. I.
Hisashi Saiki (Tokyo Jikei-kai Medical University, Aeromedical Laboratory, Tokyo, Japan) and Kazu Itoh (Meiji University, Technological Faculty, Tokyo, Japan).
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 5TH, TOKYO, JAPAN, SEPTEMBER 2-7, 1963, PROCEEDINGS. [A65-14290 05-31]
Edited by Tsuyoshi Hayashi.
Tokyo, AGNE Corp., 1964, p. 1135-1142.

Experimental investigation to discover the following: (1) whether temporary disorders or permanent damages due to oxygen toxicosis can be observed through a retinoscope after the subject has been under various g's; and (2) whether a subject that has been exposed for a long time to an oxygen-rich environment, sufficient to cause oxygen toxicosis, is more or less susceptible to g-stress. The following results are reported: (1) oxygen exposure, even when its duration is long enough to cause O_2 toxicosis, is clearly effective in preventing the fatal effect of stagnant anoxia produced by the g-stress; (2) the pulse rate of animals exposed to O_2 shows no definite increase just after the positive g-stress; and (3) some changes in the retinoscopic pictures of animals that were both O_2-exposed and g-stressed, or in those that were only O_2-exposed, were found. (Author) M. M.

A65-14524 #

APPLICATIONS STEMMING FROM BIOASTRONAUTICS.
Paul A. Campbell.
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 12 p. 31 refs.

Discussion of fortunate educated accidents from space programs crossing over from bioastronautics and aerospace medicine into other areas of endeavor. Applications are considered which have been fathered more or less recently, by aerospace medicine or bioastronautics, or represent "spill-overs" from the aerospace effort into medically oriented sciences. The applications in many instances refer to future considerations and are in some cases speculative. It is concluded that the list supplied tells only a small part of the story, as it grows day by day. Knowledge coming from hydrazine chemistry spreads into the search for tranquilizers and anti-tuberculosis drugs. Greaseless cooking in thermoplastic-lined kitchenware decreases cholesterol. Biological fuel cells, besides helping the astronaut, may someday use the refuse of cities to supplement electric power sources, or use the contents of the sea to power buoy lights to guard sea lanes. M. M.

A65-14526 #

THE LABYRINTH AND SPACE FLIGHT.
Ashton Graybiel (U. S. Naval School of Aviation Medicine, Pensacola, Fla.).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 52 p. 45 refs.
NASA Grant No. R-93.

Brief review of some of the recent experimental findings bearing on the role of the otoliths and semicircular canals in a weightless vehicle or a rotating spacecraft in orbital flight. The subjects considered are: (1) the vestibular organs, (2) weightlessness, and (3) rotating environment. It is stated that the inability to simulate adequately the weightless state under terrestrial conditions presents a problem in measuring the susceptibility of potential astronauts, and especially of space passengers without great experience in aircraft. One possibility is to determine their susceptibility to motion sickness in different force environments which expose the otoliths, but not the canals, to bizarre stimulation. Estimates based on these predictions could be validated in actual spaceflight. It is stated that, although the experience is limited, it is important to mention that persons either with slightly "suppressed" function of the semicircular canals as measured by the caloric test, or habituated to rotation at 10.0 rpm, are not handicapped sufficiently to prevent their carrying out all of their duties. M. M.

A65-14528 #

CIRCULATORY ASPECTS OF MANNED SPACE FLIGHT.
Lawrence E. Lamb (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 13 p. 8 refs.

Consideration of the apparent influence of weightlessness upon man's circulatory function. The subjects treated are: (1) influence of g force, (2) absence of g force, (3) influence of level of activity, (4) pertinent observations, (5) space cabin simulator studies, (6) bed rest studies, (7) manned spaceflight, and (8) significance in aerospace flight. It is stated that observations made on the influence of the level of physical activity and other environmental factors upon the human body suggest the following important areas for consideration in manned spaceflight: first, adequate physical exercise should increase the power requirement of the body, inducing favorable physiological responses commonly noted with adequate physical conditioning. Effective exercise in the absence of the gravitational field must cause a significant alteration of cardiovascular dynamics and a significant power load on the musculoskeletal system. The level and frequency of this form of exercise remain to be determined. It is emphasized that the level of exercise above the individual's customary level can result in increased red blood cell lysis and create other adverse circumstances that would diminish man's tolerance to spaceflight. M. M.

A65-14529 #

PRIMORDIAL ORGANIC CHEMISTRY AND THE ORIGIN OF LIFE.
Cyril Ponnamperuma (NASA, Ames Research Center, Moffett Field, Calif.).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 8 p. 17 refs.

Consideration of the possibility of finding an answer to the question of the existence of life in our planetary system. Investigations were undertaken to synthesize the constituents of the nucleic acid molecule and the protein molecule, on the hypothesis that molecules that are fundamental now were fundamental at the time of the origin of life. The results are said to show that, under simulated primitive Earth conditions, molecules of biological significance can be synthesized. These results lend support to the hypothesis of chemical evolution since: (1) the conditions are aqueous, (2) the concentrations of materials used are very small, and (3) the sources of energy used are those that are most likely to have existed under primitive Earth conditions. It is stated that, as the laws of chemistry and physics are universal laws, these laboratory experiments point out that, wherever the right conditions exist, those molecules which can act as precursors of biological systems will arise anywhere in the universe. The laboratory experiments lend support to the Oparin-Haldane hypothesis of chemical evolution and possibility of the existence of extraterrestrial life. M. M.

A65-14574 #

STEREOMODELS OF BIOLOGICAL COSMIC RAY EFFECTS.
Jakob Eugster (Zürich, Universität, Zurich, Switzerland).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 12 p. 20 refs.

Development of experimental conditions which permit a rational and feasible approach to the study of the effect of cosmic radiation on humans. Precancerous human tissues are exposed in situ to the action of cosmic radiation at an altitude of 3500 meters. The principle is shown to depend primarily on the topographical localization of particle tracks in a finite region of human skin. Along such tracks histological changes were observed. It is indicated that, although firm generalizations cannot be made on the basis of this single test case, the data suggest that proper methods for studying the effect of cosmic radiation on human tissue are now at hand. (Author) J. R.

A65-14575 #

MANNED ORBITAL LABORATORY - MEDICAL ASPECT.
Andres I. Karstens (USAF, Systems Command, Space Systems Div., Los Angeles, Calif.).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 8 p.

General discussion of the chief medical aspects of the Manned Orbital Laboratory (MOL) being developed to assess the potential

useful function of man in a space vehicle. In particular, some of the novel biomedical aspects, such as the duration of MOL missions in orbit, and the capability of greater physical activity, are considered. In addition, problems associated with life support, weightlessness, and medical surveillance are examined. J.R.

A65-14576 #
EFFECT OF INERT GASES IN CABIN ATMOSPHERES.
B. E. Welch and W. G. Robertson (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Environmental Systems Branch, Brooks AFB, Tex.).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 46 p. 77 refs.

Discussion of the use of inert gases in spacecraft atmospheres, with special attention to engineering constraints as well as to the physiological suitability of proposed atmospheres. The engineering constraints include evaluation of leakage from the spacecraft, and control of the multi-gas atmosphere. Physiological suitability of proposed atmospheres includes the evaluation of the inertness of inert gases, abilities preventing atelectasis, relation to decompression, communication effects, respiratory function, and thermal properties. On the basis of this consideration, it is concluded that an inert gas is desirable and that the choice of an inert gas should be nitrogen. J.R.

A65-14577 #
SIGNIFICANCE OF CIRCADIAN RHYTHMS FOR SPACE FLIGHT.
Juergen Aschoff (Max-Planck-Institut für Verhaltensphysiologie, Seewiesen über Starnberg, West Germany).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 37 p. 28 refs.
Grant No. NsG 259-62.

Discussion of the properties of the human circadian system and mechanism of entrainment by physiological and psychological Zeitgebers, with special emphasis on: (1) the normal phase-relationship of functions in the entrained organism and the significance of diurnal rhythms in sensory and motor performance; (2) the evidence for an endogeneous rhythmicity in man, its characteristics and implications; and (3) some of the problems of entrainment to unnatural Zeitgebers. It is concluded that the circadian rhythmicity is one of the basic features of living systems. It is the expression of a self-sustained oscillation which obeys the laws of oscillation theory. The circadian oscillator is characterized by a natural frequency which either can be observed under constant conditions as an overt free running rhythm, or which determines, in the entrained organism, the phase-angle difference between the organism and the Zeitgeber. J.R.

A65-14607
ERYTHROPOIETIC STIMULATING FACTOR (ESF) AS A STIMULANT OF CELL GROWTH IN VITRO.
Floyd E. Leaders, Alvar A. Werder, and Charlotte Schmidt (Kansas, University, School of Medicine, Depts. of Pharmacology and Microbiology, Kansas City, Kan.).
Society for Experimental Biology and Medicine, Proceedings, vol. 115, 1964, p. 658-660. 14 refs.
Contract No. NsG-298-62.

Experimental investigation in which cultures of two cell lines (one, cultured from the bone marrow of a human monocytic patient and one from a human synovial membrane) are tested for their response to administration of ESF. The results show that ESF is capable of stimulating the growth of such cultures but is ineffective in stimulating cell culture multiplication in very rapidly growing cultures. It is suggested that ESF be renamed NFG, or Non-specific Growth Factor. V.P.

A65-14804 #
CYTOKINETIC EFFECTS OF PROTON IRRADIATION.
John E. Prince (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Biosciences Branch, Brooks AFB, Tex.).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 22 p. 18 refs.

Description of an approach being taken to study experimentally the effects of ionizing proton irradiation on human cells. Since low-energy protons are absorbed by the skin, biopsies of this tissue from irradiated laboratory animals are being cultured to determine cell survival and condition at dosages below and above the mean effective dose. Comparisons of living cells irradiated in situ with those irradiated in culture are being made with the information obtained from these experiments. The state of the art in radiological physics, cell culture, microscopy, and photography permits observing the activity of individuals in a single layer of unstained living cells under proton bombardment. Using this type of instrumentation, studies to determine the effects of kinetic energy deposition in living cells of up to 10 million electron volts are initiated. These investigations are in partial support of experiments designed to determine the modifying effects of weightlessness on human cells in culture, combined with ambient space radiations, employing a 4.6-kg, 51.5-cm, 16-mm shutterless, camera microscope, complete with culture chamber and phase contrast optics. J.R.

A65-14807 #
SPACE OPHTHALMOLOGICAL PROBLEMS.
William B. Clark and James F. Culver (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Ophthalmology Dept., Brooks AFB, Tex.).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 12 p. 13 refs.

Consideration of the visual problems of spaceflight from the viewpoint of the ophthalmologist. The point is maintained that the usual system is "green and go" for all present planned spaceflight. It is stated that no operational plans should be slowed down or suspended for lack of information about the eyes. Neither should any plan be drastically altered because a laboratory shows only 75% reliability in the performance of a single visual task. The astronauts are men whose overall visual, physical, and intellectual capability for the task is in the top percentile. The space environment in itself will, in most cases, make the visual performance easier. It is pointed out that the sensors of the individual astronaut are being improved daily by the training process. This improvement is not in the eyes themselves, but in the ability to recognize, understand, and act upon information available to the eyes. M.M.

A65-14808 #
THE HOSTILE KINETIC ENVIRONMENT ON SEA, ON LAND, IN THE AIR AND IN SPACE.
John P. Stapp.
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 20 p. 23 refs.

Discussion of experimental data on deceleration, impact, and windblast, to illustrate aspects of the hostile kinetic environment of aerospace flight which must be dealt with to assure survival of spacecraft occupants on their journeys to hazards that can only be anticipated until they can be experienced and determined. It is stated that a knowledge of tolerance limits is the basic standard for aerospace protective design. Tables show the following: (1) human exposures to impact rocket sled decelerations, (2) chimpanzee exposures to impact rocket sled decelerations, and (3) chimpanzee exposures to windblast supersonic rocket sled air-ram. M.M.

A65-14831
CAESIUM IONS DO NOT PASS THE MEMBRANE OF THE GIANT AXON.

W. F. Pickard (Massachusetts Institute of Technology, Dept. of Biology and Research Laboratory of Electronics, Cambridge, Mass.), J. Y. Lettvin (Massachusetts Institute of Technology, Research Laboratory of Electronics, Cambridge, Mass.), J. W. Moore, M. Takata, J. Pooler (Duke University, Medical School, Durham, N.C.; Marine Biological Laboratory, Woods Hole, Mass.), and T. Bernstein (Cincinnati, University, Medical School, Cincinnati, Ohio; Marine Biological Laboratory, Woods Hole, Mass.).
National Academy of Sciences, Proceedings, vol. 52, Nov. 1964, p. 1177-1183. 26 refs.
Research supported by the Bell Telephone Laboratories; Contracts No. DA 36-039-AMC-03200(E); No. AF 33(615)-1747; National Institutes of Health Grants No. MH 0437-04; No. NB-03437; NSF Grant No. GP-2495; Grant No. NsG-496.

Experimental study to explain the passive flux of cations across excitable membranes. Cleaned giant axons from the hindmost stellate ganglion of the common Woods Hole squid were used in a sucrose gap voltage clamp similar to that described by Julian, Moore, and Goldman. Two sucrose streams divided the fiber into three electrically isolated regions. The short central region, called the "node," was bathed in the test solution, and the end regions were bathed in K+-rich sea water. The membrane potential of the node was taken to be the potential difference between the central pool and one of the end pools. Stimulating or clamping current was injected via the other end pool. It is shown that the disparity in behavior of K+ and Cs+ that obtains with respect to the membrane exists despite their similarities in the bulk aqueous phases bounding that membrane. It is pointed out that the process of distinguishing one ion from the other need not involve dehydrating either. Information as to the details of hydration is conveniently displayed by the interaction of the ion's plastic morphe as key, with the membrane channel's plastic morphe as lock. F.R.L.

A65-14832 #

SPACE RADIOBIOLOGY TRAINING AND OPERATIONS - A CONCEPT.

John E. Pickering (USAF, Systems Command, Aerospace Medical Div., Brooks AFB, Tex.).
Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 20 p.

Presentation of a space training and operations concept designed to conserve radiation dose in order to pursue a policy of man in the space environment while acknowledging the ever-present zones of radiation, both natural and artificial. In the new approach to the problem of permissible levels of exposure to ionizing radiation, the region surrounding the Earth has been divided into areas representing different doses and dose rates of radiation per mission profile. For example, one dose region, a low Earth orbit, 400 to 600 km and inclined at 15 to 20° to the plane of the equator, is descriptive of an area of relatively low dose and low dose rate. Space operations here will have astronauts exposed to doses not significantly different from those experienced by Schirra, Cooper, Bykovsky, and Tereshkova. On this basis, training mission profiles and times on orbit can be designed to maximize training time with minimum radiation dose. It is stated that, in the schedule proposed, all crews, regardless of the particular training schedule, 1, 3, or 5 years, could begin on a minimum dose schedule and then expend their remaining dose on mission profiles from low Earth orbit to higher Earth orbit, to belt penetration, to lunar penetration. The schedules are shown in a figure. M.M.

A65-15100

EARTHMAN IN SPACE.

Burnham M. Lewis.
Grumman Horizons, vol. 4, no. 2, 1964, p. 26-28.

Description of the Apollo spacesuit program, and the design of the life-support backpacks the astronauts will use on the Moon. The Moon suit is a one-man spacecraft in which the astronaut can maneuver in space outside of and independent of, any vehicle. On the Moon's surface, the backpack will provide four hours of oxygen, body comfort, and communications. Besides comfort and mobility, very high reliability in pressure protection is provided. Illustrations are presented. F.R.L.

A65-15153 #

DETECTION OF LIFE-RELATED COMPOUNDS ON PLANETARY SURFACES BY GAS CHROMATOGRAPHY - MASS SPECTROMETRY TECHNIQUES.

K. E. Bentley, C. E. Giffin, D. G. Whitten, and W. F. Wilhite (California Institute of Technology, Jet Propulsion Laboratory, Space Sciences Div., Pasadena, Calif.).
American Association for the Advancement of Science, Annual Meeting, 131st, Montreal, Canada, Dec. 26-31, 1964, Paper. 25 p. 6 refs.

Description of the program in progress at the Jet Propulsion Laboratory to develop a system, using a gas chromatograph and mass spectrometer in series, to analyze planetary soil for life-related compounds. To date, most experiments proposed to detect extraterrestrial life have made strong presuppositions about the nature of that life. Recent advances in the state of the art of combined gas-chromatography and mass-spectrometry techniques are considered to offer the possibility of detecting and identifying life-related compounds with minimum speculation (other than being based on organic chemistry) about the life itself. The relative merits of this approach are explored. Background information in the areas of pyrolysis, gas-chromatography miniaturization, sample enrichment devices, and mass-spectrometry miniaturization is presented. (Author) F.R.L.

A65-15227 #

SPACE FLIGHT ANALYTICAL INSTRUMENTATION.

F. J. Briscoe (Perkin-Elmer Corp., Norwalk, Conn.).
American Institute of Chemical Engineers, National Meeting, 55th, Symposium on New Developments in Aerospace Life Support - Part II, Houston, Tex., Feb. 7-11, 1965, Preprint 54e. 13 p. $0.50.
Contracts No. NAS 9-1191; No. NAS 9-2255; No. NAS 9-3355.

General discussion of manned spaceflight analytical instrumentation, with description of a CO_2 sensor presently being qualified for the Apollo program. Following a review of the various requirements for such instrumentation (sophisticated measurement, small size, adaptability to extreme environments, surface finish, stability, and low power requirement), as compared with demands made on commercial instruments, methods used by manufacturers to meet the requirements are outlined. The major acceptable trade-off is a reduction in size with a loss of versatility. A spectrophotometer, for example, is used to scan a large spectral region as a laboratory model. As a spaceflight monitor, all of the large dispersive members may be reduced to a simple nondispersive system for one specific gas, and this is the case with the CO_2 sensor. The purpose of this sensor, extensively described, is to monitor the concentration of CO_2 in the astronaut's inspired breathing gas. The successful demonstration of this method of selective measurement with a known technique has encouraged the exploration of other suitable areas of application. These are briefly discussed. F.R.L.

A65-15251 #

THE APPLICATION OF MICROWAVE SPECTROSCOPY TO CONTAMINANT ANALYSIS.

W. F. White (NASA, Langley Research Center, Hampton, Va.).
American Institute of Chemical Engineers, National Meeting, 55th, Symposium on New Developments in Aerospace Life Support - Part II, Houston, Tex., Feb. 7-11, 1965, Preprint 54d. 12 p. 5 refs. $0.50.

Discussion of the capability of microwave spectroscopy to identify unambiguously the contaminant trace gases in a mixture and to indicate the abundance of each. The aspects of the problem of maximum allowable concentrations are as follows: (1) determination of what contaminants are produced, and in what amounts; (2) definition of a goal for contaminant control systems by determining the tolerable concentration levels of the various contaminants; and (3) development and testing of control systems to these specifications. The characteristics of microwave spectroscopy are reviewed, followed by a description of the Stark spectrometer, considered the most satisfactory arrangement for contaminant analysis, used with a cold trapping system to increase the concentration of contaminants in the sample. Experimental procedures are outlined and preliminary results presented. Comment is made that the great advantage

of microwave spectroscopy is that identification is positive, and the components of a mixture need not be separated and analyzed individually. Also, the sample required is quite small and can be recovered. At present, it is considered that, although early spaceflight use of microwave spectrometers is unlikely because of weight, the technique should find widespread immediate use in the laboratory. F. R. L.

A65-15253 #
HEAT TRANSPORT FLUIDS FOR SPACECRAFT LIFE SUPPORT SYSTEMS.
H. M. Stephens and R. E. Snyder (Douglas Aircraft Co., Inc., Santa Monica, Calif.).
American Institute of Chemical Engineers, National Meeting, 55th, Symposium on New Developments in Aerospace Life Support - Part II, Houston, Tex., Feb. 7-11, 1965, Preprint 54c. 10 p. 7 refs.
$0.50.

Presentation of the results of a study conducted to develop an accurate analytical method for comparing several heat transfer fluids on the basis of efficient operation in a cold plate heat exchanger. The comparison of relative flow and pumping power requirements of various fluids is considered for a given heat exchanger, heat transfer rate, fluid inlet temperature, and load temperature. Test results are considered to show that the technique is accurate. Therefore, this method can be used in the selection of the heat transport fluid with the lowest vehicle power penalty for a specified heat transfer rate for the majority of heating or cooling components. Heat transfer fluid selection for other thermal control system components, such as space radiators in which the heat transfer rates are a function of surface temperature to the fourth power, is accomplished by similar analysis. For any given application the promising heat transport fluids must be chosen to meet the design requirements for properties such as toxicity, flammability, and dielectric strength, before the final selection is made on the basis of minimum power penalty. Experimental comparisons of fluids are described, and the results as well as the physical properties of the fluids are presented in tabular form. F. R. L.

A65-15346 #
OXYGEN REGENERATION IN A SOLID ELECTROLYTE SYSTEM.
H. W. Chandler and F. Z. Pollara (Isomet Corp., Palisades Park, N. J.).
American Institute of Chemical Engineers, National Meeting, 55th, Symposium on New Developments in Aerospace Life Support - Part I, Houston, Tex., Feb. 7-11, 1965, Preprint 47d. 8 p.
$0.50.
NASA-USAF-supported research.

Discussion of a system for regenerating oxygen from carbon dioxide by electrolytic reduction of CO_2 to CO and oxygen, followed by disproportionation of the CO to CO_2 and carbon. In comparison with other systems, this one appeared to have a number of attractive features, and the use of a solid electrolyte cell, because of its relative simplicity of operation and its potential for producing high purity oxygen, was felt to be a more suitable system for space application. The theory is reviewed, and it is shown that the reversible cell potential increases as the carbon monoxide concentration in the gas increases, and also as the pressure of the oxygen product increases. An increase in total pressure on the CO_2 side of the cell would have little effect on cell operation. The catalytic reactor operates best in the temperature range from 500° to 530°C, and uses a nickel catalyst. Increasing the total pressure in the reactor increases the equilibrium CO_2 concentration in the effluent gas and allows the use of a smaller volume reactor and a higher temperature for a given equilibrium concentration of CO_2 in the effluent. An experimental program to test the feasibility of operating a completely closed-cycle system was established and is described in some detail. Based on the information obtained in the preliminary experimental program, an engineering demonstration model was constructed, which is described. From the experience and information gained, it is considered that, with further development, it should be possible to construct a three-man system which would weigh about 100 lb and consume about 1 kw. F. R. L.

A65-15394 #
WATER ELECTROLYSIS USING A HYDROGEN-DIFFUSION CATHODE.
J. E. Clifford, E. S. Kolic, and C. L. Faust (Battelle Memorial Institute, Columbus, Ohio).
American Institute of Chemical Engineers, National Meeting, 55th, Symposium on New Developments in Aerospace Life Support - Part I, Houston, Tex., Feb. 7-11, 1965, Preprint 47f. 12 p.
$0.50.
Contracts No. AF 33(616)-8431; No. AF 33(657)-10988.

Discussion of three methods of water electrolysis that would be operable under weightless conditions, based on the principles of artificial gravity, capillary forces, and gas diffusion through solid metal, either singly or together. Brief note is made that conventional electrolysis cells and rotating cells tend to be large and heavy, and that their inherent problem is the current-blocking effect of gas in the electrolyte between the electrodes. A significant improvement is made by elimination of the hydrogen gas from the electrolyte with a hydrogen-diffusion cathode. When all of the hydrogen passes through the thin cathode of palladium silver (PdAg) foil, electrode spacing can be less, and the diaphragm can be eliminated, leading to lower cell voltage. Oxygen gas bubbles in the electrolyte in the vicinity of PdAg foil do not affect cathode performance. "P_2O_5" and PdAg matrix-type cells are discussed and, in a voltage comparison, it is shown that the low voltage of the PdAg cell and its broad current density range make it attractive for use with either present or future power supplies. The technical feasibility of the PdAg hydrogen-diffusion cathode is demonstrated, with specific reference to the attainment of practically 100% hydrogen transmission during extended operation of experimental electrolysis cells. F. R. L.

A65-15396 #
ELECTROCHEMICAL CONCENTRATION OF CARBON DIOXIDE.
Martin Macklin (Thompson Ramo Wooldridge, Inc., Cleveland, Ohio).
American Institute of Chemical Engineers, National Meeting, 55th, Symposium on New Developments in Aerospace Life Support - Part II, Houston, Tex., Feb. 7-11, 1965, Preprint 54f. 10 p.
$0.50.

Discussion of carbonation cells, which transfer ions formed from gas at one electrode, and discharge the same gas at the opposite electrode. For example, carbon dioxide and oxygen will be transferred from the cathode to the anode of a cell containing a potassium carbonate electrolyte. Experimental and analytical investigations of the application of such electrochemical concentration cells for concentrating carbon dioxide from the atmosphere of closed environments have been undertaken. Studies to date have shown that this approach is sound, and very competitive with other proven means of concentrating carbon dioxide. However, for maintenance of a normal atmospheric carbon dioxide concentration of 0.228 mm Hg, only the carbonation cell is considered feasible. Experimental results to date, and analytical support for these results are discussed. To concentrate carbon dioxide from air, cabin air is supplied to the cathode of a carbonation cell. A mixture of carbon dioxide and oxygen is transferred through the cell electrolyte to the anode. This gas is, in turn, supplied to a cell that will pass only oxygen, thereby concentrating the carbon dioxide. A four-man system maintaining 3.8 mm Hg carbon dioxide partial pressure would range from a power consumption of 550 watts and a weight of 80 lb to 820 watts and a weight of 21 lb. F. R. L.

A65-15397 #
SPACE VEHICLE WATER RECLAMATION SYSTEMS.
D. C. Popma and V. G. Collins (NASA, Langley Research Center, Hampton, Va.).
American Institute of Chemical Engineers, National Meeting, 55th, Symposium on New Developments in Aerospace Life Support - Part II, Houston, Tex., Feb. 7-11, 1965, Preprint 54a. 21 p. 9 refs.
$0.50.

Review of several water reclamation system concepts, with discussion of their various advantages and disadvantages. Man's daily water balance is presented in tabular form, and the figures given are considered to represent an average of what may be expected, and can be used as a starting point for system definition.

They can also be used to illustrate the significance of reclamation systems, and to provide a basis for making decisions concerning these systems. It is shown that there is a daily requirement of 4.69 lb of water that must be made up from stores or reclaimed from waste products containing water. The necessity for water reclamation is demonstrated by consideration of the vehicle launch weight savings at that point in time when the requirement for stored water exceeds the weight of a system to recover water from wastes. It is considered possible through application of today's technology to perform enough reclamation on man's waste products to render a space crew independent of all stored water requirements. Of methods of water reclamation, multifiltration reclamation systems, vacuum compression distillation, the air evaporation system, electrodialysis, and reverse osmosis are discussed in some detail. F. R. L.

A65-15398 #

CONTINUOUS ATMOSPHERE CONTROL USING A CLOSED OXYGEN CYCLE.

A. D. Babinsky and T. J. Walsh (Thompson Ramo Wooldridge, Inc., Cleveland, Ohio).

American Institute of Chemical Engineers, National Meeting, 55th, Symposium on New Developments in Aerospace Life Support - Part I, Houston, Tex., Feb. 7-11, 1965, Preprint 47a. 13 p. $0.50.

Contract No. NASw 650.

Discussion of a continuous regenerative system for long missions with tight cabins, using the Bosch process, which may be summarized as: (1) $CO_2 + 2H_2 \rightarrow C + 2H_2O$, (2) $2H_2O \rightarrow 2H_2 + O_2$, or (3) $CO_2 \rightarrow C + O_2$. Such a system simplifies astronaut problems by relieving the astronauts of repetitive chores during the mission. The major components of the unit are the reduction reactor, carbon filters, carbon collectors, heat exchanger, condenser-separator, compressor, and electrolysis unit, which are individually described in some detail. In operation, carbon dioxide is mixed with the recycle gas stream and fed to the reactor. The reduction occurs in part as indicated in the summary for the Bosch process; however, some CO, CH_4, and other gases may be formed. The carbon which is produced is removed from the reactor by the cycle gases and is filtered from these gases in the hot carbon filters. The gases are cooled in a regenerative heat exchanger, pass through a microfilter, and enter the condenser separator. Here a coolant reduces the temperature below the dew point of the gas so that water is removed. Thus, both products of the ultimate reaction are removed from the reaction zone. The recycle gases are compressed, pass through the regenerative heat exchanger, and back to the reactor. Reactor tests showed that the reactor was capable of operating at rates 50% above design. The final run was 25 days with the unit still in operational condition at the end of the run. F. R. L.

A65-15434 #

IMPROVED SAFETY IN JET TAKEOFFS.

James P. Loomis (Battelle Memorial Institute, Columbus, Ohio).

Battelle Technical Review, vol. 14, Jan. 1965, p. 17-21.

Discussion of the use of dynamic (rate-of-change, or predictive) information as an aid to improving flight control of jet aircraft during the take-off regime. The dynamic characteristic of the aircraft that creates take-off problems is phugoid motion, exemplified by an oscillation of the flight path in which airspeed and altitude (kinetic and potential energy, respectively) are continuously exchanged for one another. It is shown how an acceleration-biased angle-of-attack indicator can assure good climbout paths, even in cases of marginal performance, such as one engine out. Details of simulation tests are presented. It is considered that this control concept provides a continuous control-command signal which allows the pilot to take action that will bring his aircraft to a desired flight condition with a minimum of "hunting." F. R. L.

A65-15537 #

BIODYNAMIC RESPONSE OF THE HUMAN BODY.

Henning E. von Gierke (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).

Southwest Research Institute and USAF, International Symposium on Bioastronautics and the Exploration of Space, 3rd, San Antonio, Tex., Nov. 16-18, 1964, Paper. 29 p. 28 refs.

Review of recent findings (since 1956) concerning the dynamic-mechanical properties of the human body and its reaction to various mechanical force environments. The status and value of mathematical models for studying the body's response to pressure (infrasonic noise and blast) and force changes (vibration and impact) are discussed and consideration is given to the practical application of these models to physiology, pathology, protection engineering and biomedicine, in general, and to the prediction of the body's response to force environments as yet unexperienced. A table gives the density, Young's modulus, volume compressibility, shear elasticity, shear viscosity, sound velocity, acoustic impedance, tensile strength, shearing strength, and breaking index of soft tissue and compact bone. Graphs include the relationship between breaking strength and stiffness from fresh cadaver vertebrae; a comparison of the impedance of a sitting Himalayan bear with the impedance of man and dummy; and the spinal positive injury curve for 50% probability of a compressive fracture due to a rectangular acceleration pulse. W. M. R.

A65-15605

THREE-MAN SPACESUIT VENTILATOR.

Compressed Air, vol. 69, Dec. 1964, p. 22, 23.

Description of a 3-man spacesuit ventilator consisting of a combination of silent, compact, hermetic compressors plus an unusual heat exchanger design. It is stated that this 36 x 36 x 36-in. laboratory-type unit will keep the spacesuits of three astronauts pressurized, ventilated, and air-conditioned during flight simulation testing. The two major design problems that had to be solved are described. M. M.

A65-15625

METHODS FOR RECOVERY OF OXYGEN FROM CARBON DIOXIDE PRODUCED ABOARD SPACECRAFT.

C. S. Coe (Garrett Corp., AiResearch Manufacturing Co., Los Angeles, Calif.).

IN: CHEMICAL ENGINEERING TECHNIQUES IN AEROSPACE.
Edited by D. J. Simkin.
Chemical Engineering Progress, vol. 60, Symposium Series, no. 52. [A65-15607 06-28]
New York, American Institute of Chemical Engineers, 1964, p. 161-172.

Comparison of thermal decomposition, catalytic pyrolysis, hydrogenation, Fischer-Tropsch, Sabatier, and electrolytic processes for the recovery of usable oxygen from waste CO_2. The products, rate equations, heats of reaction, and necessary catalysts are discussed. The most suitable method at present appears to be the catalytic hydrogenation of CO_2 to produce water, followed by electrolysis of the latter to yield oxygen for breathing, with recycle of hydrogen to the reactor. The Sabatier process, $CO_2 + 4H_2 \rightarrow 2H_2O + CH_4$, holds promise for the reduction of power consumption and weight, if the problem of hydrogen recovery from the product methane with subsequent recycle can be overcome. W. M. R.

A65-15628

AN APPROACH TO TRACE CONTAMINANT CONTROL FOR A SPACECRAFT ATMOSPHERE.

W. A. Solitario, A. Bialecki, and G. E. Laubach (North American Aviation, Inc., Downey, Calif.).

IN: CHEMICAL ENGINEERING TECHNIQUES IN AEROSPACE.
Edited by D. J. Simkin.
Chemical Engineering Progress, vol. 60, Symposium Series, no. 62. [A65-15607 06-28]
New York, American Institute of Chemical Engineers, 1964, p. 188-198. 25 refs.

Review of the kinds of atmospheric contaminants - trace vapors, odors, and particulate matter that might be detrimental to the performance of an astronaut - and the means of their detection and control. Comparisons are made with well-documented studies of nuclear submarine atmospheres. Besides those from human

sources, contaminants generated by materials and processes are surveyed. It is found that industrial limits are often much higher than the permissible limits in a spacecraft. A specific example is acrolein: the industrial level is 0.5 ppm, although a concentration of 0.25 ppm can induce moderate irritation of human sensory organs within 5 min. Certain contaminants, such as Freon, which are relatively nontoxic in themselves, may produce toxic products in secondary reactions. A systematic testing program is proposed. W.M.R.

A65-15666 #

TEST OF AUTOMATIC PERSONAL IDENTIFICATION OF A SPEAKER [OPYT AVTOMATICHESKOGO UZNAVANIIA LICHNOSTI GOVORIASHCHEGO].

G. S. Ramishvili (Akademiia Nauk Gruzinskoi SSR, Institut Elektroniki, Avtomatiki i Telemekhaniki, Gorodok Nauk, Georgian SSR).

Akademiia Nauk Gruzinskoi SSR, Soobshcheniia, vol. 36, no. 2, 1964, p. 279-286. 5 refs. In Russian.

Discussion of an experiment conducted with a view to obtaining personal identification of 20 male and 7 female speakers from an analysis of voice signals. In the procedure employed, the voice signal at the analyzer output is expressed in terms of frequency, time, and amplitude. For use in a computer, the signal is quantified with respect to time and amplitude. The process used in pattern recognition is described, and some voice spectrograms obtained from several speakers are presented. V.P.

A65-15773

RESPONSES TO ACOUSTIC STIMULI FROM SINGLE UNITS IN THE EIGHTH NERVE OF THE GREEN FROG.

Murray B. Sachs (Massachusetts Institute of Technology, Dept. of Electrical Engineering and Research Laboratory of Electronics, Cambridge, Mass.).

Acoustical Society of America, Journal, vol. 36, Oct. 1964, p. 1956-1958.

Contract No. DA 36-039 AMC 03200(E); National Institutes of Health Grant No. MH 04737-04; NSF Grant No. GP 2495; Grant No. NsG 496.

Discussion of single-unit activity recorded from the eighth nerve of the green frog. All units are frequency-selective. Units most sensitive to tone bursts of frequencies below 450 cps show little or no spontaneous activity; their responses to tone bursts can be inhibited by tones of frequency above 500 cps. Many of these low-frequency units are sensitive to vibration, and their responses to vibration can also be inhibited. Units with most sensitive frequencies above 650 cps are spontaneous and cannot be inhibited. These high- and low-frequency units probably originate from different sense organs within the otic capsule, and evidence supporting this supposition is presented. Ten units displaying very different response patterns are also discussed. Results of this study are compared with those of Frishkopf and Goldstein for the bullfrog. (Author) F.R.L.

A65-15863

CONTROL IN BIOLOGICAL SYSTEMS - A PHYSICAL REVIEW.

A. S. Iberall and S. Z. Cardon.

New York Academy of Sciences, Annals, vol. 117, Sept. 10, 1964, p. 445-515. 108 refs.

Contract No. NASw-678.

Examination of regulation and control in biological systems from a physical point of view. A background of physical ideas useful for an analysis of regulation and control includes: static regulator performance, dynamic systems performance, control performance, linear control performance, and nonlinear mechanics. The main biological line of description appears to be: Bernard's identification and isolation of the watery interior of the body as the field where biological materials, mechanisms, and processes operate; Cannon's thesis that major material constituents of the interior and many of the processes and mechanisms are regulated by such devices as the hypothalamus and the kidney; Wiener's identification of the computer control nature of the brain, operating through a digital computer type of communications net complex; and McCulloch, Pitts, and Lettvin's sustained effort to find a communications logic for the neural nets. Power production, oscillation control, and the roles of enzymes are among the other topics covered. D.H.

A65-16032

AN INSTRUMENTED SEARCH FOR EXTRATERRESTRIAL LIFE.

E. A. Botan (Avco Corp., Research Center, Wilmington, Mass.).

Space Science Reviews, vol. 3, Dec. 1964, p. 715-723. 16 refs.

Discussion of what to look for in the search for extraterrestrial life, and how to carry out nine suggested biological experiments. The suggested experiments are to demonstrate: (1) if life exists on Mars or elsewhere; (2) what forms, metabolisms, and ecology it has assumed; (3) what its origin was; (4) what the relationship is between extraterrestrial life and Earth's life; (5) what evolutionary pattern it has followed; (6) whether there are possible exotic life forms; (7) whether there are prebiotic forms; (8) what the seasonal variation of flora and fauna are; and (9) how to protect the environment from contamination by Earth organisms. Since one instrument could not obtain all the required answers, it is suggested that an extraterrestrial-life-detecting lander should have a payload of varied, integrated instruments so that the information obtained by one could be verified and expanded upon by others. Ways of carrying out suggested biological experiments, using devices and techniques available now, or being developed, are discussed extensively. F.R.L.

LC ENTRIES

A65-80317
THE EFFECT OF O_2 DEPRIVATION ON THE INDUCTION PHASE OF PHOTOSYNTHETIC CO_2 ABSORPTION [DIE WIRKUNG VON O_2-ENTZUG AUF DIE INDUKTIONSPHASE DER PHOTOSYNTHETISCHEN CO_2-AUFNAHME].
Karl Egle and Gunter Döhler (Frankfurt am Main U., Botanisches Inst., Germany).
Zeitschrift für Naturforschung, vol. 19b, Aug. 1964, p. 773–774. 6 refs. In German.

The effect of oxygen lack was investigated using the sediment of green algae (Chlorella vulgaris Beyerink). The induction phase of photosynthesis and respiration in the dark were explored under normal aerobic conditions and under anaerobic conditions of nitrogen and a 0.03 vol.% CO_2 gas mixture. The study demonstrates that oxygen lack influences only the induction phase of the photosynthetic carbon dioxide uptake; the constant value of the photosynthesis rate is affected to a lesser extent. The effect is reversible. It is suggested that the lack of oxygen blocks a system concerned with primary CO_2 fixation and that this inhibition is slowly removed by the oxygen forming under illumination.

A65-80318
DETERMINATION OF FOOD CONSUMPTION IN SPORTSMEN [DOTYCHCZASOWE WYNIKI BADAN NAD ZYWIENIEM SPORTOWCOW].
L. Namyslowski.
Wychowanie Fizyczne i Sport, vol. 8, 1964, p. 355–366. 27 refs. In Polish.

A survey of food intake and energy expenditure of skiers, cyclists, and weight lifters of the National Polish Olympic team and of students of the Academy of Physical Education of Warsaw showed a direct correlation between energy expenditure and caloric value of food intake. In race-cyclists, however, the food intake was greatly increased, as compared with the respiratory energy index. In general, the sportsmen consumed excessive amounts of fatty meats, ham, and potatoes and very small quantities of fish, fresh vegetables, or milk. A better balanced diet is recommended.

A65-80319
THE VALUE OF SELECTED INDICES OF PHYSICAL CONDITION IN AVIATION [WARTOSC WYBRANYCH WSKAZNIKOW KONDYCJI FIZYCZNEJ W LOTNICTWIE].
Z. Jethon, Z. Sarol, Z. Dziuk, and M. Wojtkowiak.
Wychowanie Fizyczne i Sport, vol. 8, 1964, p. 327–335. 6 refs. In Polish.

After an intensive workout in training camps for pilots, the Crampton test for physical resistance (based on changes in pulse and blood pressure during shifts from the recumbent to the orthostatic position) and the Skibinski circulatory-respiratory index revealed higher values than before training. However, the Bondurant index (based on the ratio of the post-Valsalya overshoot of peripheral pressure and blackout level) did not show any significant increase. After strenuous training, normal physical exercise caused greater increases in the cardiac stroke volume and in the minute volume, and greater lowering of peripheral blood vessel resistance, than before training. In several cases the Crampton and Skibinski values were proportional to the stroke-volume increase. A close direct correlation between personal reaction of subjects and Crampton test values was noted. Crampton and Skibinski tests establish individual accommodation to hypoxia, while the Bondurant index is valid for the appraisal of a subject's acceleration stress tolerance.

A65-80320
THE VALUE OF THE CRAMPTON TEST IN THE EVALUATION OF THE CARDIO-VASCULAR EFFICIENCY ON THE BASIS OF A SIX-YEAR OBSERVATION OF OARSMEN [WARTOSC TESTU CRAMPTONA W OCENIE STANU WYDOLNOSCI SERCOWO-NACZYNIOWEJJ NA PODOSTAWIE 6-LETNICH OBSERWACJJI WIOSLARZY].
M. Lukawska and D. Weinberg-Onichimowska.
Wychowanie Fizyczne i Sport, vol. 8, 1964, p. 305–310. 7 refs. In Polish.

The Crampton test for physical resistance and physical fitness (based on the difference between pulse and blood pressure in the recumbent and standing positions) was performed on 121 male and female members of the Polish National rowing team during training, and conducted for a six-year period. It was proved valid in the appraisal of cardiovascular efficiency and in selecting suitable members of the team.

A65-80321
PHYSICAL FACTORS IN WORK ENVIRONMENT AND PERFORMANCE.
Mostafa El Batawi (Alexandria U., Dept. of Occupational Health, Egypt).
Medicine and Medicaments Courier, vol. 1, Jul.-Aug. 1964, p. 50–58. 8 refs.

Physical factors that may affect man's health and productivity are discussed. The following are included: (1) ambient conditions (excessive heat or cold, humidity, and air movements), (2) industrial noise, (3) atmospheric pressure at high and low altitudes, and (4) conditions of lighting, its distribution, and its color. The need for research in Egypt to set standards of optimum physical factors necessary for optimum production is stressed.

A65-80322
ELICITATION OF SHIVERING BY LOCAL COOLING WITHIN THE VERTEBRAL CANAL [DIE AUSLOSUNG VON KALTEZITTERN DURCH LOKALE KUHLUNG IM WIRBELKANAL].
Eckhart Simon, Werner Rautenberg, Rudolf Thauer, and Masami Iriki (Max Planck-Gesellschaft, W. G. Kerckhoff-Inst., Bad Nauheim; and Giessen U., Physiol. Inst., West Germany).
Pflügers Archiv für die gesamte Physiologie des Menschen und der Tiere, vol. 281, Nov. 10, 1964, p. 309–331. 37 refs. In German.

In dogs, lightly anesthetized with Pernocton, cooling of the vertebral canal was performed by perfusing the subarachnoid space with cool isotonic solution or by means of a thermode placed into the peridural space. At normal or elevated skin and core temperatures, shivering was elicited by a fall of the temperature in the vertebral canal. Besides shivering, vasoconstrictions in the paws were observed. Under conditions of a high ambient temperature of 27° to 33° C and an elevated core temperature, averaging 1° C above the normal level, shivering produced by cooling the vertebral canal led to a mean increase in oxygen consumption of about 30%. Cooling of the vertebral canal neither decreased the blood temperature in the aorta nor the brain temperature. The experiments, therefore, give evidence of the existence of thermosensitive structure in the vertebral canal.

A65-80323
THE EFFECT OF LOCAL TEMPERATURE CHANGES WITHIN THE VERTEBRAL CANAL ON SHIVERING [DIE BEEINFLUSSUNG DES KALTEZITTERNS DURCH LOKALE TEMPERATURANDERUNG IM WIRBELKANAL].
Werner Rautenberg and Eckhart Simon (Max Planck-Gesellschaft, W. G. Kerckhoff Inst., Bad Nauheim; and Giessen U., Physiol. Inst., West Germany).
Pflügers Archiv für die Gesamte Physiologie des Menschen und der Tiere, vol. 281, Nov. 10, 1964, p. 332–345. 13 refs. In German.

Dogs, lightly anesthetized with Pernocton, were exposed to low environmental temperatures, or their core temperature was lowered by means of a thermode placed into the esophagus. When shivering and an increase in oxygen consumption had been evoked, the temperature of the vertebral canal was changed by means of a thermode placed into the peridural space. Shivering was increased by cooling, and was decreased by warming the vertebral canal. The additional increase in oxygen consumption produced by cooling the vetebral canal under the conditions of a low environmental temperature or a low core temperature was greater than the increase in oxygen consumption produced by cooling the vertebral canal under the conditions of elevated skin and core temperatures (4,3 ml min^{-1} kg^{-1} and 2,9 ml min^{-1} kg^{-1} instead of 1,1 ml min^{-1} kg^{-1}). The decrease in oxygen consumption caused by warming the vetebral canal was 2,6 ml min^{-1} kg^{-1} in dogs exposed to low ambient temperatures, and 1,8 ml min^{-1} kg^{-1} in animals with low core temperatures. The results show that heat production can be influenced by cooling as well as by warming the thermosensitive structures located in the vetebral canal.

A65-80324
FACTORS AFFECTING THE MOON ILLUSION.
James E. Hamilton (Ind. U., Div. of Optometry, Bloomington).
(American Academy of Optometry, Annual Meeting, Chicago, Ill., Dec. 10, 1963).
American Journal of Optometry and Archives of American Academy of Optometry, vol. 41, Aug. 1964, p. 490–493.

A review is presented of various observations on theories explaining moon illusion. An evaluation of existing theories by Kaufman and Rock is given, and evidence by these workers supporting the apparent-distance theory is discussed. The author also presents recent observations of the rising of the moon at high altitude which supports the idea that terrain pattern is a crucial factor in the illusion. It is concluded that the extent of the moon illusion can be directly related to the increase in depth and distance perception cues provided by the terrain pattern. As the moon's distance above the terrain increases, the illusion of size becomes smaller. Although other factors may contribute to explaining the illusion, characteristics of the terrain affect the illusion more than any other factor.

A65-80325
THE EFFECT OF CYSTEAMIN AND AET ON OXYGEN CONSUMPTION AND BODY TEMPERATURE IN MICE [DIE WIRKUNG VON CYSTEAMIN UND AET AUF DEN SAUERSTOFFVERBRAUCH UND DIE KORPERTEMPERATUR DER MAUS].
A. Locker and J. E. Pany (Inst. für Biol. und Landwirtsch., Wien; and Wien U., Physiol. Inst., Germany).
Zeitschrift für die gesamte experimentelle Medizin, vol. 138, 1964, p. 331–337. 14 refs. In German.

Cysteamine (β-mercaptoethylamin) and AET(S-β-aminoethyl) isothiuronium-chloride-hydrochloride), respectively, depress the O_2-uptake of the

mouse, the strongest effect being exerted within the first 15 min. following i.p. injection. Following higher doses of cysteamine, a partly significant increase of O_2-uptake occurs in connection with motoric unrest of the animals with increased motor activity. Also following AET the initial decrease of O_2-consumption is reversed later in the experiment; however, at all times a linear dose dependence is preserved. Both substances depress body temperature according to the doses applied. The meaning of these reactions for the mechanism of radioprotection by cysteamine or AET is discussed.

A65-80326
STATIC CONCENTRATIONS OF ATP, ADP, AND AMP IN NORMAL AND CARBON TETRACHLORIDE DAMAGED LIVERS OF MICE [STATIONARE KONZENTRATIONEN VON ATP, ADP UND AMP IN DER NORMALEN UND TETRACHLORKOHLENSTOFFGESCHADIGTEN LEBER VON MAUSEN].
K. H. Goggel, R. Jaroschka, and F. Oppermann (Frankfurt U., Med. Universitätsklin., Germany).
Zeitschrift für die gesamte experimentelle Medizin, vol. 138, 1964, p. 338–344. 20 refs. In German.

Stationary concentrations of adenosine triphosphate (ATP), adenosine diphosphate (ADP), and adenosine monophosphate (AMP) in the liver were determined in situ by enzymatic test methods in mice frozen with liquid nitrogen. Higher values were obtained for ATP and lower values for ADP than reported by others in rats and rabbits. The difference is assumed to be primarily due to difference in technique. Fasting for 52 hours had no effect on the liver nucleotides in contrast to the findings of other researchers. Intraperitoneal injections of carbon tetrachloride resulted in decrease of ATP concentration in the liver tissue, which becomes significant after five hours, and falls to a minimum of 10% of the normal concentration after 24 hours. ATP concentration returned to its initial value 96 hours after CCl_4 injection. Concentrations of ADP and AMP varied only insignificantly.

A65-80327
OXYGEN COST OF BREATHING DURING RESPIRATION AGAINST PRESSURE (DER SAUERSTOFFVERBRAUCH DER ATMUNG BEI BEHINDERUNG DER VENTILATION).
P. Eckermann and H. P. Millahn (Rostock U., Physiol. Inst., Germany).
Zeitschrift für die gesamte experimentelle Medizin, vol. 138, 1964, p. 345–352. 15 refs. In German.

Hindrance of breathing by constant counterpressures increases the work and the oxygen cost of breathing. If the hindrance is applied to inspiration and expiration simultaneously, the decrease of ventilation is proportional to the applied counter-pressures. Hindrance of inspiration causes a much greater oxygen cost at constant ventilation or a stronger hypoventilation at constant oxygen consumption than hindrance of expiration.

A65-80328
THE EFFECT OF DECREASED BODY TEMPERATURE ON CONDITIONED REFLEX ACTIVITY IN THE RAT.
O. Burešová, J. Bureš, J. Hassmannová, and E. Fifková (Czechoslovak Acad. of Sci., Inst. of Physiol., Prague; and Charles U., Inst. of Expti. Pathol., Plzeň).
Physiologia Bohemoslovenica, vol. 13, 1964, p. 220–226. 23 refs.

The ability of rats to extinguish a passive avoidance reaction was studied at normal and decreased body temperatures (32°, 30°, and 25° C). Impairment of negative learning was already pronounced between 32° and 30° C. At 25° C all signs of extinction disappear. In another group of rats it was found that 75% of units showed a decrease in the frequency of spontaneous activity (neurons of the pontomesencephalic region) between 31° and 21° C) which was fairly uniform and had a Q_{10} of 1.8. No sudden change in unit activity could be observed which could correspond to the sudden change in learning ability at the above temperature. It is assumed that the main cause of hypothermic impairment of behavior is functional elimination of the reticular formation of the brain stem.

A65-80329
SLEEP CYCLES IN MICE.
T. Weiss and E. Fifková (Czechoslovak Acad. of Sci., Inst. of Physiol., Prague).
Physiologia Bohemoslovenica, vol. 13, 1964, p. 242–245. 9 refs.

In mice, sleep is characterized by the alternation of two EEG phases—a phase of slow, high voltage activity in the neocortex and hippocampus (lasting about seven minutes) and a "paradoxical" phase (lasting about one and a half minutes), in which the electrocorticogram is desynchronized and regular theta activity appears in the hippocampus. The disappearance of the paradoxical phase is as sudden as its appearance. It is followed by brief behavioral arousal, at the beginning of which the hippocampogram is desynchronized for a few seconds. A new cycle then begins, the animal goes to sleep again and slow high-voltage activity again appears in the neocortex and hippocampus.

A65-80330
EFFECT OF BODY TEMPERATURE CHANGES ON THETA RHYTHM IN THE RAT HIPPOCAMPUS.
T. Weiss (Czechoslovak Acad. of Sci., Inst. of Physiol., Prague).
Physiologia Bohemoslovenica, vol. 13, 1964, p. 246–255. 33 refs.

Hippocampal theta rhythm evoked by high frequency stimulation of the reticular formation can be recorded within the limits of rectal temperatures of 20°–23° C to 40°–42° C. Between 40° and 20° C, a roughly linear decrease in theta rhythm frequency occurs. The frequency of theta rhythm after the administration of physostigmine is similarly related to temperature. The frequency of hippocampal activity depends, within certain limits, on the intensity of reticular stimulation. This phenomenon is still basically preserved at the two extreme temperatures.

A65-80331
DECREASED REACTIVITY OF ADIPOSE TISSUE TO ADRENALINE AND CONNECTIVE TISSUE CHARACTERISTICS IN RATS ADAPTED TO TRAUMA.
Z. Hrůza, M. Jelínková, V. Hlaváčková (Czechoslovak Acad. of Sci., Inst. of Physiol., Prague).
Physiologia Bohemoslovenica, vol. 13, 1964, p. 292–295. 17 refs.

The injection of 50 gamma adrenaline i.p./100 g weight into rats adapted to trauma in the Noble-Collip drum did not cause the release of free fatty acids from adipose tissue as it does in nonadapted animals. No changes in the characteristics of connective tissue in the skin and tail tendon were found after adaptation.

A65-80332
LYMPHOCYTOPENIA FOLLOWING TRAUMA AND ADAPTATION TO TRAUMA.
Z. Hrůza (Czechoslovak Acad. of Sci., Inst. of Physiol., Prague).
Physiologia Bohemoslovenica, vol. 13, 1964, p. 296–299. 5 refs.

Animals adapted to trauma in the Noble-Collip drum (NCD) show a lesser decrease in the number of circulating lymphocytes following NCD trauma for 10 or 30 min. than nonadapted animals traumatized for 5 or 10 min. Following a single injection of 1 mg. ACTH the fall in circulating lymphocytes is only slightly smaller in adapted than nonadapted rats. Lymphocytes obtained from the thymus and incubated in vitro with cortisone or hydrocortisone died at an equal rate regradless of whether they were derived from adapted or nonadapted rats.

A65-80333
RADIOELECTRONICS IN COSMIC MEDICINE [RADIO-ELEKTRONIKA V KOSMICHESKOI MEDITSINE].
I. T. Akulinichev, R. M. Baevskii, K. P. Zazykin, and V. R. Freidel'.
Moscow, Izdatel'stvo "Energiia", 1964 47 p. 13 refs. In Russian.

A detailed description is presented including diagrams of telemetric devices that recorded physiological functions of subjects, engaged in Soviet suborbital and orbital missions. Considerations of ground control and principles involved are discussed. Recption, processing, and evaluation of data are described.

A65-80334
EXPERIMENTAL STUDY ON UTRICULAR FUNCTION BY INDUCING ACTION CURRENT OF THE UTRICULAR NERVE.
Hiroshi Sasaki, Kenichi Ogino, Masatoshi Yamagata, and Hironori Makino (Tottori U., School of Med., Dept. of Oto-Rhino-Laryngol., Yonago, Japan).
Yonago Acta Medica, vol. 7, Nov. 1963, p. 139–145. 9 refs.

Action potentials were recorded from electrodes inserted into the base of the utricle in rabbits for analysis of the response to linear accelerations. The response in various head positions was investigated at the same time. It is concluded that the utricular macula responds to linear accelerations which are perpendicular to the plane of the macula. Stimulation by pressure seems to be more effective than by traction.

A65-80335
THE EFFECT OF SOMAESTHETIC AND ACOUSTIC STIMULI ON THE THRESHOLD OF FUSION OF PAIRED LIGHT FLASHES IN HUMAN SUBJECTS.
G. Horn and P. H. Venables (Cambridge U., Dept. of Anat., Great Britain; and Inst. of Psychiat., Social Psychiat. Res. Unit, London, Great Britain).
Quarterly Journal of Experimental Psychology, vol. 16, Nov. 1964, p. 289–296. 11 refs.
MRC supported research.

The threshold of fusion of paired flashes of light was measured by determining the largest interval between two flashes of light at which they were reported as one and not as two flashes. When a weak electric shock to the skin was presented at the same time as the first flash, the threshold was increased compared to the threshold measured when the flashes were unaccompanied by a shock. As the interval between shock and first flash was increased up to 600 millisec., the effect diminished. A similar pattern of results was obtained using a click, instead of a shock as the additional stimulus. The effect on the two-flash threshold of varying click intensity was also studied. No retroactive effects of the shock on the two-flash threshold were observed.

A65-80336
STIMULUS SET AND RESPONSE SET: THE ALTERNATION OF ATTENTION.
D. E. Broadbent and Margaret Gregory (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, England).

Quarterly Journal of Experimental Psychology, vol. 16, Nov. 1964, p. 309–317. 10 refs.

If a meaningful phrase of three words was presented together with three digits, in such a way that each ear received some items of each of the two types of material, it was no harder to recall the items grouped by type than it was to recall them grouped by ear (Gray and Wedderburn, 1960). This finding is repeated and confirmed in several forms, culminating in the use of three letters of the alphabet and three digits as the six items presented. However, even when all material is presented to one ear, it is harder to recall a list made up of alternate items of two classes than it is to recall the same items arranged as two successive sublists. Rather than interpreting the above situation as one in which alternation of attention between the ears is especially easy, it can be conceived as one in which continued attention to one ear is particularly difficult because it requires alternation between classes of items. A reduction in the presentation rate of stimuli produced a much greater improvement in performance when the items were of two alternated classes than when the classes were left separate. Equally, a slow presentation rate is more helpful when alternation between ears is required than when each ear is to be dealt with separately. These results support the idea that attention takes time to shift; but require a separate kind of attention, to a class of item rather than to a source of stimulation.

A65-80337

ON THE RELATIONSHIP BETWEEN CODING AND THE ABILITY TO SEE WHAT ONE IS DOING IN A SENSORI-MOTOR TASK.

J. A. Leonard (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, England).

Quarterly Journal of Experimental Psychology, vol. 16, Nov. 1964, p. 325–331. 8 refs.

In order to examine the possible interaction between different display-control relationships and the ability to look at what one is doing, an experiment was carried out under four conditions: half the subjects were trained with a color code display, the other half with a positional code; within each of these groups, half the subjects were allowed to look at their hand while performing, and the others were not. It was found that the effect of not being allowed to look was larger with the color code in the initial phase of training, and larger with the positional code in the final phase of training.

A65-80338

THE COMBINATION OF INFORMATION FROM DIFFERENT SOURCES.

R. Davis (Reading U., Dept. of Psychol., England).

Quarterly Journal of Experimental Psychology, vol. 16, Nov. 1964, p. 332–339. 17 refs.

In this experiment subjects were presented with visual information from two different sources and were required to combine it in order to make the correct response. The time interval between the two signals was varied in two different ways (a) regularly and (b) randomly. Reaction times were measured from the moment of occurrence of the second signal. By this means the time course of the decision procedure involved in combining the information from the two sources was analyzed. Results indicate that subjects may deal with the situation in two ways (1) by means of a perceptual classification in which the individual elements are not analyzed separately, or (2) by means of an intellectual classification in which each signal is analyzed sequentially. The two methods correspond to the experimental conditions of (a) regular intervals and (b) random intervals. It is argued that when subjects use the latter strategy the results are consistent with the conception of the human operator as an intermittent analyzing system.

A65-80339

SELECTIVE STRATEGIES IN THE ASSIMILATION OF SUCCESSIVELY PRESENTED SIGNALS.

A. F. Sanders (Inst. for Perception RVO-TNO, Soesterberg, The Netherlands).

Quarterly Journal of Experimental Psychology, vol. 16, Nov. 1964, p. 368–372. 13 refs.

It is found that performance in experiments on the psychological refractory period is highly affected by instructions. In the present experiment, subjects were instructed either to handle the signals successively or to group them. Both instructions were obeyed. This seems to indicate that the human organism has various strategies available. Which strategy is actually applied is likely to depend on the structure of the experimental situation, and partly on momentary preference. This may explain the variety of results in the literature on this subject. Finally, it is found that, when two signals are presented simultaneously, the total reaction time is considerably shorter if the signals are grouped than if they are handled successively. This difference disappears at interstimulus intervals of 0.2 sec. and 0.4 sec. The hypothesis is put forward, that the gain in time at the former case is due to simultaneous perceptual processing of the signals.

A65-80340

LEAD POISONING: HEMATOLOGIC ASPECTS.

Robert C. Griggs (Cleveland Metropol. Gen. Hosp., Dept. of Med., Ohio).

IN: PROGRESS IN HEMATOLOGY, VOL. IV.

Edited by Carl V. Moore and Elmer B. Brown.

New York, Grune and Stratton, 1964, p. 117–137. 81 refs.

Grant PHYS-OH-00064.

A review is presented of the present knowledge of the morphological and metabolic changes caused by lead in the human erythrocyte. Blood values are listed and development of erythrocyte stippling is discussed. Fragility of the erythrocyte during lead poisoning is considered in mechanical and physical terms. The decrease in red blood cell survival rates in lead poisoning is noted from many studies and related to anemia. A review of studies of iron metabolism reveals that lead in some way interferes with cellular (erythrocyte) iron metabolism. It is possible that the effect may prevent the incorporation of iron into the mitochondria. Heme synthesis during lead poisoning is reviewed in man and other systems. It appears that the site of the effect of lead may be at both the delta-aminolevulinic (ALA) and the porphobilinogen (PBG) step of heme synthesis. The effects on prophyrin metabolism in man is related to excretion of ALA and PBG. Treatment and chemotherapy is discussed.

A65-80341

THE INFLUENCE OF TASK COMPLEXITY AND PRACTICE ON PERFORMANCE AFTER LOSS OF SLEEP.

D. M. J. Corcoran (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, Great Britain).

Journal of Applied Psychology, vol. 48, Dec. 1964, p. 339–343. 9 refs.

An experiment was conducted to assess the effects of degrees of task complexity and practice on performance after loss of sleep. The subjects were automatically presented with cards containing 6 symbols every 7 secs. for 23 mins. A symbol had to be chosen on the basis of certain rules. Some cards required one rule, some two, some three, and some four. Group I was practiced after normal sleep and tested after 22 and 46 hours without sleep. Group II was tested without sleep and without previous practice. Group III was practiced and tested after normal sleep. Loss of sleep had a greater effect after practice, but no clear differences emerged between the different levels of task complexity.

A65-80342

CHECK-READING ACCURACY AS A FUNCTION OF POINTER ALIGNMENT, PATTERNING, AND VIEWING ANGLE.

Sidney G. Dashevsky (Rochester U., N.Y.)

Journal of Applied Psychology, vol. 48, Dec. 1964, p. 344–347. 10 refs

Prior studies have shown that detecting a single deviant dial in a 4 X 4 matrix can be markedly improved by aligning the null position of the pointers. In the present study, efficiency in a similar task was rendered 85% more efficient by continuing the line formed by the pointers across the entire panel face. The deviant dial then appeared as a break in a line, a finding consonant with the Gestalt principles of figural continuity; nor did any significant difference emerge when displays were presented to the front and the sides of subjects.

A65-80343

COMBINING CHECK-READING ACCURACY AND QUANTITATIVE INFORMATION IN A SPACE-SAVING DISPLAY.

Sidney G. Dashevsky (US Army Human Engr. Labs., Aberdeen Proving Ground, Md.)

Journal of Applied Psychology, vol. 48, Dec. 1964, p. 348–350.

An experiment was conducted to investigate the possibilities that a check-reading display could be designed to yield quantitative information, and that a more compact format could be used, saving space while preserving information content. The commonly used 4 X 4 display matrix and 0.50 sec. exposure time were used. Application of Gestalt principles proved advantageous. In an earlier study the principle of continuity was found highly efficient for qualitative readout. In the present case, the principle of similarity of form was found to allow quantitative readout with little or no loss of check-reading efficiencies, which ranged between 94% correct detection of errors. Compressing the display by use of semicircular, rather than circular, dials improved performance even beyond its earlier, almost perfect, level.

A65-80344

SENSORY-FEEDBACK ANALYSIS OF BEHAVIOR IN STEREOTELEVISED VISUAL FIELDS.

Karl U. Smith and John D. Gould (Wis. U., Milwaukee).

Journal of Applied Psychology, vol. 48, Dec. 1964, p. 361–368. 7 refs.

NSF and NIH supported research.

This research has devised special methods of 3-dimensional television in order to explore several main problems of visual-feedback control of behavior: (a) evaluate techniques of achieving remote mobile 3-dimensional vision; (b) analyzesensory-feedback control of behavior by means of 3-dimensional vision; (c) preliminarily evaluate the design problems of machines guided with remote stereotelevision and similar display channels. The research was divided into two main parts—an initial phase of equipment development and evaluation and a second phase of controlled experiments. The initial experiments have been reported earlier. In the present sensory-feedback research, the results indicate that stereotelevised feedback has major visual limitations, which can

be overcome in part by instrumental control and that different task patterns with 3-dimensional remote vision present specialized characteristics of sensory feedback, dynamic in nature and best assessed by direct visual-feedback research.

A65-80345
STEREOSCOPIC TELEVISION PURSUIT TRACKING.
John D. Gould (Wis. U., Milwaukee).
Journal of Applied Psychology, vol. 48, Dec. 1964, p. 369–377. 14 refs.
NSF and Natl. Inst. of Mental Health supported research.

This research was concerned with tracking a remote target moving in depth. A 3-D television system provided visual feedback, and direct and aided pursuit tracking systems were evaluated as a function of target speed. The stereoscopic display was shown to be generally satisfactory for remote-control operations, although some fatigue or eyestrain was reported, probably due to the optics of the system. Contrary to previous tracking studies on non-depth courses, it was shown that on a depth course direct tracking is consistently superior to aided tracking at the 3 target speeds used. Amplitude of error analysis provided answers concerning what subjects do when not on target. Tracking behavior was interpreted in terms of the sensory-feedback mechanisms governing the control of motor patterns.

A65-80346
INVESTIGATIONS INTO THE MECHANISM OF THE SYNTHESIS OF AMINO ACIDS IN PLANTS. IV. THE GENESIS OF ASPARTIC ACID IN CHLORELLA VULGARIS [RICERCHE SUL MECCANISMO DI SINTESI DEGLI AMMINOACIDI NEI VEGETALI. NOTA IV: GENESI DELL'ACIDO ASPARTICO IN CHLORELLA VULGARIS].
Giovanni Ferrari and Calvino Passera (Padova U., Inst. di Chimica Agraria, Lab. del Centro di Studio per la Chimica delle Radiazioni, Italy).
Ricerca Scientifica, vol. 34, Serie 2, Jun. 1964, p. 641–644. 5 refs. In Italian.

The aspartic acid, extracted from Chlorella vulgaris by dipping in boiling ethyl alcohol 30 seconds after the addition of $NaH^{14}CO_3$, was degradated by UV irradiation. α-Alanine, β-alanine, serine, and glycine were obtained. The specific activity ^{14}C of these products was found to be very close to that of the original aspartic acid in β-alanine, only 25% in dalanine and serine, and 6% in glycine. We can deduce that most of the ^{14}C lies in the β-carboxyl of aspartic acid. In its biosynthesis there is operating a mechanism of carboxylation of a C_3 compound, e.g., phosphoenolpyruvic acid.

A65-80347
DRIVERS' GALVANIC SKIN RESPONSE AND THE RISK OF ACCIDENT.
D. H. Taylor (Road Res. Lab., Dept. of Sci. and Ind. Res., Great Britain).
Ergonomics, vol. 7, Oct. 1964, p. 439–451. 12 refs.

Galvanic skin responses (GSR) of 20 drivers were measured in two studies covering a wide range of roads and road conditions. Accident histories were obtained for the roads in one of the studies. It is shown that the level of GSR activity does not depend primarily on the nature of the road or conditions. Consistent sources of variations in the GSR are observed, one of them apparently being the subject's driving experience. The distribution of GSR per unit distance traveled was found to be similar to the distribution of accidents per unit total distance of vehicle travel (the accident rate). Results support a view that driving is a self-paced task governed by the level of emotional tension or anxiety which the driver wishes to tolerate. The possible effects of this on the distribution of accidents is discussed.

A65-80348
MULTIPLE CHANNEL MONITORING.
Earl L. Wiener (Miami U., Coral Gables, Fla.)
Ergonomics, vol. 7, Oct. 1964, p. 453–460. 17 refs.
Grant PHS-RG-AC-00126.

The experiment investigated the effect of channel load in a one-, two-, and three-meter vigilance task. Also investigated was the effect of training under one of the three-channel load conditions when subjects were later transferred to a two-channel condition. Subjects monitored a voltmeter display for 64 minutes. Results showed that the overall performance of the two- and three-channel groups was virtually identical, and considerably inferior to the single-channel group in the initial session. A time decrement was exhibited by all three groups. In the second session when all subjects monitored two channels, no significant differences between groups were found. The results are discussed in terms of time-sharing load on the monitor, and implications for equipment design and training.

A65-80349
A NOTE ON THE MEASUREMENT OF PERCEPTUAL MOTOR LOAD.
J. A. Michon (Inst. for Perception RVO-TNO, Soesterberg, The Netherlands).
Ergonomics, vol. 7, Oct. 1964, p. 461–463. 5 refs.

A method of measuring the perceptual motor load of tasks in which activity is negligible, and the input and processing of perceptual data is the important thing. The method involves the use of a simple subsidiary task, the Interval Production Task, consisting of the production by tapping, or nodding, or counting, of as regular a sequence of intervals as possible. One of the advantages of the method is the variety of tasks with which it may be used.

A65-80350
SENSITIVITY TO HEAT AND COLD OF SUMMER AND WINTER PREFERRERS.
Audrey F. M. Driver (Hong Kong U., Dept. of Physiol.)
Ergonomics, vol. 7, Oct. 1964, p. 475–479.

The thresholds of unpleasant heat and cold have been found for Chinese males, some of whom preferred tropical summer and others cooler weather. The summer preferrers had higher thresholds for unpleasant heat in both seasons than the winter preferrers, and these were significantly different. There was no evidence that the threshold for unpleasant cold was related to climatic preference. The threshold of unpleasant heat for one European, tested throughout the year, showed a relationship to skin temperature. Blood pressures of the summer preferrers were significantly higher than those of the winter preferrers.

A65-80351
THE CHEMICAL PROTECTION OF IRRADIATED SKIN. (HISTOLOGICAL ASPECTS).
S. Boccardi and E. Morano (Nat. Inst. for the Study and Treatment of Tumours, Div. of Morbid Anat., Milan, Italy; and Hosp. Maggiore, Vercelli, Italy).
Panminerva Medica, vol. 6, Oct. 1964, p. 362–365. 18 refs.

The behavior of irradiated skin with and without chemical protection by subdermal application of cysteamine was investigated in guinea pigs. After a single high dose of ionizing radiation, the skin was analyzed histologically. The cysteamine-treated animals showed far less thickening of the epithelial layer, and in general the lesions were far less extensive than in the nontreated animals.

A65-80352
EFFECT OF SEVERE PHYSICAL EXERCISE ON THE KIDNEYS.
K. Záruba and B. Fixa (Charles' U. Faculty of Med., Dept. of Med., Hradec Králové, Czechoslovakia).
Medicina Experimentalis, vol. 11, 1964, p. 233–238. 18 refs.

The effect of exercise on renal function was studied in dogs trained to run on a treadmill. Dogs were exposed to running for a period of 1.5 hours until near exhaustion; renal functions were then tested. A significant restriction of renal plasma flow was noted as well as a large increase in the filtration fraction. It is felt that renal ischemia could be developed, especially in the cortex, during severe exercise which could result in pathological changes in the kidney. Symptoms of this damage could be hematuria and proteinuria.

A65-80353
THE UROLOGICAL PROBLEMS IN SPACE MEDICINE.
Abraham T. K. Cockett (Calif. U., School of Med., Dept. of Surg. /Urol., Los Angeles; and Harbor Gen. Hosp., Torrance, Calif.)
Journal of Urology, vol. 92, Nov. 1964, p. 564–567. 9 refs.
Harbor Gen. Hosp., Calif., supported research.
Grant AF-AFOSR-61-81.

Two major problems appear to warrant further investigation by the urologist: (1) possible increased formation of calculi during prolonged space travel and (2) possible decrease in the force of urinary stream during prolonged weightless periods. Supporting evidence in both instances is mentioned. The data, however, appear to be meager and inconclusive. Areas in which research is now in progress have been mentioned. These studies should tend to rule out certain environmental factors which will be encountered in space travel. The final solution of these potential urological problems must await further studies evaluating all of the environmental factors in space. As the astronaut's time of flight increases, needed data should become available.

A65-80354
EFFECTS OF OXIDANTS AND IONIZING CONDITIONS ON SEED GERMINATION AT SUBATMOSPHERIC OXYGEN LEVELS.
S. M. Siegel, C. Giumarro, and L. Halpern (Union Carbide Res. Inst., Tarrytown, N.Y.)
Botanical Gazette, vol. 125, Dec. 1964, p. 241–245. 7 refs.
NASA Contract NASw-767.

When seed germination and seedling growth are limited by subatmospheric oxygen levels, a number of substances act as stimulants. These include a variety of substituted p-benzoquinones, organic peroxides, and inorganic oxidants. Of the latter, most have marginal effects, if any, but hydrogen peroxide is quite active under conditions which preclude its serving as a general source of atmospheric O_2. Indirect α radiation from Po^{210} was highly effective as a stimulant, even under anaerobic conditions. Representative subatmospheric stimulants were found to be inactive or inhibitory when applied in air. Results were discussed both in terms of the role of various oxidants as substitutes for O_2 and the changing role of various oxidants (stimulation vs. inhibitions) when oxygen tension is modified.

A65-80355
OXYGEN IN THE ANIMAL ORGANISM.
Frank Dickens and Eric Neil, ed. (Middlesex Hosp. Med. School, Great Britain).
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil (Middlesex Hosp. Med. School, Great Britain). Oxford, Great Britain, Pergamon Press, 1964, xviii +694 p.

The following papers are listed in the table of contents:

SOME STUDIES ON THE REACTIONS OF OXYGEN AND CARBON DIOXIDE IN HAEMOGLOBIN SOLUTIONS AND IN BLOOD. F. J. W. Roughton. p. 5–27.

OXYGEN SUPPLY IN AQUATIC FORMS. J. Krog. p. 29–48.

CHEMISTRY, GENETICS, AND FUNCTION OF INVERTEBRATE RESPIRATORY PIGMENTS - CONFIGURATIONAL CHANGES AND ALLOSTERIC EFFECTS. C. Manwell. p. 49–119.

STRUCTURE AND FUNCTION OF HAEMOGLOBIN AND MYOGLOBIN. E. Antonini. p. 121–140.

ELECTRONIC STRUCTURE AND PROPERTIES OF OXYGEN. J. S. Griffith. p. 141–154.

THE REGULATION OF CARBOHYDRATE UTILIZATION. J. M. Lowenstein. p. 163–177.

PROBLEMS AND CONTROVERSIES IN THE FIELD OF THE RESPIRATORY CHAIN-LINKED DEHYDROGENASES. T. P. Singer and T. Cremona. p. 179–217.

THE OXYGEN ELECTRODE. I. S. Longmuir. p. 219–237.

THE MEASUREMENT OF P_{O2} IN TISSUES. D. B. Cater. p. 239–246.

A65-80356
REFLEX CIRCULATORY AND RESPIRATORY RESPONSES TO HYPOXIA.
M. De Burgh Daly (St. Bartholomew's Hosp. Med. Coll., Dept. of Physiol., London, Great Britain).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 267–276. 49 refs.
[See A65-80355].

Acute systemic hypoxia causes an increase in respiratory minute volume due to stimulation of the carotid and aortic body chemoreceptors by the reduction of arterial blood oxygen tension. Accompanying this hyperpnea are changes in the cardiovascular system which in man, and in some laboratory animals, include tachycardia, and increase in cardiac output and peripheral vasodilation. A review of the literature dealing with these experiments is presented. Because hyperpnea of ventilation hypoxia is due to a chemoreceptor reflex, it has been assumed that the cardiovascular effects are attributable to the same mechanism. The evidence reviewed briefly indicates however that not only are the mechanisms involved complex, but that the circulatory effects cannot be attributed to a direct effect of excitation of the peripheral chemoreceptors. There is strong evidence that the cardiovascular effects of ventilation hypoxia are, at least in part, secondary to changes in pulmonary ventilation. Other mechanisms participating in the responses have yet to be found.

A65-80357
THE RESPIRATORY RESPONSE OF MAN TO HYPOXIA.
D. J. C. Cunningham, J. M. Patrick, and B. B. Lloyd (U. Lab. of Physiol., Oxford, Great Britain).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 277–293. 29 refs.
[See A65-80355].

Induction of severe hypoxia is commonly accompanied by hypercapnia and acidosis. The hypoxic stimulus is an important component of the intense stimulation caused by asphyxia. Experiments are reviewed in which a relatively high threshold for oxygen stimulation is demonstrated using rebreathing and steady-state techniques with human subjects, and in which the effects of oxygen stimulation are evaluated during marked hypercapnia. Included are representative diagrams, graphs, and equations.

A65-80358
AEROBIC WORK CAPACITY.
Per-Olof Åstrand and Erik Hohwü Christensen (Gymnastiska Centralinst., Dept. of Physiol., Stockholm, Sweden).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 295–314. 47 refs.
[See A65-80355].

Physical performance is based on the following factors: energy output (aerobic and anaerobic processes), neuromuscular function, and psychological factors. The importance of the different factors varies with the task. When large muscular groups are very active for a minute or longer the individual's aerobic work capacity is to a high degree decisive for the capability. Discussed is the following relationship: (1) the oxygen uptake during exercise; (2) aerobic work capacity and age and sex; (3) aerobic work capacity and capacity for prolonged continuous muscular work; and (4) continuous versus intermittent muscular work.

A65-80359
SOME PHYSIOLOGICAL RESPONSES TO CHRONIC HYPOXIA.
Arthur B. Otis (Fla. U., Coll. of Med., Dept. of Physiol., Gainesville).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 315–323. 18 refs.
[See A65-80355].

The hyperventilation occurring at altitude is of adaptive value. The higher the ventilation the less the amount of oxygen removed from each volume of inspired air. By comparison, individuals hypoxic from the presence of right to left shunts usually have increased ventilation which is of negative value in improving the delivery of oxygen to the tissues, and present the typical acidbase picture of metabolic acidosis, partially, but not completely, compensated by increased ventilation. Such acidosis is not advantageous for the high altitude dweller. The pressure at which oxygen is delivered to the tissues appears to be relatively independent of pH. Individuals with chronic hypoxia usually have polycythemia and consequently an increased oxygen capacity of the blood, which is proportional to the severity of hypoxia. They typically have a higher oxygen content in their arterial blood, although a lower oxygen tension than in normal persons. On the other hand, in hypoxia resulting from a right to left shunt, an increased oxygen capacity raises the oxygen tension in both arterial and venous blood because the arterial oxygen tension is not only determined by the lung oxygen load but also by that in venous blood shunted to the arterial side of the circulation. These effects are illustrated graphically.

A65-80360
THE INTRACELLULAR OXIDATION-REDUCTION STATE.
Britton Chance, Brigitte Schoener, and Frederick Schindler (Pa. U., Johnson Res. Found., Philadelphia).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 367–392. 48 refs.
[See A65-80355].

Following a review of various methods for measuring the physical properties in vivo of oxidative phosphorylation in the respiratory chain, data are presented on hypoxia of the rat cerebral cortex. Comparison is made of the fluorescence increases observed on the rat brain cortex and the kidney cortex, with ischemia by decapitation, with cessation of breathing, with oxygen concentration measured by platinum electrode, and with the electroencephalogram. Only under conditions where the brain cortex energy reserves were exhausted, either by previous episodes of hypoxia or by treatment with a convulsant such as metrazol or pictotoxin, was there cessation of electrical activity closely associated with termination of oxidative phosphorylation activity. A discussion is presented on the correlation of rat brain hypoxia with oxygen concentration and oxyhemoglobin dissociation, and three methods are described for determining intracellular oxygen concentration corresponding to varying degrees of oxidation-reduction of mitochondrial DPNH. Cytochrome a_3 reduction and pyridine nucleotide reduction obtained from a stirred flow reactor are correlated as a function of oxygen input rate and oxygen concentration.

A65-80361
FACTORS AFFECTING THE RATE OF EXCHANGE OF O_2 BETWEEN BLOOD AND TISSUES.
R. E. Forster (Pa. U., Graduate School of Med., Dept. of Physiol., Philadelphia).
IN: OXYGEN IN THE ANIMAL ORGANISM
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 393–409. 30 refs.
[See A65-80355].

Assuming that the capillary system can be described adequately by a uniform single capillary, surrounded by a concentric cylinder of nourished tissues, equations are presented for calculating the distribution of oxygen in the tissues around the capillary. An attempt is made to bring out the

importance of numerical values assigned to various parameters in drawing conclusions concerning the magnitude of oxygen partial pressure gradients (P_{O_2}), between the capillary and tissues by plotting representative calculated curves. The drop in P_{O_2} within the tissue around the capillary may represent the major part of the total pressure drop from the blood to the mitochondrion, but the calculated values depend almost entirely on values assumed for the dimensions and other parameters of tissue. Equations are used to describe diffusion of oxygen within capillary blood and across the capillary wall, within the cell, and within the mitochondria. After consideration of the factors concerned with oxygen exchange between capillary blood and the tissues, it is concluded that the most important factor is the capillary blood volume provided for each milliliter of tissue volume.

A65-80362
OXYGEN CONSUMPTION AND SODIUM REABSORPTION IN THE MAMMALIAN KIDNEY.
Kurt Kramer and Peter Deetjen (Göttingen U., Physiol. Inst. Germany).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 411–431. 42 refs.
[See A65-80355].

In order to prove the stoichiometric relationship between oxygen consumption and sodium actively transported (QNa/O_2) through the kidney, experiments were performed on anesthetized dogs with the kidney in situ. A dual linear relationship was observed between oxygen consumption and blood flow and between oxygen consumption and glomerular filtration rate (GFR). Arteriovenous oxygen saturations increased, and a constancy was found of QNa/O_2. A series of changes of sodium reabsorption induced by injection of hypertonic solutions, vasodilating substances, and breathing hypoxic mixtures did not change the QNa/O_2. Strong osmotic diuresis did affect the energy output of the kidney to the effect that, per Na^+ transported, a higher rate of oxygen consumption appeared. Cyanide injected into the renal artery poisoned both the metabolism for sodium transport and basal processes. The causal relationship of sodium reabsorption and oxidative energy supply was demonstrated using the technique of mannitol diuresis and stopped flow. Discussion is presented on medullary oxygen consumption, sodium transport, the counter-current system of Henle's loop, and anaerobic energy requirement of medullary tissue. It is concluded that sodium load, not blood flow, is the determinant factor of oxygen consumption. With the autoregulation of blood flow, GFR is also autoregulated and with it, the sodium load. Renal oxygen consumption varies with the sodium load, of which there appears to be no limit in oxygen supply. With an increased sodium load, the proximal tubule seems alwasy to reabsorb the same percentage of the load.

A65-80363
CEREBRAL BLOOD SUPPLY AND CEREBRAL OXIDATIVE METABOLISM.
Carl F. Schmidt (US Naval Air Develop. Center, Aviation Med. Acceleration Lab., Johnsville, Pa.).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 433–452. 7 refs.
[See A65-80355].

The human brain represents abount 2% of the body weight and accounts for 20% of the body's total oxygen consumption and 15% of the total cardiac output. Increased oxygen consumption by the brain during increased cerebral functional activity in man has not been demonstrated, but there is ample evidence that impairment of cerebral functions by drugs or diseases is associated with decreased cerebral oxygen consumption. The lower limit of the pysiological range is the same as that of monkeys, viz. half the normal level. The increase in cerebral blood flow during increased cerebral activity in animals is due to automatic decrease in cerebral vascular resistance. The mechanisms are still obscure, but vasoconstrictor innervations probably are involved. The fact that irreversible damage to brain tissue occurs when cerebral oxygen consumption is reduced to less than half the normal suggests that in the brain an unusually large proportion of total energy input is dedicated to the maintenance of cell structure.

A65-80364
GENERAL EFFECTS OF OXYGEN AT HIGH TENSION.
John W. Bean (Mich. U., Dept. of Physiol., Ann Arbor).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 455–474. 86 refs.
[See A65-80355].

A review is presented of the more outstanding adverse effects of high oxygen pressure observed in man and in animal experiments. Included are the effects on the lungs (edema, pleural effusion, erythrocyte extravasation, hemorrhage, etc.), vascular system, central nervous system (convulsive seizures), cerebral blood flow, cerebral oxygen tension, oxygen dissociation curve of mammalian blood, sympathetic nervous system, pituitary-adrenal system, and isolated tissues or whole organisms, presumably by direct effects on specific enzymes. It has been demonstrated that "Tris" [tris (hydroxymethyl) amino methane], an in vivo carbon dioxide buffer, has been effectively used as a protective agent against the toxic action of high oxygen pressure.

A65-80365
BIOLOGICAL EFFECTS OF OXYGEN.
Rebeca Gerschman (Buenos Aires U., Fac. de Farm. y Bioquim., Argentina).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 475–494. 146 refs.
[See A65-80355].

A review of the literature on the biological effects of oxygen reveal that they are highly relevant to the problems of cell division, growth, aging, mutagenesis, radiobiology, and cancer. The demonstration by electron spin resonance spectroscopy of free radicals in living material has confirmed Michaelis theory (the reduction of oxygen can proceed by univalent steps, implying intermediate free radical states) and strengthened the views on the mechansim of oxygen toxicity. It is postulated that the basic mechanism of oxygen toxicity has similarities with the initial biological effects of x-irradiation. This theory has led to experiments using a variety of chemicals (antioxidants, glutathione, γ-amino-butyric acid, vitamine E, carotenoids for plants, coenzyme II, cystein) which proved to be capable of modifying oxygen toxicity.

A65-80366
THE TOXIC ACTION OF OXYGEN ON METABOLISM AND THE ROLE OF TRACE METALS.
Niels Haugaard (Pa. U., Schools of Med., Dept. of Pharmacol., Philadelphia).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 495–507. 43 refs.
[See A65-80355].

Metabolic changes produced by high oxygen tension are reviewed briefly, including the inhibition of tissue respiration in vitro, enzyme activity, phosphorylation in the brain, and inhibition of tissue cultures. Coenzymes possessing sulfhydryl groups are involved in many metabolic reactions susceptible to oxygen toxicity. Trace metals and the chelating agent EDTA (ethylenediaminetetraacetic acid) have been effective in the inhibition of oxygen toxicity in cell-free rat heart homogenates and in the intact animal. Included is a discussion of recent studies on the mechanism of oxygen toxicity in the rat brain.

A65-80367
THE ROLE OF OXYGEN IN THE PHENOMENA OF CHEMICAL PROTECTION AGAINST IONIZING RADIATION
Z. M. Bacq (Liege U., Lab. de Pathol. et Therap. Gen., Belgium) and P. Alexander (Chester Beatty Res. Inst., London, Great Britain).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 509–536. 153 refs.
[See A65-80355].

There seem to be many facts in favor of anoxia as the main (though not the exclusive) mechanism for the radioprotective action in mammals by acetylcholine, histamine, catecholamines, and chlorpromazine. For tryptamine and 5-hydroxytryptamine, arguments in favor of anoxia are numerous, but mechanisms not involving oxygen cannot be excluded. As far as the most powerful radioprotectors, the thiol protectors (cysteamine, cysteine, AET or mercaptoethylguanidine), are concerned, anoxia is not the main mechanism responsible for radioprotection either in mammals, cells in vitro, or viruses. Radiochemical investigations, first with model systems and more recently with cell nuclei and whole cells, have provided clear indications that these sulfhydryl compounds protect by a repair mechanism in which oxygen is involved. In vegetative systems a repair reaction by added sulfhydryl substances would be essentially instantaneous and at its most effective in the presence of oxygen.

A65-80368
OXYGEN STORES OF MAN.
Hermann Rahn (N. Y. State U. at Buffalo, Dept. of Physiol.)
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 609–619. 14 refs.
[See A65-80355].

Under conditions of prolonged apnea the body calls upon the oxygen stores of the blood and lung. The relative contribution of these two sources depends upon the absolute size of the lung oxygen stores. The latter can be greatly altered by (1) size of lung volume, (2) fraction of oxygen, and (3) barometric pressure. Various examples are discussed. It appears that the length of a maximal voluntary apnea is to a large extent controlled by the size of oxygen stores. The important key to asphyxial defense is the wise administration of the body's oxygen stores by preferential distribution to the oxygen sensitive tissue. To what extent this occurs in man has yet to be determined.

A65-80369
PROBLEMS OF OXYGEN SUPPLY DURING EXPOSURE TO HIGH G.
A. G. H. Bjurstedt (Karolinska Inst., Dept. of Aviation Med., Stockholm, Sweden).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 631–640. 24 refs.
[See A65-80355].

Bilateral cervical vagotomy radically altered the respiratory response in anesthetized dogs exposed to positive g: initial apnea no longer occurred and the animals showed marked hyperventilation during centrifugation. Severing the carotid sinus nerves after vagotomy resulted in respiratory failure. Preservation of carotid chem- or baroreceptors, or both, was essential for the development of hyperventilation in dogs under gravitational stress. In man exposed to high g forces in the head to foot direction, great falls occurred in arterial pressure at the level of the carotid bodies. Concomitant vigorous hyperventilation may be due in part to ischemic excitation of carotid chemoreceptors. Hyperventilation in man was especially marked if no anti-g suit was used. Arterial desaturation occurred during prolonged exposures to accelerative forces in dog experiments, proving the development of a large intrapulmonary shunt as a result of this type of stress. In humans, arterial oxygen tension also decreased during a two-minute exposure to 5 g. Men exposed to prolonged gravitational stress in the centrifuge showed derangement in pulmonary gas exchange at, or slightly above 5 g lasting for a two-minute period. Impairment of arterialization of the blood was found which caused pulmonary shunt development.

A65-80370
ATMOSPHERE AND EVOLUTION.
Daniel L. Gilbert (Jefferson Med. Coll., Dept. of Physiol., Philadelphia).
IN: OXYGEN IN THE ANIMAL ORGANISM.
(Symposium of the International Union of Biochemistry and the International Union of Physiological Sciences, London, 1963, Proceedings.)
Edited by Frank Dickens and Eric Neil.
Oxford, Great Britain, Pergamon Press, 1964, p. 641–655. 61 refs.
[See A65-80355].

A biosphere might possibly exist on a planet during the time its atmosphere evolved from one composed of molecular hydrogen, helium, water, methane, and ammonia into one composed of carbon dioxide and molecular nitrogen. In the beginning and ending of such a possible life-stage on a planet, the atmosphere could be expected to contain little or no molecular oxygen. The formation of water by the marriage of oxygen, the second most abundant chemically reactive cosmic element, to hydrogen, the predominant cosmic element, is the essential source of energy for most of the earth's biosphere. The destructive influence of this energy source on the biosphere is reflected in the phenomenon of oxygen toxicity.

A65-80371
CURRENT DIAGNOSIS AND TREATMENT.
Henry Brainerd (Calif. U. School of Med., Dept. of Med.; and U. of Calif. Hosp., San Francisco), Sheldon Margen (Calif. U., Dept. of Nutr. Sci., Berkeley; and Calif. U. School of Med., Dept. of Biochem., San Francisco), and Milton J. Chatton.
Los Altos, Calif., Lange Medical Publications, 1964, [9]+ 870 p. $9.50.

Contained within this clinical tome of diagnosis and treatment of diseases is a section on the medical effects of air travel and selection of patients for air travel. Physical ailments and diseases which contraindicate air travel are listed. These include cardiovascular diseases, respiratory diseases, anemia, hernias, postoperative conditions, etc.

A65-80372
LIQUID WATER AND THE ORIGIN OF LIFE.
Stanley L. Miller (Calif. U., Dept. of Chem., La Jolla).
IN: ISOTOPIC AND COSMIC CHEMISTRY.
Edited by H. Craig, S. L. Miller, and G. J. Wasserburg.
Amsterdam, North-Holland Publishing Co., 1964, p. 103–113. 28 refs.
NSF Grant G-22000.

The origin of life and the growth of living organisms in nonaqueous solvents is discussed. This possibility cannot be proved impossible, but it is very unlikely. The temperature limits for living organisms in an aqueous medium are at most between −80° and +150°. Various solutes that could depress the freezing point of water are examined. The freezing point of water can be raised in a dense atmosphere by the formation of gas hydrates. Some of these hydrates are denser than water and the oceans would freeze from the bottom up. These considerations limit the number of planets on which life can arise and persist.

A65-80373
PETROLOGICAL AND COMPOSITIONAL RELATIONSHIPS IN METEORITES.
Harmon Craig (Calif. U., Dept. of Earth Sci., La Jolla).
IN: ISOTOPIC AND COSMIC CHEMISTRY.
Edited by H. Craig, S. L. Miller, and G. J. Wasserburg.
Amsterdam, North-Holland Publishing Co., 1964, p. 401–451. 78 refs.

A discussion is given of the past and present classification of meteorites based on their mineral composition. New data from superior analyses are shown. In the carbonaceous chondrites the concentrations of MgO, SiO_2, Na_2O and K_2O show a marked linear variation with sulfur content, when calculated on a water and carbon free basis. Recent papers on the composition of these chondrites are reviewed.

A65-80374
ALGAE AND MAN.
Daniel F. Jackson ed. (Syracuse U., Dept. of Civil Engr., N. Y.).
Edited by Daniel F. Jackson (Syracuse U., Dept of Civil Engr., N. Y.).
New York, Plenum Press, 1964, X+434 p. $14.50.

The papers presented in this book are based on lectures given at the NATO Advanced Study Institute, July 22-August 11, 1962, Louisville, Kentucky. Selected papers have been abstracted separately.

CONTRIBUTIONS OF CURRENT RESEARCH TO ALGAL SYSTEMATICS. G. W. Prescott (Michigan State U., Dept. of Botany, East Lansing, Mich.), p.1–30.

CRITERIA AND PROCEDURES IN PRESENT-DAY TAXONOMY. C. van den Hoek (Rijksherbarium, Leiden, Netherlands), p. 31–58.

THE GROSS CLASSIFICATION OF ALGAE. Tyge Christensen (Copenhagen U., Institut for Sporeplanter, Denmark), p. 59–64.

THE CYTOLOGY OF THE PHAEOPHTA – A REVIEW OF RECENT DEVELOPMENTS, CURRENT PROBLEMS, AND TECHNIQUES. Margaret Roberts (Hull. U., Dept. of Botany, England), p. 65–76.

ENVIRONMENTAL CONDITIONS AND THE PATTERN OF METABOLISM IN ALGAE. G. E. Fogg (Westfield Coll. Dept. of Botany, London, England), p. 77–85.

MICRONUTRIENT REQUIREMENTS FOR GREEN PLANTS, ESPECIALLY ALGAE. Clyde Fyster (Charles F. Kettering Research Lab., Yellow Springs, Ohio), p. 86–119. 184 refs. [See A65-80375].

SOME PROBLEMS REMAINING IN ALGAE CULTURING. A. G. Wurtz (Director, Station of Applied Hydrobiology, Le Paraclet par Boves, France), p. 120–137. [See A65-80376].

THE ECOLOGY OF BENTHIC ALGAE. F. E. Round (Bristol U., Dept. of Botany, England), p. 138–184.

A DISCUSSION OF NATURAL AND ABNORMAL DIATOM COMMUNITIES. Ruth Patrick (Academy of Natural Sciences, Dept. of Limnology, Philadelphia, Pa.), p. 185–204.

A65-80375
MICRONUTRIENT REQUIREMENTS FOR GREEN PLANTS, ESPECIALLY ALGAE.
Clyde Fyster (Charles F. Kettering Res. Lab., Yellow Springs, Ohio).
IN: ALGAE AND MAN.
Edited by Daniel F. Jackson.
New York, Plenum Press, 1964, p. 86–119. 184 refs. [See A65-80374].

A review is presented of the nutritional requirements of various types of green plants, especially the blue-green algae and the green algae. For each of the 12 elements discussed a review of the literature is given. Mineral requirements for the heterotrophic and autotrophic growth of Chlorella pyrenoidosa are listed. It is concluded that for algae manganese, iron, chlorine, zinc, and vanadium are needed for photosynthesis. It is also indicated from the literature that calcium, manganese, boron, cobalt, copper, and silicon are needed in small quantities for other metabolic functions such as growth, cell wall formation, etc. Many references are made to nutritional studies on Chlorella.

A65-80376
SOME PROBLEMS REMAINING IN ALGAE CULTURING.
A. G. Wurtz (Sta. d'Hydrobiol. Appl., Le Paraclet par Boves, France).
IN: ALGAE AND MAN.
Edited by Daniel F. Jackson.
New York, Plenum Press, 1964, p. 120–137. [See A65-80374].

Various outstanding problems in the culturing of algae are discussed. Problems of major importance to raising algae for use in photosynthetic gas exchangers include estimation of growth and yield, obtaining bacteria-free algae cultures, and the effect of innoculum size on culture growth. Other problems mentioned primarily are concerned with industrial uses of algae. Methods of estimating cell growth such as colorimetry, turbidity measurement, and cell count are discussed. Techniques of isolating cultures are mentioned. The author describes one of his techniques involving boiling of the growth medium. A brief discussion is given of utilizing algae in a food chain using fish and arthropods, which in turn could be used for human food.

A65-80377
PRINCIPLES OF PRIMARY PRODUCTIVITY: PHOTOSYNTHESIS UNDER COMPLETELY NATURAL CONDITIONS.
Jacob Verduin (Bowling Green State U., Dept. of Biol., Ohio).
IN: ALGAE AND MAN.
Edited by Daniel F. Jackson.
New York, Plenum Press, 1964, p. 221–238. 7 refs. [See A65-80374].

A discussion is presented of the desirability of studying photosynthesis under completely natural environmental conditions. Factors concerning the advantages of this method, rather than laboratory culturing techniques, are cited. Data from growing algae in natural ponds are given. A comparison of photosynthesis and respiration in two small ponds shows general agreement with data from the literature. A much neglected limiting-factor equation derived from the Baule-Mitscherlich equation is analyzed as to photosynthetic yields. Various limiting factors are found and discussed. Lambert-Beer's law is applied to aquatic environments giving an equation from which a coefficient relating light penetration to suspension concentration can be evaluated. Further application of this equation to aquatic environments is recommended.

A65-80378
MASS CULTURE OF MICROALGAE FOR PHOTOSYNTHETIC GAS EXCHANGE.
Richard J. Benoit (Gen. Dyn. Elec. Boat, Res. and Develop., Chem. Engr. Sect., Groton, Conn.)
IN: ALGAE AND MAN.
Edited by Daniel F. Jackson.
New York, Plenum Press, 1964, p. 413–425. 14 refs. [See A65-80374].

A short history of the use of algae for photosynthetic gas exchange is given along with comments on the use of electrochemical methods of producing oxygen. The main body of the article is concerned with the environmental factors in culturing algae and the practical limits for algal photosynthetic systems. Growth rates in relation to light intensity, culture density, aging, dilution rate, and other factors are discussed. The practical application of algae culturing to submarines and space flight is discussed.

A65-80385
EFFECT OF EXERCISE ON INTRAOCULAR TENSION AND ITS RELATIONSHIP TO OPEN ANGLE GLAUCOMA.
Kenneth H. Cooper, Philip Lempert, and James F. Culver (USAF School of Aerospace Med., Aerospace Med. Div., Specialty Training and Ophthalmol. Dept., Brooks AFB, Tex.)
Aerospace Medicine, vol. 36, Jan. 1965, p. 51–53. 11 refs.

Three subjects suspected of having glaucoma were seen at the USAF School of Aerospace Medicine. Following the completion of their work-ups, they were given a Balke-Ware treadmill performance test which was terminated when the pulse reached 180 beats per minute. Repetitive intraocular pressures taken afterwards showed a consistent fall of at least 27 percent, and the pressure remained at below initial levels for at least 55 minutes.

A65-80387
CONVULSIONS IN A PILOT FOLLOWING DRUG WITHDRAWAL.
J. Richard Dille, Pei Chin Tang, and Samuel F. Flynn (FAA, Office of Aviation Med., Aeron. Center Med. Clin., Oklahoma City, Okla.)
Aerospace Medicine, vol. 36, Jan. 1965, p. 55–58. 12 refs.

A case history of a commercial pilot with psychiatric problems, seizures, and headaches is presented. The pilot, referred for medical evaluation by his supervisor, denied having any medical problems and attributed his symptoms to an increased workload and problems at home. He also denied use of narcotic drugs, tranquilizers, sedatives, or alcohol in any form. The presence of fast and slow waves appeared to indicate that he had taken some form of drug prior to an electroencephalographic recording. During hospitalization the patient had at least one major seizure plus minor ones occurring during withdrawal from all medications. Definite evidence was obtained that the patient had taken barbiturates, meprobamate, and diazepam of unknown dosage and duration. It was also determined that he received thirty 100 mg. capsules of pentobarbital per month for several months and diazepam for one month prior to the initial electroencephalogram. Since withdrawal symptoms usually follow abrupt cessation after prolonged overdosage, pentobarbital is the most likely cause of producing fast and slow waves in the electroencephalogram and convulsions upon withdrawl.

A65-80388
READERSHIP SURVEY ON ABSTRACTS OF CURRENT LITERATURE SECTION OF AEROSPACE MEDICINE: A REPORT BY COMMITTEE ON SCIENTIFIC COMMUNICATIONS.
Aerospace Medicine, vol. 36, Jan. 1965, p. 87–89.

Results are presented of a survey using a questionnaire with items related to frequency of use, information sought, principal use, recommended improvement, and desirability of current abstracts and their annual indexes prepared by the Library of Congress under NASA contract and appearing in Aerospace Medicine. The sampling included 2502 members and 1403 nonmembers, both foreign and domestic. Replies were received from 1585 individuals or 41% (53% of members surveyed) within a two-week period. Utilization according to affiliation (e.g., Civil Aviation Medical Association and Aerospace Industrial Life Sciences Association) and according to primary occupation (e.g., research administrators, flight surgeons, FAA medical examiners, and physicians in practice) was analyzed. Replies favored continuation of the current abstracts by over 98%.

A65-80389
A NEURO-PSYCHOLOGICAL EXPLANATION OF THE UNITY OF BINOCULAR VISION.
Deryck Humphriss
Review of Optometry, vol. 101, Sep. 1, 1964, p. 31–44. 28 refs.

The summatory match mismatch theory of cortical activity is applied to phenomena of binocular vision, as follows: (a) binocular vision takes place in an area of association cortex, (b) binocular vision can be shown to be a summatory process, (c) stereoscopic vision is the result of an analysis of the degree of mismatch in an otherwise matching pattern, (d) stereoscopic vision is a high level function which can be dominated or inhibited by monocular clues. On this basis binocular visual performance may be related to psychological dimensions of rigidity, lability, perseveration, etc.

A65-80390
A DETECTION METHOD AND PROBABILISTIC MODELS FOR ASSESSING INFORMATION PROCESSING FROM BRIEF VISUAL DISPLAYS.
W. K. Estes and H. A. Taylor (Stanford U., Calif.)
Proceedings of the National Academy of Sciences, vol. 52, Sep. 1964, p. 446–545. NSF supported research.
NONR 225(73).

Methods of measuring apprehension span are reviewed. The classical tachistoscopic experiment with report of the observed elements is modified to detection of one of two critical elements (consonants) in random noise (noncritical consonants). Each display contains only one of the critical elements. This technique minimizes problems of retention loss. With the above methods an evaluation is made of models representing the perceptual processes involved in the assimilation of information from brief displays. The fixed-sample-size model of statistical learning theory is considered and found inadequate in view of the discrepancy between the possible stimulus input from the retina and the small number of elements actually perceived. Instead the authors propose a serial processing model based on the idea that elements registered in the receptor apparatus must be scanned one at a time by a central mechanism. The number scanned is limited by the decay of stimulus traces activated by a brief display. An experiment exploring mathematical assumptions made on the basis of the model and employing the detection method produced satisfactory results. The model promises to account for: (a) virtual invariance of observed report span over a wide range of exposure times, and (b) the susceptibility of report span to disruption by events occurring immediately following the stimulus exposure.

A65-80391
CAROTID SINUS BARORECEPTOR REFLEX EFFECTS UPON MYOCARDIAL CONTRACTILITY.
Hilare De Geest, Matthew N. Levy, and Harrison Zieske, Jr. (St. Vincent Charity Hosp., Res. Div., Cleveland, Ohio).
Circulation Research, vol. 40, Oct. 1964, p. 327–342. 39 refs.
Cleveland Area Heart Soc. supported research.
Grant PHS-G-HE-07724.

The reflex effects of stimulation of the carotid sinus baroreceptors on left atrial and ventricular performance were studied in an auxotonic and an isovolumetric left heart preparation, which was innervated though completely isolated hydraulically. Reflex changes of heart rate, arterial impedance, venous return, and level of circulating catecholamines were prevented from influencing cardiac performance. In the auxotonic preparation, stimulation of the carotid sinus baroreceptors decreased aortic pressure, cardiac output, and external left ventricular work. Simultaneously, mean left atrial pressure

rose definitely. In the isovolumetric preparation, a decrease of the left ventricular peak systolic pressure was observed. These changes in atrial and ventricular dynamics were attributed primarily to a reflex negative inotropic effect directly upon the atrial and ventricular myocardium, mediated by the sympathetic nervous system. No definite changes in distensibility of the isovolumetric left ventrical were observed, although this could not be excluded in the auxotonic preparation. Primary changes in the coronary vascular bed were not considered to be responsible for the observed changes in atrial and ventricular dynamics.

A65-80392
CARBON DISULPHIDE PSYCHOSES (SIROUHLIKOVE PSYCHOZY).
Michal Turcek and Jan Molcan (Bratislava U., Psychiat. Clin., Czechoslovakia).
Pracovni lekarstvi, vol. 16, Aug. 1964, p. 257–261. 16 refs. In Czech.

The effects were studied of 15 persons who were exposed to CS^2 in some cases, up to 7 times the maximum allowable time. The exposure ranged from 5 months to 13 years. In 10 of the cases, more or less intensive disturbances of consciousness were noted, which lasted 1 to 7 days; of these, 3 were affective delirious, 1 oneiroid (these 4 had a better prognosis and shorter illnesses), 2 paranoid-schizoid, 2 manic, and 2 depressive. Of the 5 without disturbance of consciousness, 1 was manic, 2 melancholic, and 2 had dementia syndromes. Later it was found that half of the patients had, before becoming sick, oligophrenic symptoms, or psychopathy, and 6 were alcoholic. The prodromic symptoms were mostly neurasthenic, while somatic symptoms were also frequent just prior to the illnesses. The more difficult cases responded well to insulin therapy of fairly low dosage.

A65-80393
PHYSIOLOGICAL REACTIONS OF MAN TO ACCELERATION OF MAXIMAL DURATION AND INTENSITY IN THE SPINE-CHEST AXIS. REPORT I. MAXIMAL TOLERANCE AND MAIN TREND OF THE PHYSIOLOGICAL REACTIONS.
A. S. Barer, G. A. Golov, V. B. Zubavin, and E. P. Tikhomirov
(Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 56, Jul. 1963, p. 24–29.)
Bulletin of Experimental Biology and Medicine, vol. 56, Aug. 1964, p. 726–730. 9 refs. Translation.

The maximum tolerance to accelerations acting in the back-chest direction at an angle of 65° to the longitudinal axis of the human body was determined on a large-radius centrifuge. The following were studied: cardiovascular system, external respiration system, movement coordination, bioelectrical activity of the brain and of various groups of skeletal muscles, and subjective sensations. Definite stages were revealed in the body responses, which were most pronounced during the action of the average acceleration values (6 to 10 g). For 6 g the mean action time was 653 seconds, for 8 g–186.4 seconds, for 10 g–57.6 seconds, for 12 g–27.6 seconds, for 14 g–17.7 seconds and for 15 g–10.4 seconds.

A65-80394
EFFECT OF SEVERE STRESS ON THE β-LIPOPROTEIN CONTENT OF BLOOD SERUM AND OF SOME ORGANS.
A. F. Bliuger and Ia. Ia. Shuster (Riga Med. Inst. Depts. of Infectious Diseases and Pharmacol., Latvian SSR).
(Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 56, Jul. 1963, p. 56–60)
Bulletin of Experimental Biology and Medicine, vol. 56, Aug. 1964, p 757–760. 16 refs. Translation.

Subjection of rats to violent stresses causes appreciable changes in the β-lipoprotein contents of their serum and of some of their organs. Violent acute stresses (hypoxia, scalding, immersion in cold water) cause rises in the β-lipoprotein levels of the serum and the liver. Accidents developing following application of some of the stressful factors is regularly associated with a fall in the content of liver and serum β-lipoproteins. Application of violent stresses either does not affect the β-lipoprotein contents of the brain and the heart, or it raises them.

A65-80395
THE 24 HOUR RHYTHM OF MITOTIC ACTIVITY DURING REPARATIVE REGENERATION OF THE SALIVARY GLAND, LIVER AND EPIDERMIS IN WHITE MICE AND RATS.
N. V. Krasil'nikova (Khanarovsk Med. Inst., Dept. of Histol., USSR).
Biulleten'Eksperimental'noi Biologii i Meditsiny, vol. 56, Jul. 1963, P. 91–96.)
Bulletin of Experimental Biology and Medicine, vol. 56, Aug. 1964, p. 794–796. 8 refs.

Comparison of the curves of the 24-hour mitotic rhythm in the submaxillary salivary gland, liver and skin epidermis during regeneration demonstrated that they were parallel and had a single peak. The maximum mitotic activity was observed at 8 a.m. and the minimum at 8 to 11 p.m. The same changes of the 24 hour mitotic rhythm in the mentioned organs were observed during physiological regeneration. Consequently during physiological and repair regeneration of various animal organs there are general regularities in the 24 hour changes of mitotic activity of the cells evidently caused by the close interrelationship of these processes.

A65-80396
INVESTIGATION OF TASTE SENSATION IN HUMAN SUBJECTS DURING PROLONGED INHALATION OF OXYGEN.
N. S. Zaiko, M. I. Kuznetsov, and N. A. Chelnokova (USSR, Acad. of Med. Sci., Inst. of Norm. and Pathol. Physiol., Moscow).
(Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 55, Aug. 1963, p. 11–13.)
Bulletin of Experimental Biology and Medicine, vol. 56, Aug. 1963, p. 835–837. 5 refs. Translation.

The paper describes the effect produced by prolonged oxygen inhalation on the changes occurring in taste sensitivity of subjects on a strictly planned diet. No changes occur in the taste sensitivity of humans placed in a barochamber with an atmospheric pressure corresponding to an altitude of 5500 m. and gas mixture with an increased oxygen content for 2.5 to 8 hours; this points to normal function of the digestive tract. This method of determining the functional mobility of the taste receptor apparatus may be used to study nutritional problems in prolonged high-altitude flights.

A65-80397
BODY REACTIONS TO PROLONGED CORIOLIS ACCELERATION.
N. I. Arlashchenko, B. B. Bokhov, V. E. Busygin, N. A. Volokhova, Iu. G. Grigor'ev, B. I. Poliakov, and Iu. V. Farber.
(Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 55, Aug. 1963, p. 28–32.)
Bulletin of Experimental Biology and Medicine, vol. 56, Aug. 1963, p. 852–855. 5 refs. Translation.

Reactions to the prolonged action of Coriolis acceleration against the background of slow rotation were studied in a special slowly rotating chamber (MVK-1) for two persons. After an hour of rotation the greatest changes of somatic and autonomic functions investigated were noted in the gait and in the skin temperature.

A65-80398
PHYSIOLOGICAL HUMAN REACTIONS TO ACCELERATION ALONG THE VERTEBROSTERNAL AXIS: CHANGES IN THE SYSTEM OF EXTERNAL RESPIRATION.
A. S. Barer, G. A. Golov, and E. I. Sorokina.
(Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 55, Aug. 1963, p. 33–37.)
Bulletin of Experimental Biology and Medicine, vol. 56, Aug. 1963, p. 856–859. Translation.

An inquiry was made into the chief indices of external respiration in man during the action of accelerations (up to 15 g) directed along the dorsothoracic axis at an angle of 65° to the back of the armchair. A definite regularity was established in the changes of the indices studied with various accelerations. Definite stages were noted in the development of individual reactions; this regularity reflected the essence of the general biological laws concerning body adaptation to new environmental conditions.

A65-80399
SATELLITE MEASUREMENTS OF THE METEOROID ENVIRONMENT.
Charles T. D'Aiutolo (NASA, Washington, D. C.)
Annals of the New York Academy of Sciences, vol. 119, Nov. 11, 1964, p. 82–97. 14 refs.

An attempt has been made to review the meteoroid hazard environment, based primarily on the data obtained from the Explorer XVI. Although the Explorer XVI provided the first known penetrations by meteoroids in thin metallic skins, additional measurements must be made to appraise the hazard in thicker materials. An experimental device soon to be placed into orbit to provide this appraisal is described. A comparison of meteoritic encounter frequency and the penetrations recorded by the Explorer XVI indicates that the majority of meteoroids in the near-earth environment are not high density compact objects but may be of relatively low density. Further research is required to substantiate this broad conclusion.

A65-80400
POSTGRADUATE OFFICER TRAINING FOR PILOT TRAINEES.
Alan J. Grill
Air University Review, Nov.–Dec. 1964, p. 74–83.

Revision of the curriculum of the undergraduate pilot training program in the Air Training Command was carried out after recognition of the changing curriculae and standards of precommission schools. The current program is organized along the following guidelines: (1) leadership by example, (2) heritage, (3) duty, (4) leadership application, (5) counterinsurgency instruction, (6) physical training, and (7) expansion of previous experience. Evaluation of officer training performance is made on the basis of Officer Performance Ratings, performance results in physical training, evaluation in the

counterinsurgency course, flight performance, and academic training. Much emphasis is placed on the development of personal traits requisite in an officer.

A65-80401
PSYCHOPHYSIOLOGIC STUDIES OF PULMONARY VENTILATION.
Donald L. Dudley, C. J. Martin, and Thomas H. Holmes (Wash. U., School of Med., Dept. of Psychiat., Seattle; and Firland Sanatorium, Seattle, Wash.)
Psychosomatic Medicine, vol. 26, Nov.–Dec. 1964, p. 645–660. 35 refs.

In a group of 22 subjects, action-oriented behavior has been correlated with hyperventilation in 20 subjects in response to short-term adverse life situations. Seven of the 22 subjects were found to hypoventilate in response to short-term life situations to which they reacted with nonaction orientation. Seven of the 22 subjects were found to react to long-term adverse life stimuli with sustained changes in psychologic orientation and increased or decreased ventilation without a corresponding change in the fractional concentration of alveolar carbon dioxide. Reduced carbon dioxide production occurred during nonaction-oriented behavior, and increased carbon dioxide production occurred during action-oriented behavior. Respiratory changes occurring during anger or anxiety were similar to those occurring during real or suggested exercise, and respiratory changes occurring during depression were similar to those occurring during real or suggested sleep.

A65-80402
RELATIONSHIP BETWEEN CRITICAL FLICKER FREQUENCY AND AGE IN FLICKER PERIMETRY.
Ernst Wolf and Angela M. Schraffa
Archives of Ophthalmology, vol. 72, Dec. 1964, p. 832–843. 22 refs.
Grant NINDB B-1482

Flicker fields recorded on 302 normal eyes of individuals ranging in age from 6 to 94 years have been grouped into nine age ranges of ten years each, and the results have been studied in regard to changes in critical flicker frequencies (CFF) with age. It appears that CFF changes with age at each point of the visual field in a specific manner. Up to age 60 years the decline in CFF is relatively small; above age 60, CFF decreases considerably with the further advance of age. The flicker field shows differences in CFF between nasal, temporal, upper and lower quadrants. When studying flicker fields in patients, abrupt changes in CFF are indicative of retinal pathology. The magnitude of retinal abnormality and its extent can, however, be fully evaluated only when the observed CFF values are correlated with the age of the individual. In this fashion, flicker fields are obtained which yield point for point considerably more information than when only sudden changes in critical flicker frequencies are observed.

A65-80403
THE NORMAL VALUES OF CARDIOVASCULAR INDICES DURING PHYSICAL WORK. I. THE DEPENDENCY OF HEART MINUTE VOLUME ON OXYGEN UPTAKE [DAS NORMALVERHALTEN DER FUNKTIONSGROSSEN DES KREISLAUFS UNTER KORPERLICHER ARBEIT. I. MITTEILUNG: DIE ABHANGIGKEIT DES HERZMINUTENVOLUMENS VON DER SAUERSTOFFAUFNAHME].

W. Noder (Münster U.; and Bäderwiss. Inst., Bad Salzuflen, Germany)
Archiv für Kreislaufforschung, vol. 44, Oct. 1964, p. 224–231. 6 refs. In German.

The normal values of heart minute volume (HMV) during physical stress were determined in 137 males with normal cardiovascular systems, ages ranging from 18 to 64 years. Physical work was carried out on a bicycle ergometer. A total of 421 investigations was made. The results show that in the normal heart under physical stress HMV is a quadratic function of the oxygen uptake, represented by a simple parabolic curve, with the maximum running through the zero point of the coordinates. The above formula can be applied in the individual cases to evaluate the normality of heart minute volume during a cardiovascular function test.

A65-80404
THE PROGRESS OF X-RAY DIAGNOSIS IN THE LAST DECADES AND THE POSSIBILITY OF ITS APPLICATION TO AVIATION MEDICINE [POSTEPY RADIODIAGNOSTYKI LEKARSKIEJ W OSTATNICH DZIESIATKACH LAT I MOZLIWOSCI ZASTOSOWANIA ICH W MEDYCYNIE LOTNICZEJ].
Boleslaw Bembnowski (Mil. Inst. of Aviation Med., Warsaw, Poland)
Lekarz Wojskowy, no. 7, 1964, p. 499–505. In Polish.

Modern methods of X-ray investigation in the U.S.A. and Europe are outlined, with reference to important works published since 1941. This progress also affected manufacturing of modern X-ray apparatus from simple 100 m.A. instruments to a combined 6-channel apparatus of 1000 m.A. Modern electronics and application of TV and moving pictures to medical investigation give rise to the possibility of studying neural and metabolic processes. It is in this connection that X-ray diagnosis has been applied to aviation medicine.

A65-80405
THE EFFECT OF SMALL ALCOHOL DOSES ON THE ABILITY TO ESTIMATE DISTANCE OF OBJECTS BY APPLICANTS FOR OPERATION OF POWER TRAINS (WPLYW MALYCH DAWEK ALKOHOLU NA OCENE ODLEGLOSCI PRZEDMIOTOW U KANDYDATOW NA KIEROWCOW POJAZDOW MECHANICZNYCH).
Jan Lach and Stanislaw Domagaka
Lekarz Wojskowy, no. 7, 1964, p. 506–509. In Polish.

The effect of 100 g. of 45% ethyl alcohol on 100 enlisted men was studied by means of the Dolman apparatus in 1961–62. All measurements were carried out three times in 20 min. and 2 hrs. after alcohol use. A considerable deterioration of the ability to estimate distance was formed in 25 men after 20 min. and in 65 men after 2 hrs. of alcohol intake.

A65-80406
TEMPORAL EFFECTS IN BINOCULAR VISION.
T. G. R. Bower and L. J. Haley (Cornell U., Ithaca, N. Y.)
Psychonomic Science, vol. 1, Dec. 1964, p. 409–410. 5 refs.

The temporal parameters of the rivalry process and the effects on them of stimulus variables are determined. No stimulus effect is found. It is concluded that binocular rivalry is determined by structural properties of the organism.

A65-80407
PHYSIOLOGIC FACTORS IN HYPERVENTILATION.
Walter I. Tucker (Lahey Clin. Found., Dept. of Neuropsychiat., Clin. Div., Boston, Mass.)
Biochemical Clinics, no. 4, 1964, p. 83–88.

The electroencephalogram was recorded in two control subjects and six patients with anxiety attacks before and during hyperventilation. Measurements of blood sugar, phosphorus, calcium, potassium, chloride, carbon dioxide content, carbon dioxide combining power, hemoglobin and hematocrit were made in these same subjects before and after hyperventilation. In three control subjects and six patients with anxiety attacks, venous blood pH, and pulse and blood pressure were measured before and after hyperventilation. With hyperventilation slow waves were frequent but not consistent findings. The blood potassium concentration was decreased in six of eight subjects and the blood calcium level was increased in seven of eight subjects. The blood pH was increased to 7.45 or above in six of nine subjects.

A65-80408
MECHANISM AND MANAGEMENT OF HYPERVENTILATION SYNDROMES.
Bernard I. Lewis (Stanford U. School of Med., and Palo Alto Med. Clin., Dept. of Internal Med., Metabol. Section, Palo Alto, Calif.)
Biochemical Clinics, no. 4, 1964, p. 89–96. 19 refs.

There is a chronic hyperventilation syndrome which is much more common, of greater medical significance, and far more difficult to diagnose than better known acute hyperventilation attack. This chronic syndrome tends to mimic grave organic disease with which it frequently is associated or superimposed. Once the diagnosis is suspected and appropriately confirmed, it is possible to "cure" over 70 percent of such patients by means of simple therapeutic measures.

A65-80409
BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Madeleine F. Barnothy, ed. (Ill. U., Coll. of Pharm., Chicago).
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, ix + 324 p. 212 refs.

All pertinent chapters in this book have been abstracted separately.

A65-80410
INTRODUCTION [TO "BIOLOGICAL EFFECTS OF MAGNETIC FIELDS"].
Jeno M. Barnothy (Biomagnetic Res. Found., Evanston, Ill.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 3–24. 11 refs. [See A65-80409].

A survey of different physical phenomena which through their cumulative physical effects could be considered as precursors of biomagnetic effects is presented. The following are included: (1) magnetic fields, (2) characteristics of the field, (3) geomagnetic field, (4) physical phenomena in magnetic fields, (5) classification of biomagnetic effects, and (6) environment of specimen in the magnetic, moderate or high fields.

A65-80411
SIMPLE THEORETICAL MODELS FOR MAGNETIC INTERACTIONS WITH BIOLOGICAL UNITS.
Peter W. Neurath (AVCO Corp., Med. Sci. Dept., Wilmington, Mass.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 25–32. 10 refs. [See A65-80409].

Under favorable circumstances static magnetic fields can produce observable effects on models which are representative of living tissue. Very much larger fields are needed for magnetomechanical than for electromagnetic effects. The basic reason is that mechanical alignment of spins against thermal agitation requires each spin, i.e., each magnetic unit, to be acted upon independently, while in the electromagnetic case it is integrated electrical effect over a large volume which was calculated. Whether neurons are generally sensitive to small currents much below the threshold values for depolarizing axons, and to what degree, in quantitative terms, would perhaps make a good subject for new experiments.

A65-80412
THE VECTOR CHARACTER OF FIELD AND GRADIENT AND ITS POSSIBLE IMPLICATIONS FOR BIOMAGNETIC EXPERIMENTS AND SPACE TRAVEL.
Jeno M. Barnothy (Biomagnetic Res. Found., Evanston, Ill.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 56–62. [See A65-80409].

Various experiments are presented suggesting that a change in the direction of a magnetic field or gradient vector relative to the coordinate system of the specimen (organ, cell, molecule) will entail a change in the direction or a reversal of the sign of the cumulative effect. In space travel the astronaut may be exposed for long periods to strong extraterrestrial magnetic fields. If the spaceship is propelled by ion-jet engines, the astronauts will be exposed to the strong stray fields of the magnets necessary to confine the plasma. The reversible precursor theory suggests that the possible detrimental effects of long-term exposures to magnetic fields can be overcome by periodically changing the positions of the astronauts relative to the external or internal magnetic field and gradient. In space travel of extended duration, the discomfort caused by weightlessness, as has been experienced by astronauts in satellites, will constitute a serious problem. It is suggested that an inhomogeneous magnetic field which produces an accelerating force upon the otoliths be used in spaceships and space stations to create the sensation of a gravitational field acting upon the balance organ.

A65-80413
ROTATIONAL DIFFUSION IN A MAGNETIC FIELD AND ITS POSSIBLE MAGNETOBIOLOGICAL IMPLICATIONS.
Maximo Valentinuzzi (Nat. Inst. of Microbiol., Buenos Aires, Argentina).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 63–73. 11 refs. [See A65-80409].

A theoretical exploration of the effect due to modifications of the rotational diffusion of paramagnetic molecules caused by magnetic fields is presented. It would be necessary to deal with well-known enzymatic reactions in an attempt to apply the developed concepts and to obtain quantitative information about chemical velocities in a magnetic field. Formulas showing that a reinforcement of the inhibitory effect should be attained by decreasing the temperature and by increasing the magnetic field intensity and the value of the magnetic moment are described. If the temperature is increased, the inhibitory effect diminishes. In order to apply the ideas and relationships developed in this paper in an analysis of growth inhibition by magnetic fields, it would be necessary to introduce the factor γ into the anabolic and catabolic term which could be made to appear in the differential equation of biological growth. Due to the intricacy of the chemistry of living systems, those terms should describe the chemical complexes corresponding to anabolism and catabolism as a whole by means of an average method following definitions as stated by Rashevsky (Mathematical Biophysics, 1960).

A65-80414
DISTORTION OF THE BOND ANGLE IN A MAGNETIC FIELD AND ITS POSSIBLE MAGNETOBIOLOGICAL IMPLICATIONS.
Leo Gross (Waldemar Med. Res. Found., Woodbury, N. Y.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 74–79. 12 refs. [See A65-80409].
Grant NIH C-4561.

A mechanism is postulated to explain the interference of biochemical reactions by magnetic fields in living systems. This effect is a distortion or change in the bond angle, which subsequently causes interference chemical reactions such as those of enzymes. Enzymes being paramagnetic will be more greatly affected. The amounts of energy for bending bond angles can be small. In the case of a free radical, which is paramagnetic, there is a transitional period where the orbital will be distorted. A discussion is given as to whether or not the disorientation is sufficient to influence energy transfer in reactions. This includes determining a rate constant of the transfer and the size of the paramagnetic molecules. The question of paramagnetic resonance effect is analyzed, and an equation is given for the amount of enzyme removed from a reaction under magnetic influence. Experimental evidence for this is noted, and an equation is given for the rate of inhibition of the reaction. Various suggestions are made for ways of demonstrating these effects.

A65-80415
A POSSIBLE EFFECT OF THE MAGNETIC FIELD UPON THE GENETIC CODE.
Madeleine F. Barnothy (Ill. U., Coll. of Pharm., Chicago).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 80–89. 7 refs. [See A65-80409].
Biomagnetic Res. Found.; and Graduate Res. Grant, U. of Ill., supported research.

The influence of a magnetic field upon the tunneling in DNA is discussed. Two experiments, the results of which could be interpreted as an effect of the magnetic field on the genetic code, are presented and discussed. Both experiments (postponement of aging and pathological changes in the adrenal) must be considered only as preliminary investigations requiring many further observations until a definite connection of the magnetic field with the genetic code can be established. An effect of the magnetic field upon the tunneling probability can theoretically be expected. Hence, should tunneling be the major cause for alterations in the genetic code, the magnetic field could be a powerful tool in the further investigation of the code.

A65-80416
DEVELOPMENT OF YOUNG MICE.
Jeno M. Barnothy (Biomagnetic Res. Found., Evanston, Ill.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 93–99. [See A65-80409].
Biomagnetic Res. Found. supported research.
Grant Ill. U. RC-56-92-92-36

Various experiments studying the effects of magnetic fields on the development of mice of different strains, ages, and field strengths are presented. Both homogeneous and inhomogeneous fields were used. Total weight differences of young mice are larger than those of older mice. The relative decrease of the growth rate, that is, the difference in growth rate divided by the growth rate of the controls, is greater for older mice. Young mice do not stop growing in fields of the magnitude used, whereas older mice sometimes may lose weight. The effect of the homogeneous field is far greater than that of the inhomogeneous field. The weight curve indicated a minimum around the second day and following recovery. To investigate this second-day weight minimum, which seems to be a shock of the magnetic field, six 38-day-old female ICR strain mice were, in 14-day intervals, repeatedly exposed to a homogeneous field of 9400 Oe. The magnitude of the minimum does not decrease in subsequent cycles, proving that, if repeated every 14 days, the mice do not get adapted to the shock of the magnetic field.

A65-80417
REJECTION OF TRANSPLANTED TUMORS IN MICE.
Jeno M. Barnothy (Biomagnetic Res. Found., Evanston, Ill.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 100–108. [See A65-80409].

Two experiments in which T2146 adenocarcinoma cells were transplanted in albino random bred mice are described. All mice, both controls and those treated, obtained transplants from the same donor piece. The treated mice were then exposed to magnetic fields. From these two experiments the tentative conclusion was drawn that in fields as produced by DuBois magnets, a rejection of the tumor can be expected only in a first homotransplant, but not in later subsequent ones. There is the possibility that the magnetic field did not affect the cancer cells, but merely increased the homograft of the host. The stress caused by the magnetic field, together with the isolation of the tumor from surrounding tissues, due to the retardation of the fiber system, is presumably enough to lead to a rejection of the tumor. In the second experiment, through the repeated transplantation in the same genotype, the tumor became more hystocompatible and the effects of the magnetic field were no longer adequate to trigger a rejection. Only by transferring the animal to a field of greater strength and paramagnetic strength could a rejection be achieved. But the stress of such strong fields may kill the animal. A sex preference for tumor rejection in magnetic fields was observed.

A65-80418
HEMATOLOGICAL CHANGES IN MICE.
Madeleine F. Barnothy (Ill. U., Coll. of Pharm., Chicago).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.

New York, Plenum Press, 1964, p. 109–126. 16 refs. [See A65-80409].
Biomagnetic Res. Found. supported research.
Grant Ill. U. RG-56-92-11

Three experiments investigating the effects of magnetic fields on leukocytes of mice are reported. A Coulter electric particle counter was used to indicate cell numbers. Housing of the animals and blood sampling and experimental procedures are described and discussed. It was observed that a vertical homogeneous magnetic field of 4200 Oe. decreases the number of circulating leukocytes in virgin female mice within the first 2 weeks by 20 to 40%. This minimum is followed by a temporary increase in the leukocyte count, which may reach the baseline. It is followed by a second drop, reaching a minimum around the 30th day of residence in the field. The time of the first minimum and that of the maximum seems to occur in older mice a few days earlier (12th and 16th day, respectively) than in younger animals (18th and 21st day, respectively). If the mice are removed from the field at the time of the first or second minimum, the number of leukocytes drastically increases and in about 2 weeks overshoots the baseline by 20%. But this increase after removal is missing if the mice are left in the field for a prolonged time after the second minimum. The following explanation of these results is proposed: the first minimum is caused by the shortening of the lifespan of leukocytes; the maximum is the consequence of the immobilization of the stored cells; at the peak of the maximum the storage is depleted; and the second minimum is caused by the inhibition of the leukocyte-producing organs.

A65-80419
REDUCTION OF IRRADIATION MORTALITY THROUGH PRETREATMENT.
Madeleine F. Barnothy (Ill. U., Coll. of Pharm., Chicago).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 127–131. [See A65-80409].
Biomagnetic Res. Found. supported research.

Mice of different ages and strains were treated in homogeneous and inhomogeneous magnetic fields and various time intervals were interposed between termination of magnetic treatment and X-ray irradiation; magnetic treatment after irradiation was also tried. In most instances, 30 mice were treated in ten permanent magnets and the same number were housed during that time in ten dummy magnets. The total X-ray dose was always 800 r, delivered with an intensity between 33 r/min. and 100 r/min., producing a mortality of 30 to 100% in the control group. After irradiation the animals were placed in standard cages, three treated and three controls to compensate for possible cage effects. At high lethal irradiation doses, magnetic pretreatment of mice in a homogeneous 4200-Oe. magnetic field, and with less than a 3-day delay between termination of the treatment and irradiation, decreases the death rate by 23 to 30%. The difference in mortality rate is significant on a probability level of 1:800. The leukocytosis following the magnetic treatment does not compensate the leukopenia caused by the irradiation; it merely diminishes it slightly. Treatment in inhomogeneous fields affects not only the leukocyte count, but also the erythrocyte count and could influence irradiation anemia. The interpretation of the mortality curves for these fields is too complex to be attempted at present, due to simultaneous variation of two blood elements (probably also platelets).

A65-80420
LIFESPAN INCREASE OF TUMOR-BEARING MICE THROUGH PRETREATMENT.
Leo Gross (Waldemar Med. Res. Found., Woodbury, N. Y.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 132–139. 5 refs. [See A65-80409].
Grant NIH C-4561.

Tumor-free mice were individually housed in magnetic fields and maintained there continuously for 30 days. A group of control animals were individually housed in dummy magnetic cages outside the magnetic fields. Another group of animals were normally housed. All groups were implanted with tumors 7 to 10 days after the test mice were removed from magnetic fields, by which time lymphocytosis had developed. The growth pattern of these tumors and the fates of their hosts were observed. Control mice lived an average of 16.7 days. The average lifespan of the animals that resided in the magnetic field is 23.3 days— an increase in life expectancy of 30% while carrying the tumor. There does not appear to be any difference in the onset or growth of the tumor, but the animals that are treated survive with larger tumors and appear less debilitated than their controls. Thus, it was demonstrated with high statistical significance that the life expectancy of a tumor-bearing host is lengthened if the host is exposed to a magnetic field prior to the transplantation of the tumor. The effect is apparently related to the leukocytosis which follows magnetic treatment.

A65-80421
WOUND HEALING AND TISSUE REGENERATION.
Leo Gross and Lawrence W. Smith (Waldemar Med. Res. Found., Woodbury, N. Y.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 140–145. 7 refs. [See A65-80409].
Grant NIH C-4561.

To show the effect of magnetic fields on cell growth, mice were studied during wound healing of the skin and regeneration of the tissues after turpentine injection. In both cases the mice were exposed before, before or after, and after wounding or injection. The field intensity of the magnets was 3000 to 4000 Oe. During skin healing there was a reduction in fibrosis and fibroblast proliferation. There was apparently no effect on growth or tissue repair in the turpentine-injected mice. Secondary histological observations on other organs showed no difference in weights or in the mitotic index in the treated mice and the controls.

A65-80422
MAGNETOTROPSIM.
L. J. Audus and J. C. Whish (London. U., Bedford Coll., Great Britain).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 170–182. 13 refs. [See A65-80409].

Experiments are described suggesting that relatively large effects of magnetic fields on growth rate of higher plant organs are most unlikely. However, the magnetotropic curvatures in strong magnetic gradients observed in these experiments are consistent with a very small growth-accelerating effect of fields transverse to the long axis of the organ but, since growth curvatures are extremely sensitive indicators of small differences in growth rate, it is unlikely that small induced changes of this kind would ever be shown up by the relatively coarse methods involving direct measurements of growth rates of sample.

A65-80423
PLANT GROWTH RESPONSES.
R. P. Mericle, L. W. Mericle, A. E. Smith, W. F. Campbell, and D. J. Montgomery (Mich. State U., East Lansing).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 183–195. 20 refs. [See A65-80409].
Grant NIH 6M08967

Barley seeds (90 grains) were germinated in the presence of an externally applied magnetic field, while an equal number were germinated concurrently in the absence of the field, serving as controls. For exposure to the fields, individual rolls containing grains were placed 3 to 4 mm. in front of the magnet (one roll per magnet). At intervals following initiation of the experiment, rolls from the magnetic field and respective control groups were opened and measurements made of the length of the shoot and the longest root. Roots of seedlings developing in the magnetic field present a different pattern of changing growth rate than that of the controls, whereas the patterns exhibited by the shoots are similar. Although the roots in the magnetic field initially showed increased growth rates over the controls, their growth rate subsequently dropped sooner and more abruptly than that of the controls, then eventually rose again. The shoots, on the other hand, showed consistently higher growth rates, but in a pattern of rise and fall that closely paralleled the controls.

A65-80424
EFFECTS ON THE CENTRAL NERVOUS SYSTEM.
Yu. A. Kholodov (USSR Acad. of Sci., Inst. of Higher Nervous Activity and Neurophysiol., Moscow).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 196–200. 15 refs. [See A65-80409].

The effects of a static magnetic field on the central nervous system were studied in birds, fish, and mammals by the conditioned reflex method. Reactions to light, sound, and electric current were utilized. The field strength varied from 1 to 800 Oe. and exposure time from seconds to hours. Although food-seeking and electrodefensive reflexes to a magnetic field could be established, it was easier in fish to develop inhibitory conditioned reflexes. In this aspect magnetism proved a greater stimulus than light or sound. In pigeons, alimentary conditioned reflexes were inhibited in 70% of the cases by the magnetic field. In fish the strength of the electric current needed to stimulate a fish to quiver increased by 45% in a field of 100 to 200 Oe. In rabbits it was shown that the forebrain and diencephalon, when deprived of nerve connections to the receptors, react more to a magnetic field than an intact brain. It is concluded that a magnetic field acts as (1) a weak stimulus, (2) is usually inhibitory, and (3) acts directly on the forebrain and diencephalon.

A65-80425
SURVIVAL OF ANIMALS IN MAGNETIC FIELDS OF 140, 000 OE.
Dietrich E. Beischer (U.S. Naval School of Aviation Med., Pensacola, Fla.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 201–208. 5 refs. [See A65-80409].
NASA supported research.

Experiments are presented studying the effects of very strong magnetic fields on mice, Drosophila melanogaster, Sea Urchin eggs, luminescent bacteria, and Neurospora. It appears most unlikely that the strongest available homogeneous magnetic fields will elicit purely magnetic effects in biological material. The survival of mice and flies demonstrated in these studies at 120, 000 Oe. is a case in point. The results of the exposure of animals to strong magnetic fields with a high gradient do not differ noticeably from the results obtained with strong homogeneous fields. The physical effects of such fields on living matter seem to be within tolerable limits for the applied exposure time. The fact that a mammal survived prolonged exposure to a magnetic field of 120,000 Oe. increases to a certain degree confidence in the safety range in human exposure. Further animal experiments at very high field strength will substantially contribute to the assessment of possible physiological and psychological effects in man if he should be exposed to strong magnetic fields during space travel.

A65-80426
TISSUE RESPIRATION.
Vernon R. Reno and Leo G. Nutin: (Inst. Divi Thomae, Div. of Biol. and Exptl. Med., Cincinnati, Ohio).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 211–217. 5 refs. [See A65-80409].

Effects of magnetic fields on cell respiration of S-37 tumor and mouse embryo and adult kidneys were investigated. The permanent magnet used in all experiments produced a field of 7300 Oe. in an air gap of 1.5 cm. Simultaneous oxygen-consumption measurements were taken with the experimental tissue continuously exposed to the field while the control tissue was at the 0-Oe. point. The difference between the means of the experimentals and the corresponding controls was 0.84 for the S-37, 0.92 for the embryo kidney, and 0.1 for the adult kidney. Results with the many types of cells studied would indicate that both the qualitative and quantitative effects of a magnetic field on tissue respiration are correlated with several biological factors in addition to those pertaining to the field itself. It can be concluded that a magnetic field has an effect on cellular metabolism which is related to the type and age of the tissue. It can further be stated that this effect appears to be correlated with field strength and temperature.

A65-80427
AGGLUTINATION OF HUMAN ERYTHROCYTES.
E. Hackel, A. E. Smith, and D. J. Montgomery (Mich. State U., East Lansing).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 218–228. 23 refs. [See A65-80409].
Grants NIH 6M-08967 and NSF G6208

Effects of magnetic field exposures on erythrocyte agglutination were investigated. The experiments in which agglutination was determined visually show definite enhancement of the phenomenon by magnetic fields of moderate strength. The experiments in which agglutination was determined by the Coulter counter, on the other hand, show no signs of response to magnetic fields. If the counter completely failed to detect any agglutination, it would be easy to assume that in the counting procedure the aggregates are destroyed, possibly by being torn apart when entering the aperture. But, as has been established in the present work as well as that of others, agglutination can be detected by the Coulter counter, and in fact antibody titer can be determined by it. It is suggested that the effect in each case is real, but the differences in methods of observation result in differences in kinds of aggregates observed. If it can be established that the two methods do detect different kinds of agglutination, then the discordance between them in fact gives a new tool for investigating agglutination. Until then, it must be admitted that no effect of magnetic fields of weak or moderate strength has proved itself discernible by electronic counting methods. Possible mechanisms for effects of magnetic fields on agglutination are discussed.

A65-80428
INHIBITION OF BACTERIAL GROWTH IN FIELDS OF HIGH PARAMAGNETIC STRENGTH.
Vincent F. Gerencser (West Va. U., Morgantown), Madeleine F. Barnothy (Ill. U., Chicago), Jeno M. Barnothy (Biomagnetic Res. Found., Evanston, Ill.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 229–239.
Graduate Res. Grant, U. of Ill.; and Biomagnetic Res. Found. supported research. [See A65-80409].

Experiments studying the effects of magnetic fields on growth of bacteria (Serratia marcescens and Staphylococcus aureus) are reported. The average magnetic field strength was 15,000 Oe., with a constant gradient ot 2300 Oe./cm. throughout the culture medium. The paramagnetic strength of the field was 34.5 MOe./cm. Results indicate that magnetic fields of the paramagnetic strength used do affect the growth of bacteria. The fact that the inhibition was observed in a highly inhomogeneous magnetic field, and particularly that the inhibition of S. aureus was found in a field of the same average strength as with S. marcescens, but only at a higher paramagnetic strength, indicates that the inhibition must be attributed to a paramagnetic phenomenon in which magnetic dipoles play a role. Mathematical analyses of the growth curves together with possible explanations of the results are presented.

A65-80429
INHIBITION OF BACTERIAL GROWTH IN HOMOGENEOUS FIELDS.
H. C. Hedrick (Gen. Dyn., Appl. Sci. Lab., Fort Worth, Tex.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 240–245. [See A65-80409].

Results of studies on the effects exhibited by selected microorganisms (Staphylococcus aureus, Sarcina lutea, and Escherichia coli) on a physiological or morphological basis when exposed to a constant homogenous magnetic field are presented. The response of the exposed organisms to the field of 14,000 Oe. was determined by running growth response curves on the cultures. Samples were taken during a 0-12 hour exposure period in a series of runs and during a 12-24 hour period in a second series. Growth of the exposed S. aureus culture progressed in the same trend as the control for a period of 15 hours. At the 16th-hour sampling period, an inhibition of growth was exhibited which continued throughout the remaining period of exposure. When S. lutea was exposed to the same constant homogeneous field used on S. aureus, no significant inhibition was observed. With E. coli as the biosystem, no significant quantitative difference in cell level was indicated by the growth response curve. The gas produced by E. coli when exposed for 48 hours in the homogeneous field was analyzed for its composition. A slight difference in hydrogen-gas production was obtained in the exposed system. This latter response is not considered significant at this time.

A65-80430
INCREASE OF TRYPSIN ACTIVITY.
Elton S. Cook and Sister M. Justa Smith (Inst. Divi Thomae, Div. of Chem. and Biochem., Cincinnati, Ohio).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 246–254. 16 refs. [See A65-80409].
Grant PHS CA 06642

Changes of trypsin structure upon ultraviolet inactivation were compared with the behavior of the enzyme in a magnetic field. Exposure of trypsin to ultraviolet irradiation of 2537 Å produces opposite effects to those resulting from exposure to a magnetic field in terms of enzyme activity, ultraviolet absorption, and release of -SH groups. There is no evidence at presence that inactivation of trypsin by ultraviolet irradiation can be reversed by subsequent exposure to a magnetic field. Trypsin solution irradiated with ultraviolet for 30 min. and nearly completely inactivated show no restoration of activity or reduction in the number of -SH groups after exposure to an 8000-Oe. field for 1 or 2 hours. Exposure of trypsin solution to ultraviolet for 1 min. resulted in 30% to 35% loss of activity and the appearance of approximately 0.7 to 0.8 -SH group. Subsequent exposure to the 8000-Oe. field for 1 to 2.25 hours caused no reversal. Explanations of these results are attempted and areas of needed future study are discussed.

A65-80431
MAGNETIC REACTIVATION OF PARTIALLY INHIBITED TRYPSIN.
Richard H. Wiley, Samuel L. Cook, Jr., Thomas H. Crawford, Billy J. Fairless, Hsene-Fui Liu, and Edwin C. Weber (Louisville U., Coll. of Arts and Sci., Dept. of Chem., Ky.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 255–259. 6 refs. [See A65-80409].
Contract DA-49-193-MD-2411.

Changes in the activity of trypsin following exposure to a static magnetic field were reinvestigated. Partially inhibited trypsin preparations show a 4% to 12% restoration of activity. Reactivation was observed following deactivation by egg-white trypsin inhibitor and apparently also following deactivation by 1 to-3 hour autolysis at pH 7-8 in the absence of calcium ions. No reactivation was observed after deactivation by ultraviolet exposure or treatment with soybean trypsin inhibitor or diisopropylphosphorofluoridate. Reactivation of the inhibited preparation following exposure to the magnetic

field in no case exceeded the usual activity level of the uninhibited enzyme. The maximum reactivation (9% to 12%) followed the longest magnetic exposures (1008 to 1106 min.). An exposure of 90 min. coupled with slight (4%) inhibition appears to be insufficient. It is assumed that the magnetic field reorganizes the enzyme at or near the active site. The effect may be attributable to the reestablishment of certain hydrogen-bonded structures or related dipolar structures.

A65-80432
RESPONSES OF PLANARIANS AND SNAILS.
F. H. Barnwell and F. A. Brown, Jr. (Northwestern U., Dept. of Biol. Sci., Evanston, Ill.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 263–278. 15 refs. [See A65-80409].
Grants NIH RG-7405; AND NSF G-15008;
Contract NONR-1228-03

Experiments were performed to determine whether a living organism could perceive differences in strength and direction of the horizontal vector of very weak artificial fields. Other experiments were performed to assess whether organisms were capable of responding to the earth's magnetic field. Mud snails (Nassarius obsoletus) and the common planarian (Dugesia dorotocephala) were used as subjects. The orientation of these animals was modified by artificial fields of the order of strength of the geomagnetic field. The nature of the organismic response is far from simple. The systematic and periodic alterations in the strength and character of biological response suggest a highly differentiated response mechanism within the organism and belie any conclusion that the responsiveness is adventitious. To the contrary, the nature of the response properties suggest that the organism is normally integrated with its geomagnetic environment to a striking degree.

A65-80433
PROPOSED MECHANISMS FOR THE NAVIGATION OF MIGRATING BIRDS.
Jeno M. Barnothy (Biomagnetic Res. Found., Evanston, Ill.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 287–293. [See A65-80409].

Two hypotheses are proposed to explain the mechanism of navigation of birds. They are: (1) wing flapping as dc to ac converter, and (2) the relativistic geoelectric field. Both hypotheses are discussed as they relate to electromotive forces and potential differences in wingtips of birds flying perpendicular to the direction of the geomagnetic field. If a bird turns east, a vertical potential difference of 0.9 mv. will appear between its wings' uppermost and lowest positions. If a bird turns west, the vertical potential difference will reverse its polarity. As a consequence of wing flapping, polarization currents are generated. Possible application of this information for the guidance of intercontinental missiles is discussed.

A65-80434
BIBLIOGRAPHY OF THE BIOLOGICAL EFFECTS OF STATIC MAGNETIC FIELDS.
Leo Gross (Waldemar Med. Res. Found., Woodbury, N. Y.)
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 297–311. 212 refs. [See A65-80409].
Grant NIH C4561

A bibliography on the biological effects of magnetic fields is presented. The bibliography is divided as follows: (1) biological effects of static magnetic fields (biomagnetic effects), (2) biomagnetic effects of geomagnetic field strengths (biogeomagnetic effects), (3) interactions of magnetic fields with living tissues, and (4) clinical application of static magnetic fields.

A65-80435
SPACE FLIGHT PROBLEMS-MECHANICAL, MEDICAL, AND MORAL.
Leslie W. Ball and Romney H. Lowrey (FAA, Office of Aviation Med., Washington, D. C.)
Journal of the American Medical Association, vol. 189, Sep. 28, 1964, p. 1013–1015.

This paper reviews various aspects of space flight problems. The following subjects are included: (1) typical space missions, (2) causes of equipment unreliability, (3) some physiological and psychological problems and the type of research physicians are performing in the aerospace industry, and (4) action taken to assure the level of mental and moral discipline required for space conquest.

A65-80436
MAN IN WEIGHTLESSNESS: PSYCHO-PHYSIOLOGICAL REACTIONS [CHELOVEK V NEVESOMOSTI PSIKHOFIZIOLOGICHESKIE REAKTSII].
V. Lebedev.
Aviatsiia i Kosmonavtike, vol. 47, Sep. 1964, p. 77–82. In Russian.

The vestibular analyzer, which consists of the semicircular canals, the otolithic apparatus, connecting neurons, and cortical centers and subcortical areas, is the gravitational receptor which conveys information to the brain. In the state of weightlessness, this information is distorted, because the otoliths lose weight. General body coordination becomes uncertain, and this results in psychological stress. Gagarin, the first man to accomplish an orbital flight, reported no significant effects because of weightlessness. Titov, the second Soviet astronaut, felt suspended upside down after entering the orbit but felt no particular discomfort. There are reports of some Soviet astronauts to the effect that they could not cope with the effects of weightlessness and developed psychotic symptoms of terror similar to the reactions of mental patients who lose orientation of space and time and develop a feeling of "falling through space". In all cases, the astronauts lost the ability to coordinate movements with their eyes closed. Extensive training may develop greater adaptability to the state of weightlessness, help the astronauts to overcome the feeling of anxiety, and allow greater control of coordination.

A65-80437
A STUDY OF THE MECHANISM OF PAIR-WISE WORK OF THE VESTIBULAR APPARATUS [K IZUCHENIIU MEKHANIZMA PARNOI RABOTY VESTIBULIARNOGO APPARATA].
G. I. Gorgiladze.
Doklady Akademii Nauk SSSR, vol. 158, Sep. 11, 1964, p. 488–491. 18 refs. In Russian.

In curarized cats with their brain cortex exposed, an unipolar electrocorticogram was recorded upon electrical stimulation of the vestibular apparatus by direct current, either unilaterally or bilaterally. The final effect of the vestibular stimuli on the brain cortex (and, probably, on the spinal cord) is the result of disturbance of the dynamic equilibrium normally existing between the vestibular brain centers, because of "labyrinth tonus". The equilibrium was disturbed by both, the stimulating (cathode) or suppressing (anode) action on the impulses during polarization. The disturbance of balance could involve three mechanisms: (1) Head movements may increase impulses from one labyrinth and decrease them from the other because of the anatomic disposition of the vestibular apparatus. (2) Strong impulses on one side and no impulses originated on the opposite side, or suppressed by the inhibitor neurons, could result in greater disequilibrium. (3) The vestibular division fibers of the acoustic nerve may suppress the afferent impulses of the vestibular receptors.

A65-80438
PROBLEMS OF ENGINEERING PSYCHOLOGY IN AERONAUTICS AND SOME EXPERIMENTAL RESULTS [ZADACHI INZHENERNOI PSIKHOLOGII V KOSMONAVTIKE I NEKOTORYE REZUL'TATY ISSLEDOVANII].
V. G. Denisov, E. S. Zav'ialov, A. I. Kuz'minov, M. M. Sil'vestrov, and V. I. Iazdovskii.
Kosmicheskie Issledovaniia, vol. 2, Sep.–Oct. 1964, p. 783–796. 9 refs. In Russian.

Human engineering problems regarding systems applicable to manned space missions, and to the training of astronauts for performing specific tasks, are discussed. A method based on the information theory is outlined for the evaluation of a closed partly computerized "operator-spacecraft" system. Emphasis is placed on physiological data pertaining to biopotentials of various human body areas, which may indicate the degree of tension and performance ability. Some results of the studies with regard to the most practical systems of conveying directions, signaling, and manual controls are given. The need of constructing training apparatus on the ground and on board the spacecraft is suggested.

A65-80439
PHYSIOLOGICAL RESPONSE OF THE ANIMAL ORGANISM AFTER EXPOSURE TO CERTAIN FACTORS CONNECTED WITH COSMIC FLIGHT [SOSTOIANIE REAKTIVNOSTI ORGANIZMA ZHIVOTNYKH POSLE VOZDEISTVIIA NEKOTORYKH FAKTOROV KOSMICHESKOGO POLETA].
V. V. Antipov, B. I. Davydov, E. F. Panchenkova, P. P. Saksonov, and G. A. Chernov.
Kosmicheskie Issledovaniia, vol. 2, Sep.–Oct. 1964, p. 797–804. 17 refs. In Russian.

Changes in the animal organism's response to physical stress, after combined exposure to acceleration and X-rays, and after bombardment by protons with and energy of 120 Mev, are discussed. The results indicate a lasting effect of these exposures, alone or in combination. These changes are correlated with a shift in the ceruloplasmin values of the blood serum.

A65-80440
EXPERIMENTAL RESULTS OF IMPACT STRESS ON THE ANIMAL ORGANISM DURING LANDING [EKSPERIMENTAL'NYE ISSLEDOVANIIA VLIIANIIA UDARNYKH PEREGRUZOK PRIZEMLENIIA NA ORGANIZM ZHIVOTNYKH].
S. A. Gozulov, G. P. Miroliubov, N. N. Popov, and N. I. Frolov.
Kosmicheskie Issledovaniia, vol. 2, Sep.-Oct. 1964, p. 805-811. 11 refs. In Russian.

An impact of an aircraft or of any part of it (such as the space cabin or the escape capsule) with a land or water surface during forced landing, was simulated in the laboratory on experimental animals. The results disclosed considerable damage to the internal organs followed by disturbances in the physiological functions. The character of changes depended on the degree of the acceleration stress. No bone fractures were noted.

A65-80441
EFFECT OF HYPERCAPNIA ON THE SPONTANEOUS AND EVOKED POTENTIALS IN THE INTACT AND ISOLATED CEREBRAL CORTEX IN RABBITS.
I. S. Repin (USSR, Acad. of Med. Sci., Inst. of Exptl. Med., Lab. of Gen. Pathol., Leningrad).
(Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 56, Sep. 1963, p. 3-7).
Bulletin of Experimental Biology and Medicine, vol. 56, Sep. 1963, p. 935-938. 12 refs.

In rabbits, inhalation of an air mixture containing 5% to 30% CO_2 and 25% to 75% O_2 induced hypercapnia, which affected the potentials of the isolated area of the cerebral cortex, connected with the rest of the brain only by the pial vessels. The amplitude increased from the normal 150 to 200μV to 500 to 600μV of the periodically alternating fast and slow waves. In several cases, only slow waves were noted. Local application of ethanol, or mechanical damage, or intravenous injections of nembutal or adrenalin obliterated the potential changes, indicating their local origin. Electrical stimulation of the area had no effect on potential activity. Superficial local application of camphor or strychnine solutions to the intact cortex caused successive tetanic discharges of high amplitude. Ten to twenty percent CO_2 inhalation obliterated this effect. A preliminary chloroform block of the reticular formation did not affect the hypercapnia caused by excessive CO_2 inhalation, which suggested an extrareticular origin of the hypercapnic inhibition.

A65-80442
CHANGES IN THE CORTICAL ELECTRICAL ACTIVITY OF THE RABBIT DURING EXPOSURE TO AN UHF ELECTROMAGNETIC FIELD. REPORT 2. THE DIRECT ACTION OF THE UHF FIELD ON THE CENTRAL NERVOUS SYSTEM.
Iu. A. Kholodov.
(Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 56, Sep. 1963, p. 42-46).
Bulletin of Experimental Biology and Medicine, vol. 56, Sep. 1963, p. 969-972.

The effect of an UHF field on the EEG after injury to the telereceptors, alone or concurrent with an incision of the mesencephalon at the inferior colliculi, was studied in rabbits. The animals' reactions after single deafferentation, or combined with the brain section, were the same as in the normal controls, that is, the EEG showed an increase in amplitude and a decrease in frequency. The effect was evaluated in terms of response frequency and latent period. The same reaction, even more pronounced, was noted in the isolated brain, which suggested that the telereceptors are not primarily concerned with the perception of the UHF field. Incision at the mesencephalic level increased the duration of the response but shortened the latent period. The diencephalon and telecephalon located above the incision were capable of responding to the UHF field. The mean latent period was increased after deafferentation. However, the distribution curve in different individuals showed two maxima. No morphological explanation could be found to account for the difference in response. However, the cortex and the hypothalamus showed distinct histological changes.

A65-80443
REVERSIBILITY OF CARDIAC HYPERTROPHY DUE TO ALTITUDE HYPOXIA.
Iu. M. Repin (USSR, Acad. of Med. Sci., Inst. of Norm. and Pathol. Physiol., Moscow).
(Biulletin' Eksperimental'noi Biologii i Meditsiny, vol. 56, Sep. 1963, p. 46-49).
Bulletin of Experimental Biology and Medicine, vol. 56, Sep. 1963, p. 973-975. 13 refs.

During a prolonged exposure of albino rats to oxygen deficiency in an altitude chamber at a simulated level of 7000 to 8000 m., an increase in cardiac mass was noted due to hyperfunction. The histological picture of the subendocardial layer of the myocardium revealed a thickening of fibers, basophilia, and abnormality of the cell structures. The hypertrophy was a result of protein synthesis stimulation in the myocardial muscle tissue. The condition normalized a short time after the animals were brought back to normal atmospheric pressure.

A65-80444
ORGANIZED ELEMENT DISTRIBUTION TO SIZE IN THE ORGUEIL METEORITE.
George Claus and Eva A. Suba-c (Calif. U., Dept. of Chem., La Jolla, San Diego).
Nature, vol. 204, Oct. 10, 1964, p. 118-120. 21 refs.
Contract NsG-341.

An experiment is presented testing: (1) whether the seemingly high number (1,000 to 1,700) of organized elements found by other investigators in 1 mg. of Orgueil meteorite could be substantiated; and (2) whether these simple forms, which they described as type 1 or 2, have characteristics such that a biogenic origin could be assumed for them. Separation procedures for 1 mg. of Orgueil meteorite placed on slides coated with egg albumin or glycerine and methods of measuring the number of organized elements are described. The experiment resulted in the recognition of 1,534 organized elements belonging to types 1 and 2 in the sample of the Orgueil meteorite. A dimensional histogram obtained through the careful measurements of 303 types 1 and 2 organized elements suggests that even these most simple forms (type 1) do not represent just simple mineral grains, but may be the remains of some kind of primitive life indigenous the the meteorites.

A65-80445
TUBERCULOSIS OF FLIGHT PERSONNEL [GRUZLICA U PERSONELU LATAJACEGO .
Jozef Hornowski and Tadeusz Kaminski (Military Inst. of Aviation Med., and Central Antituberculosis Sanatorium, Warsaw, Poland).
Lekarz Wojskowy, no. 4, 1964, p. 272-278. 7 refs. In Polish.

Investigations of tuberculosis in Poland from 1936 through 1961 are briefly outlined. In the Air Force, during 1954 through 1959, case histories were collected describing tuberculosis in 38 Air Force men. These cases were analysed in 1959 by Kaminski who discovered that some specific aviation conditions promote development of tuberculosis. He listed among them; (1) rapid pressure changes and low air pressure at flights in open cabins, (2) humid and cold weather, and (3) temperature variations. One hundred other cases of tuberculosis of flying personnel were selected by the Division of Pathophysiology of the Military Institute of Aviation Medicine for study of sickness, its origin, and effects of various forms of medical treatment. The study showed that detection of tuberculosis in flying personnel usually was at the beginning of the sickness, that underweight was the most representative symptom of tuberculosis, and that medical treatment in specialized institutions effected rapid recovery. Preventive treatment of body protection against unfavorable weather conditions, and modern methods of tuberculosis treatment, favored improvement of tuberculosis control in Air Force units.

A65-80446
THE EFFECTS OF VEHICULAR VIBRATIONS ON THE GENITALS OF FEMALE TRANSPORTATION PERSONNEL [DIE EINWIRKUNG VON FAHRZEUGSCHWINGUNGEN AUF DAS GENITALE DES WEIBLICHEN FAHRPERSONALS].
F. Böhm (Deut. Zentralinst. für Arbeits Med., Berlin, Germany).
Zeitschrift für die Gesamte Hygiene und ihre Grenzgebiete, vol. 10, Oct. 1964, p. 720-736. In German.

One thousand female vehicle operators (bus drivers, streetcar operators, etc.) were investigated over a two-year period with respect to obstetrical-gynecological complaints that could be attributed to occupational origin. The observed pathology was compared to that found in 1000 unselected patients at the gynecological clinic. The morbidity of the traffic personnel was extremely high considering the unselected nature of the sample. Occupational factors were implicated in the incidence of pelvic inflammations, abortions, and tumors. However, occupational influence was seen in the increased incidence of disturbances of the menstrual cycle, and positional anomalies of the genital organs, e.g. retroflexion, prolapse, etc., whereby percentages were even higher than those for the control group of clinic patients. Hyperemesis of pregnancy was also encountered more often in the vehicle operators. Vibration either alone or in combination with constitutional predisposition is considered to be the causal factor. Prophylactic measures are suggested.

A65-80447
STROKE VOLUME AND CARDIAC OUTPUT AFTER SMOKING IN THE POSTPRANDIAL AND IN THE FASTING STATE.
Louis A. Soloff and Donald V. Powers (Temple U. Med. Center, Div. of Cardiol., Philadelphia, Pa.)
American Journal of the Medical Sciences, vol. 248, Dec. 1964, p. 693-696. 5 refs.

Arline Dickler Grass Chapter of the Heart Assoc. of Southeastern Pennsylvania (Cardiovascular Res. Center HE 06313-03); and Tobacco Industry Res. supported research.

Eight habitual smokers were studied to learn if glucose by mouth, as has been demonstrated after intravenous glucose, can block the increase in the stroke volume and in cardiac output provoked by smoking. In all instances, peroral glucose blocked the increase in stroke volume and cardiac output provoked by smoking. A volume of water equal to the volume of glucose solution has no effect on cardiac output or stroke volume nor did this amount of water inhibit the increase in stroke volume and cardiac output provoked by smoking. These studies suggest that the physiological act of eating (sugar) prevents the cardiac effects of smoking which may occur in the fasting state. The cardiac response to smoking can not be fully characterized by studies limited to the postabsorptive state.

A65-80448
DRUGS AND PLACEBOS: EFFECTS OF INSTRUCTIONS UPON PERFORMANCE AND MOOD UNDER AMPHETAMINE SULPHATE AND CHLORAL HYDRATE WITH YOUNGER SUBJECTS.
A. D. Krugman, Sherman Ross, and S. B. Lyerly (V. A. Hosp., Durham, N. C.)
Psychological Reports, vol. 15, Dec. 1964, p. 925-926.
Human Ecology Fund, New York and Washington, D. C., supported research.

This is a brief report of the third experiment using a new design to study the effects of drugs and placebos upon human performance and mood. The earlier studies, using older male subjects, had demonstrated significant effects attributable to differences in drugs (racemic amphetamine sulphate and chloral hydrate) and in expectations arising from instructions given. The present study, with younger subjects, did not yield significant results. Possible explanations are discussed.

A65-80449
DIET OF QUECHUA INDIANS LIVING AT HIGH ALTITUDE: NUNOA, PERU.
R. B. Mazess and P. T. Baker (Pa. State U., Depts. of Sociol. and Anthropol., University Park).
American Journal of Clinical Nutrition, vol. 15, Dec. 1964, p. 341-351. 18 refs.

The results of a dietary survey made in the rural areas around the town of Nuñoa (Melgar Province, Department of Puna, Peru during July 1962, are presented. The Nuñoa area is situated in a broad valley with a 4,000 meter base and lies in a distinct altitudinal and vegetational zone of the Andes. Both qualitatively and quantitatively, the Nuñoa diet is more adequate than that reported for any other highland Peruvian community. The much larger quantity of food which was consumed in the Nuñoa diet provided more of some nutrients, i.e., in July fresh potatoes were the major source of ascorbic acid; but because of the large quantity consumed, ascorbic acid intake was high. The differences between the ecological zones and the related cultural differences produce qualitative variations between the Nuñoa diet and that in the lower altitude zone.

A65-80450
PSYCHOLOGICAL RESEARCH IN SPACE FLIGHT.
H. F. Huddleston (R. A. F. Inst. of Aviation Med., Farnborough, Great Britain).
Spaceflight, vol. 6, Nov. 1964, p. 189-192. 12 refs.

Main areas of psychological research explored in the two suborbital and ten orbital flights between April 1961 and June 1963, are presented in form of tables. The sources of information include open literature bibliography, the English press, and broadcasts. The information obtained from a total experience of 450 flight hours is insufficient to make valid conclusions. Weightlessness, radiation, earth-separation, and sensory impoverishment are discussed as the four major aspects of spaceflight environment that defy adequate ground simulation. It is expected that visual cues, and the visual system may compensate for the depletion of other sensory input.

A65-80451
ON THE METABOLISM OF THE HUMAN HEART. I. THE SUBSTRATE SUPPLY OF THE HEALTHY HUMAN HEART AT REST, DURING AND AFTER PHYSICAL WORK (UBER DEN STOFFWECHSEL DES MENSCHLICHEN HERZENS. DIE SUBSTRATVERSORGUNG DES GESUNDEN MENSCHLICHEN HERZENS IN RUHE, WAHRFND UND NACH KORPERLICHER ARBEIT).
J. Keul, E. Doll, H. Steim, H. Homburger, H. Kern, and H. Reindell (Freiburg I. Br., U., Med. Universitatsklin., Germany).
Pflugers Archiv fur die Gesamte Physiologie des Menschen und der Tiere, vol. 282, 1965, p. 1-27. 90 refs. In German.

Oxygen pressure, carbon dioxide pressure, pH, standard bicarbonate, and base excess of the coronarvenous and arterial blood were determined in 10 healthy male adults during rest, defined easy and heavy work, and recovery. At rest the coronarvenous pressure is 25.1 mm. Hg. These values obtained by platinum electrode are higher than those previously reported. During work there is no significant decrease of the coronarvenous O2 pressure. After work there was a high significant increase of the coronarvenous O2 pressure, probably because in the recovery, coronary circulation exceeds the actual demands of the metabolism in the heart. During rest the coronarvenous CO2 pressure is 48.4 mm. Hg. During work the coronarvenous CO2 pressure and the arteriocoronarvenous difference of the CO2 pressure increase, because the cardiac production of CO2 is higher and the blood CO2 affinity is smaller. In spite of the high extraction of lactate, pyruvate, and free fatty acids the pH in the coronarvenous blood is higher than in the arterial blood, because the cardiac CO2 production causes an increase in the coronarvenous CO2 pressure. At rest, during work, and after work standard, bicarbonate and base excess is higher in the coronarvenous blood than in the arterial blood.

A65-80452
ON THE METABOLISM OF THE HUMAN HEART. II. OXYGEN AND CARBON DIOXIDE PRESSURES, PH, STANDARD BICARBONATE AND BASE EXCESS IN CORONARY VENOUS BLOOD AT REST, DURING AND AFTER PHYSICAL WORK (UBER DEN STOFFWECHSEL DES MENSCHLICHEN HERZENS, II. SAUERSTOFF- UND KOHLENSAUREDRUCK, PH, STANDARDBICARBONAT UND BASE EXCESS IM CORONARVENOSEN BLUT IN RUHE, WAHREND UND NACH KORPERLICHER ARBEIT).
E. Doll, J. Keul, H. Steim, C. Maiwald, and H. Reindell (Freiburg I. Br., U., Med. Universitatsklin., Germany).
Pflugers Archiv fur die gesamte Physiologie des Menschen und der Tiere, vol. 282, 1965, p. 28-42. 31 refs. In German.

Arteriocoronarvenous differences of glucose, lactate, pyruvate, the lactate/pyruvate quotient, free fatty acids, -hydroxybutyrate, and acetacetate were measured in 10 healthy male adults at rest, during work, and during recovery. There is a significant correlation between the arterial level of lactate and the arterial-coronarvenous difference. Cardiac work also influences lactate extraction. Cardiac muscle extraction of pyruvate is dependent to a small extent on the arterial concentration of pyruvate. During physical work in the maximal steady state pyruvate is excreted by the heart, probably due to a limited capacity for its oxidation. The lactate/pyruvate quotient during work is lower in coronarvenous blood than in the arterial blood, which is reversed after work. A higher lactate/pyruvate quotient in coronarvenous blood should be only guardedly evaluated as an expression of coronary sclerosis. During rest and recovery the heart extracts glucose continuously from arterial blood. During work the extraction rate is lower than at rest and during recovery. During submaximal work the heart extracts more free fatty acids and during maximal steady state less than at rest. After work the extraction increases again. Only a small quantity of -hydroxybutyrate and acetacetate is extracted by the heart ar rest, during work, and during recovery. There is no indication, that the amino acids are important for energy supplying reactions in the human heart.

A65-80453
ON THE METABOLISM OF THE HUMAN HEART. III. THE OXYDATIVE METABOLISM OF THE HUMAN HEART UNDER DIFFERENT WORK CONDITIONS [UBER DEN STOFFWECHSEL DES MENSCHLICHEN HERZENS. III. DER OXYDATIVE STOFFWECHSEL DES MENSCHLICHEN HERZENS UNTER VERSCHIEDENEN ARBEITSBEDINGUNGEN].
J. Keul, E. Doll, H. Steim, U. Fleer, and H. Reindell (Freiburg I. Br. U., Med. Universitätsklin., Germany).
Pflügers Archiv für die gesamte Physiologie des Menschen und der Tiere, vol. 282, 1965, p. 43-53. 31 refs. In German.

The contribution of the main energy supplying metabolites to the oxidative metabolism of the heart was determined in 10 healthy male adults in rest, during defined easy and heavy work, and during recovery. The contribution of free fatty acids to the oxidative metabolism of the heart is 34% at rest. During work the percentage is smaller. During work the main energy donator for the heart is lactate, which is responsible for more than 60% of the energy donating reactions of the heart. Because the increasing level of lactate during work limits the working capacity, the very high consumption of lactate by the human heart during work is important for the working capacity. At rest, glucose contributes 30% to the oxidative metabolism of the heart. This percentage is smaller during work. The contribution of β-hydroxybutyrate, acetacetate, and pyruvate in oxidative metabolism is very small, with the exception of a condition in which the heart does not perform either pressure or volume work (extracorporal circulation). Here, β-hydroxybutyrate and acetacetate donate 25%, possibly as consequence of the high arterial level. The energy demand of the human heart is supplied almost exclusively by the oxidative catabolism of energetic compounds (98%), and the rest (2%) by the anaerobic splitting of glucose.

A65-80454
HUMORAL TRANSMISSION OF SLEEP AND WAKEFULNESS II. HEMODIALYSIS OF A SLEEP INDUCING HUMOR DURING STIMULATION OF THE THALAMIC SOMNOGENIC AREA.
Marcel Monnier and L. Hosli (Basel U., Physiol. Inst., Germany).
Pflügers Archiv für die gesamte Physiologie des Menschen und der Tiere, vol. 282, 1965, p. 60-75. 16 refs.

Dialysis of cerebral venous blood was performed in rabbits during sleep induced by electrical stimulation of the medio-central intralaminary thalamus. This hemodialysis lasted maximally 2 hrs. (40 min. preliminary experiment, 80 min. sleep experiment). The dialysate from the sleeping donor was then

injected i.v. into a recipient animal and the effects analyzed by film, kinesimetry, electroencephalography, and automatic frequency analysis. Control experiments were performed with dialysate from nonsleeping "control" donors (sham stimulation of the thalamus). Recipients having received 20 ml. dialysate from a sleeping donor fell asleep 10 to 15 min. after the injection for at least 25 min. This sleep was behaviorally and electrographically similar to physiological spontaneous sleep. Control recipients showed, after injection of dialysate from control donors, a slight activation of motor behavior and EEG. It is suggested that sleep induced in the recipient is mediated by a special humor extracted in the dialysate from the sleeping donor (specific neurohumor or complex metabolite).

A65-80455
EXERCISE AND CARDIAC STROKE FORCE.
Ernst Jokl and John B. Wells (Ky. U., Lexington).
Journal of the Association for Physical and Mental Rehabilitation, vol. 18, Nov.-Dec. 1964, p. 148-163. 17 refs.
U. of Kentucky Faculty Res. Fund Comm. supported research.

Analyses of ballistocardiograms obtained at rest and after exercise from trained and untrained subjects revealed enhanced systolic stroke forces and bradycardia as integrated components of the physiological syndrome of cardiac adaptation to sustained physical activity. After a 2.2 mile run, the majority of contestants showed a significant augmentation of systolic stroke force together with a sharp acceleration of cardiac frequency. Both the sympathetic and the parasympathetic division of the autonomic system are capable of inhibiting as well as augmenting frequency and force of the heart beat. Since the functional status of the autonomic system of trained athletes is distinguished by a generalized parasympathetic preponderance, the enhanced systolic stroke force at rest must be considered an integral component of the latter; while the increase of systolic stroke force attending short-lasting strenuous exercise represents part of the "heterostatic deployment" mediated through the sympathetic division of the autonomic system.

A65-80456
REPEATED MEASUREMENTS AND SESSION-SPACING EFFECTS ON CRITICAL FLICKER FREQUENCY.
Daniel J. Baer (Fordham U., Dept. of Psychol., Bronx, N.Y.)
Journal of Psychology, vol. 59, Jan. 1965, p. 11-15. 11 refs.

To evaluate the effect of session replication and the effect of the duration of the interval between sessions on critical flicker frequency (CFF), 3 groups different in the methods of spacing sessions were tested for 10 sessions. A significant interaction effect was observed between interval durations and session replications. The group that was tested daily for 5 consecutive days showed a consistent elevation in threshold after the first 2 sessions, while the other 2 groups showed relatively uniform threshold scores over the 10 sessions.

A65-80457
VARIABILITY IN VISUAL THRESHOLDS.
Janice Marie Jackson (Marymount Coll., Dept. of Psychol., Tarrytown, N.Y.)
Journal of Psychology, vol. 59, Jan. 1965, p. 17-28. 9 refs.

Visual threshold variability was studied with 6 subjects over 50 consecutive days. Session-to-session variability agreed closely with the variability estimates reported previously (not more than .3 of a log unit). No periodic or cyclic trends appeared for the group or for any individual. For all 6 subjects for the first 15 days of testing, a learning phenomenon was observed for the mean and standard-deviation data. There was a slow rise over the last 10 days of testing for the mean, but not for the standard deviation data. (A discussion of the possible causes of the rise of the mean over the last 10 days suggested the influence of extraneous factors, such as boredom and fatigue.) Conversion of the data into quanta-per-cone values yielded a ratio of 4 to 11 quanta per 100 cones estimated on a field of 93 minutes of arc.

A65-80458
TRAVELING PREFERENCES, EXPERIENCE, AND AIRPLANE DRAWINGS.
Daniel J. Baer (Boston Coll., Dept. of Psychol., Chestnut Hill, Mass.)
Journal of Psychology, vol. 59, Jan. 1965, p. 149-153. 9 refs.

A sample of 128 subjects differing in flying experience were compared in their travel preferences and in their drawings of airplanes. Significant sex differences were found, with males drawing more "realistic" airplanes; and females, larger airplanes. Those males who had flown and who indicated motion in their drawings tended to report some experience of motion sickness. Those females who had flown and who indicated motion in their drawings tended to report fear of high places.

A65-80459
THEORETICAL INTERPRETATION OF VARIOUS QUALITATIVE AND QUANTITATIVE ASPECTS OF FLICKER AND FUSION PHENOMENA.
Thomas M. Nelson and S. Howard Bartley (Mich. State U., Dept. of Psychol., East Lansing).
Journal of Psychology, vol. 59, Jan. 1965, p. 185-194. 28 refs.
Grant NSF-G-19485.

This paper is a theoretical interpretation of general facts interrelating critical flicker frequency (CFF), the length of the pulse train, and the interval of separation between pulse trains. Predictions are made within the framework of the alternation-of-response theory covering stimulus conditions not yet investigated. The theory consists of a set of statements describing how intensive, durational, and distributional features of photic input are utilized by the visual system. Empirical basis of it is that the cortical processes control CFF and brightness, and that certain temporal distributions of cortical activity are necessary to explain discriminations of edge, size, hue, and saturation.

A65-80460
FLASH FREQUENCY WHEN BRIGHTNESS IS VARIED BY MANIPULATION OF THE TEMPORAL DISTRIBUTION OF PHOTIC INTERMITTENCY.
Thomas M. Nelson, S. Howard Bartley, and Frank Bochniak (Mich. State U., Dept. of Psychol., East Lansing).
Journal of Psychology, vol. 59, Jan. 1965, p. 195-205. 17 refs.
Grant NSF-G-19485.

Experiments were conducted with three subjects to establish the relation between flash frequency and photic pulse rate. It was shown that flash rate and photic pulse rate tally only at very slow input frequencies. As input rate increases, flash rate falls progressively behind until a certain point is reached at which flash rate per stimulus rate is nearly constant. Flash rate need not be a strict submultiple of photic pulse (input) rate. Moreover, the present results suggest that under certain conditions flash frequency can exceed the input rate. The study of the duration of intervals filled with intermittent photic input indicates that durations are almost always underestimated and that the best matches are associated with slow repetition rates in combination with small pulse-to-cycle frequencies.

A65-80461
BODY ROTATION AND THE STABILITY OF FIELD DEPENDENCE.
Abraham Wolf (Temple U. Med. Center, Philadelphia, Pa.)
Journal of Psychology, vol. 59, Jan. 1965, p. 211-217. 7 refs.
Grant NIMH-G-M-3524/A/.

Subjects in the first group were administered the Rod and Frame Test, then after a delay they were spun and retested immediately after rotation (immediate test group). Subjects in the second group were given the Rod and Frame Test, rotated, and then given the Rod and Frame Test after a delay of 10 minutes (delay test group). The control group was given the Rod and Frame Test which was repeated again after a 15 minute delay. Subjects in both the immediate-test group and control group showed a decrease in field dependence, with the immediate-test group showing a slightly greater decrease than the control group. Subjects in the delay-test group did not show a decrease in field dependence. Contrary to expectation, in no case was there a mean increase in field dependence. The results indicate the possibility of a normal decrease in field dependence with readministration of the Rod and Frame Test after a short lapse of time.

A65-80462
EFFECT ON DROSOPHILA MELANOGASTER AND S-37 TUMOR CELLS; POSTULATES FOR MAGNETIC FIELD INTERACTIONS.
Indumati L. Mulay and L. N. Mulay (Pa. State U., Mater. Res., and Frear Biochem. Labs., University Park).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by Madeleine F. Barnothy.
New York, Plenum Press, 1964, p. 146-169. 18 refs.
Am. Cancer Society Grant (T-250).

Studies on Drosophila melanogaster in vivo and Sarcoma-37 mouse tumor cells in vitro along with a summary of related early works are reported. A résumé of magnetic field effects on chemical reactions carried out by other workers and postulates for explaining the interaction between magnetic fields and biological systems is included. When Drosophila melanogaster organisms were exposed to magnetic fields of 3000 and 4400 Oe. for more than one generation, the frequency of deformities increased. Exposure to lower intensities (100, 600, and 1500 Oe.), even for more than two generations, did not increase the frequency of deformities. It is not possible at present to state whether the observed deformities were due to high intensities alone or due to the combined effect of the high gradient and the high intensities. Studies on the effect of magnetic fields on ascites tumor cells indicate the following trends: (1) magnetic fields of high intensities (4400 to 8000 Oe.) seemed to produce some degeneration of S-37 tumor cells at a temperature of 37° C. after about 18 hours, (2) fields of low intensities (100 to 2000 Oe.) did not show any visible effects after the same period, and (3) the observed effect seems to be very specific or dependent on certain precise conditions of tumor and magnetic field. The basic condition of the tumor seems to play a very important part.

A65-80463
AN ANALYSIS OF THE VESTIBULAR EVOKED POTENTIALS IN RESPONSE TO STIMULATION OF THE AMPULLAR NERVE.
Takeo Kumoi, Hideo Hosomi, and Hikaru Matsumura (Kobe Med. Coll., Dept. of Otolaryngol., Japan).
Kobe Journal of Medical Sciences, vol. 9, Sep. 1963, p. 79-88. 5 refs.

The bulbar distribution of the evoked potentials was outlined in anesthetized cats. Electric stimulation of the lateral ampullar nerve resulted in maximum action potentials in the ipsilateral medial vestibular nucleus with short latency. The recorded response was usually spike waves followed by slow negative waves of a considerably longer duration. The refractory curves of two negative waves n_1 and n_2 show definite differences. After plotting the potential field created by these two components the center of the field of slow waves was found in the ventromedial part of the nucleus. A possible origin of these two components is discussed.

A65-80464
OPOSSUM FETUSES MAY YIELD ZERO-G DATA.
Kenneth J. Stein.
Aviation Week and Space Technology, vol. 82, Jan. 18, 1965, p. 71, 73, 75, and 78.

The article describes a proposed biomodule spacecraft for orbiting 24 opossum fetuses in a controllable low-gravity environment. This would be a quick means of getting a large amount of data of effects of weightlessness on developing mammalian tissue. Observation would be by telemetry and television. Because much of their embryonic development occurs outside the mother's body, the marsupials are ideal for studying early development. The data received will be related to human tolerance of weightlessness. Physiological instrumentation will observe respiration, heart rate, and sensory perception. Aspects of the biochamber, dynamic control of the spacecraft, launching procedure, video system, and data storage units are discussed. Drawings of the design are shown. The proposal was made by the RCA Corp. and the Marquardt Company.

A65-80465
THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES.
Sidney W. Fox, ed. (Fla. State U., Inst. for Space Biosci., Tallahassee; and Miami U., Inst. of Molecular Evolution, School of Environ. and Planetary Sci., Coral Gables, Fla.)
(Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963 under the Auspices of the Insti ute for Space Biosciences, Fla. State U., and National Aeronautics and Space Admin.)
Edited by Sidney W. Fox (Fla. State U., Inst. for Space Biosci., Tallahassee; and Miami U., Inst. of Molecular Evolution, School of Environ. and Planetary Sci., Coral Gables, Fla.)
New York, Academic Press, 1965, xx+482 p.

CONTENTS:

Selective papers of this symposium have been abstracted separately.

A65-80466
DATA NEEDED FOR A BLUEPRINT OF THE FIRST ORGANISM.
J. B. S. Haldane (Genet. and Biometry Lab., Bhubaneswar, India).
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 11–18.

It is suggested that the initial organism consisted of a so-called "gene" of ribonucleic acid specifying just one enzyme, a very generalized phosphokinase, which could catalyze the following reactions: (1) formation of nucleotides, (2) coupling of nucleotides to form chains, (3) combination of amino acids with adenosine triphosphate or related substance, and (4) coupling of these amino acids to form a peptide chain. The smallest enzyme at present known is ribonuclease, which may have evolved at a fairly early stage from the hypothetical primitive enzyme. The primitive enzyme was possibly a shorter peptide of low activity and specificity, incorporating only 100 amino acid residues. The first synthetic organism may have been something like a tobacco mosaic virus, but including the enzyme or enzymes needed for its own replication.

A65-80467
RANDOM POLYMERS AS A MATRIX FOR CHEMICAL EVOLUTION.
M. S. Blois (Stanford U., Biophys. Lab., Calif.)
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 19–33. Discussion p. 33–38. 14 refs.
NASA Grant Nsg-218-62.

The class of random, partially aromatic polymers is important in chemical evolution since it probably was formed through photopolymerization on the prebiological Earth, and is still synthesized today by living organisms. It is proposed that melanin biosynthesis involves free radical polymerization and that natural melanin is a high random polymer. Because the photoproduced polymer of phenylalanine is similar to melanins, it is believed to be a member of the class of random, irregular polymers as are melanins. In experiments concerning the absorbance changes under ultraviolet irradiation in nitrogen and oxygen atmospheres and their rate of dialysis and kinetics of tyrosine and phenylalanine, it was found that in both the oxygen and oxygen-free cases the primary photochemical changes were generally similar, and among these one of the operating mechanisms was photopolymerization. To place these isolated findings in the chemical evolutionary scheme, the pre-existence of aromatic compounds of abiogenic origin on the primitive earth is assumed. In the presence of the reducing atmosphere and of short-wavelength solar ultraviolet light, the most stable configuration of these aromatics would be their incorporation into random polymers, similar to present melanin.

A65-80468
THE FOLLY OF PROBABILITY.
Peter T. Mora (Natl. Inst. of Health, Bethesda, Md.)

IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 39–52. Discussion p. 52–64. 27 refs.

The inadequacies and discrepancies arising when the concept of probability is applied to speculation on the origin of life are described as related to the following topics: (1) order and macromolecular structure; (2) thermodynamics; (3) internal control of molecular functions; (4) minimum requirements necessary for a self-reproducing and mutable system; (5) infinite escape clauses postulating an infinite amount of time and material (monomers) for the occurrence of even the most unlikely event; and (6) singularity of origin and some insolvable problems. Discussion is included on the semantic confusion in using the word selectivity, which has different physicochemical and Darwinian operational meanings. The limitations in the current scientific approach are mentioned to possibly explain why a probability concept is favored, along with a teleological viewpoint for biology which may lead to new approaches in the problems connected with origin of life.

A65-80469
MOLECULAR MATRICES FOR LIVING SYSTEMS.
J. D. Bernal (London U., Birkbeck Coll., Dept. of Phys., Great Britain).
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 65–88.

A series of 32 questions dealing with speculations on the origin of life are discussed. They are not confined to any one or particular topic outlined for molecular matrices. Included are data on micromolecules, especially in relation to their appearance on meteorites; on macromolecules; molecules of precellular organization; and on the general possibilities for life.

A65-80470
HISTORY OF THE SUBJECT MATTER OF THE CONFERENCE.
A. I. Oparin (Acad. of Sci., A. N. Bakh Inst. of Biochem., Moscow, USSR).
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 91–96. Discussion p. 96–98.

The three problems confronting natural science are the nature of life, the origin of life, and the distribution of life in the cosmos. A brief historical outline is presented of the theories dealing with the spontaneous generation of life, origin of life from inorganic nature, origin of organic substances abiogenetically similar to the processes observed on other celestial bodies, origin of organic substances (hydrocarbons, amino acids, purines, pyrimidines, porphyrins) in the primordial Earth, and origin of living organisms from the primordial environment by molecular evolution.

A65-80471
TWO ASPECTS OF THE GEOCHEMISTRY OF AMINO ACIDS.
J. R. Vallentyne (Cornell U., Dept. of Zool., Ithaca, N.Y.)
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 105–120. Discussion p. 120–125. 21 refs.
Grant NSF G-12452.

Amino acids and a substance tentatively identified as urea were detected in hydrolyzates of samples of the Orgueil and Holbrook meteorites. The quantities could not be accounted for by contamination during analysis, but there was a resemblance between the results of meteorite analyses and the amino acids found in a hydrolyzate of "hand-picked sand." Quantitative data on amino acids are given for four samples of dust, the total concentrations being about 1000 times higher than in meteorites. Dust hydrolyzates contained much higher relative amounts of proline and cysteic acid, and somewhat higher relative amounts of glutamic acid than did those of the meteorites analyzed. A reminder was made that some attention might profitably be given to rates of decomposition in "soup" experiments. Labile compounds necessary for biopoiesis could exert a controlling influence on the rate of evolution of eobionts in a primitive sea.

A65-80472
ASYMMETRIC HYDROGENATION OF CARBONYL COMPOUNDS.
Shiro Akabori (Osaka U., Inst. for Protein Res., Japan).
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Walkulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 127–135. Discussion p. 135. 6 refs.

Investigations are presented on the asymmetric modification of the catalytic activity of Raney nickel using methyl acetoacetate as a substrate for catalytic hydrogenation. Studied were the effects of: pH of modifying solution, temperature modification, immersion time in modification of catalyst, mixing of D- and L-glutamate, successive modification, various amino acids, and L-malic acid and D-tartaric acid. This work does not offer any information concerning the problem of abiogenic asymmetric formation of organic substances. However, it suggests a possibility of asymmetric formation of organic substances in the absorbed state on the surface of solid matter. The best result obtained was methyl-L-β-hydroxybutyrate, which was found to be composed of 75% L- and 25% D-form. Included are representative tables and graphs.

A65-80473
STAGES AND MECHANISMS OF PREBIOLOGICAL ORGANIC SYNTHESIS.
J. Oro (Houston U., Dept. of Chem., Tex.)
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 137–162. Discussion p. 162–171. 58 refs.
NASA Grant NsG-257-62.

Observations on the composition of carbon star atmospheres, interstellar matter, the Jovian planets, comets, and meteorites indicate that the synthesis of organic compounds in the universe is a more general process than has been thought heretofore. Prior to and during the formation of the solar system, but before the earth was completely formed, organic syntheses probably occurred in the following four stages (or sites): carbon star atmospheres, solar nebula, planetesimals, and protoplanets. The energy for these syntheses was provided initially by the high temperature of star atmospheres and then mainly by the ionizing radiation and ultraviolet light coming from the sun. Catalytic processes and other localized sources of energy were probably also involved in the formation of organic compounds. Astronomic and meteoritic observations indicate that the conditions prevailing in the majority of cosmic bodies during the latter stages of evolution of the solar system were as follows: reducing or oxygen-free atmosphere, aqueous environment, basic or neutral pH, moderate temperature, and presence of a relatively high concentration of organic compounds. A number of general mechanisms can be postulated to have been involved in the abiotic formation of simple biochemical compounds: (a) a radical mechanism in the synthesis of the aliphatic and aromatic aldehydes which are the precursors of α-amino acids, (b) a base-catalyzed aldol condensation of simple aldehydes in the formation of pentoses, 2-deoxypentoses, and other monosaccharides, and (c) a base-catalyzed condensation of hydrogen cyanide and other nitriles, followed by other condensation reactions, in the synthesis of purines, pyrimidines, and other heterocyclic compounds.

A65-80474
AMINO ACIDS, PEPTIDES, AND SPHERULES OBTAINED FOM "PRIMITIVE EARTH" GASES IN A SPARKING SYSTEM.
Karl A. Grossenbacher and C. A. Knight (Calif. U., Dept. of Soils and Plant Nutr., and Virus Lab., Berkeley).
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 173–183. Discussion p. 183–186.

Data from experiments using a spark source and a mixture of methane, ammonia, hydrogen, and water in a modified Miller-Urey system indicate that: (1) under some conditions the formation of organic compounds appeared to be autocatalytic; (2) ten different amino acids were produced; (3) peptides were formed by two lines of evidence; and (4) spherules ranging from 50 to 800 A in diameter were produced which consisted partially of organic material.

A65-80475
THE THERMAL SYNTHESIS OF AMINO ACIDS FROM A HYPOTHETICALLY PRIMITIVE TERRESTRIAL ATMOSPHERE.
Kaoru Harada and Sidney W. Fox. (Fla. State U., Inst. for Space Biosci., Tallahassee).
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 187–194. Discussion 194–201. 22 refs.
NASA Grant Nsg-173-62.

In the primitive atmosphere vigorous reactions might have occurred on the hot surface of the earth's crust. The atmosphere is regarded as a reducing agent comprising such gases as methane, ammonia, hydrogen, and water vapor. Under laboratory conditons, the following amino acids were produced by the thermal reaction of methane, ammonia, and water vapor in the presence of silica and by electric disc: aspartic acid, threonine, serine, glutamic acid, proline, glycine, alanine, valine, alloisoleucine, isoleucine, leucine, tyrosine, phenylalanine, α-NH_2 butyric acid, β-alanine, sarcosine, and N-methylalanine. The composition of amino acids obtained varied significantly with temperature and with the nature of the solid surfaces on which the vapor phase reaction occurred. Aromatic amino acids were found in the products. Simple gases are thermally convertible to most of the amino acids common to protein in a way that is sequentially compatible with other aspects of the thermal theory of biochemical origins of life on earth.

A65-80476
PRIMORDIAL ULTRAVIOLET SYNTHESIS OF NUCLEOSIDE PHOSPHATES.
Carl Sagan (Harvard U. and Smithsonian Astrophys. Obs., Cambridge, Mass.)
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27-30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 207-219. 15 refs.

A discussion is presented of the primitive environment and of the evolution of the terrestrial atmosphere in three stages: from a highly reductive one, to an atmosphere neither strongly reducing nor oxidizing and lacking both free hydrogen and oxygen, to the present oxidizing atmosphere. In the experimental approach to the origin of life, the simplest working hypothesis holds that fundamental molecules now were fundamental at the time of the origin of life. It is conceivable that nucleic acids and proteins or at least their precursors appeared at a very early stage in the earth's evolution. Laboratory investigations have been made of the synthesis of purines, pyrimidines, sugars, nucleosides, and nucleotides that are found in the nucleic acid molecule. In one series of experiments ethyl metaphosphate was irradiated with ultraviolet light and successfully produced nucleoside phosphates in quantum yields. It is postulated that nucleoside phosphates were present, perhaps in large amounts, in the primitive oceans. Speculation is made of primordial polynucleotide synthesis, and the possibility of organic matter on the Moon, Mars, and Jupiter.

A65-80477
A BIOLOGICAL SYNTHESIS OF SOME NUCLEIC ACID CONSTITUENTS.
Cyril Ponnamperuma (NASA, Ames Res. Center, Exobiol. Div., Moffett Field, Calif.)
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27-30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 221-236. Discussion p. 236-242. 23 refs.

The following experiments were performed: electron irradiation of methane, ammonia, and water; ultraviolet and ionizing irradiation of formaldehyde; polymerization of hydrogen cyanide by ultraviolet light; and ultraviolet irradiation of adenine, adenosine, adenosine monophosphate, and adenosine diphosphate. Syntheses were demonstrated of purines, adenine, guanine, the sugars ribose and deoxyribose, the nucleoside adenosine, and the nucleotides, adenosine monophosphate, adenosine diphosphate, and adenosine triphosphate. These results are relevant to the problem of the origin of life, as the conditions of reaction are aqueous, the concentration of materials very low, and the sources of energy used are those most likely to have existed under primitive earth conditions.

A65-80478
PROBABLE SYNTHESIS OF PORPHINE-LIKE SUBSTANCES DURING CHEMICAL EVOLUTION.
Anton Szutka (Detroit U., Dept. of Chem., Mich.)
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27-30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 243-252. Discussion p. 252-254. 43 refs.
NASA Grant NsG-226-62.

A review of the literature dealing with the problem of the origin of life indicates that at some stage of chemical evolution porphyrins must have developed. Porphine-like structures can be synthesized in the presence of oxygen from precursors which were available in the very earliest stage of chemical evolution. Aldehydes were found in products of the action of electrical discharge on the Urey atmosphere, pyrroles and prrolidines were formed from ammonia, acetylene, and other unsaturated hydrocarbons by simple catalysis or under the influence of ultraviolet radiation. Organic matter in water increases the yield of porphine-like substances considerably as do standing chloroform solutions. Arguments are presented to indicate that with the transition of the earth's reductive atmosphere into an oxidative one, an immediate need was created for the formation of porphinelike substances, since they provided a mechanism for the efficient utilization of lower energy radiation and aided in chemical transformations.

A65-80479
PROJECTING BACKWARD FROM THE PRESENT STAGE OF EVOLUTION OF BIOSYNTHESIS.
Fritz Lipmann (Rockefeller Inst., New York City, New York).
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27-30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 259-273. Discussion p. 274-280. 17 refs.

An attempt is made to discover the continuous trend from preorganismic, largely chemical, development towards the microbial plateau from which all presently known evolution appears to begin. Namely, in orderly sequence from more primitive to more complex situations. Projecting backward it may be possible to find links for primitive evolutionary stages within the metabolic picture in order to apprehend surviving metabolic "fossils". The coupling of chemosynthesis to electron transport was proposed as an early event in parallel with nonbiological energy-coupling mechanisms on earth, such as the water cycle. Polyphosphate was preferred as the primeval energy carrier as evidenced by recent observations on pyrophosphate and tripolyphosphate appearing in reversible energy transfer reactions. In protein evolution, such primitive structures as the iron containing, amino acid-deficient hydrogen carrier, ferrodoxin, may be representative. Searching further back, cell wall peptides synthesized in a primeval fasion could represent an early sampling of a pretemplate period. Included is a brief outline of metabolic evolution.

A65-80480
RANDOM POLYCONDENSATION OF SUGARS.
Peter T. Mora (Natl. Inst. of Health, Bethesda, Md.)
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27-30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 281-288. 11 refs.

An experiment is presented to show that probability considerations are useful in predicting the structure of polysaccharides obtained by polycondensation of certain carbohydrates (aldoses) at elevated temperatures. Namely, the resulting structures are random, but they depend on the nature of monomers and on the reaction conditions used. The following parameters are considered, as they control the reaction mechanism and the structure of the polymer formed: functional groups of monomers, their relative reactivities, and the influence of heart and catalyst.

A65-80481
THERMAL POLYCONDENSATION OF FREE AMINO ACIDS WITH POLYPHOSPHORIC ACID.
Kaoru Harada and Sidney W. Fox (Fla. State U., Inst. for Space Biosci., Tallahassee).
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27-30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 289-297. Discussion p. 297-298. 18 refs.
NASA Grant NsG-173-62.

The occurrence of amino acids on the preorganismic earth has been explained by many published syntheses. Phosphates occur in the crust of the earth, and ordinary phosphate is converted to polyphosphate by temperatures of 300°C. or less in volcanic zones. In the laboratory, an analysis was made of the amino acid composition, N-terminal amino acid composition, and molecular weight of the reaction products obtained by polycondensation with commercial polyphosphoric acid (PPA) or with thermally prepared PPA at temperatutes ranging from 70° to 130°C. The following six combinations of amino acids were obtained: aspartic acid, aspartic acid-glycine, aspartic acid-alanine, aspartic acid-valine, aspartic acid-glutamine, and aspartic acid-lysine. Glutamic acid and aspartic acid copolycondense with 14 neutral and basic amino acids in the presence of PPA by heating at 100°C. to prepare the proteinoid. The amino acid analysis of the proteinoid shows that aspartic acid is more prevalent in the synthetic polymers.

A65-80482
SYNTHESIS OF NUCLEOSIDES AND POLYNUCLEOTIDES WITH METAPHOSPHATE ESTERS.
Gerhard Schramm (Max-Plank-Inst. für Virusforschung, Tubingen, Germany).

IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 299–309. Discussion p. 309–315.
12 refs.

It is postulated that a model prebiological system be able to multiply and undergo evolution. A model is suggested of a virus which multiplies by using the energy sources of the environment, and reproduces by means of a template mechanism in which a matrix, formed by nucleotides, controls the catalytic assembly of other nucleotides to a complementary strand, which in turn serves as matrix for the original strand. To determine whether such a system can be set up without enzymes, a discussion is presented on the nonenzymatic formation of nucleotides from sugars, bases, and phosphate, and the condensation of these nucleotides to long chains of polynucleotides. These condensations are possible with metaphosphate esters (MPE). The synthesis of nucleosides and polynucleotides with MPE is described. That a self-reproducing system originated from polynucleotide mixtures is considered. Possibly self-reproduction begins when one polynucleotide is used as matrix to form a complementary polynucleotide which in turn catalyzes the formation of the original polynucleotide chain. Whether a polynucleotide can function as template in a nonenzymatic system needs further elucidation.

A65-80483

THERMAL CONDENSATION OF CYTIDYLIC ACID IN THE PRESENCE OF POLYPHOSPHORIC ACID.

H. W. Schwartz, E. Bradley, and S. W. Fox (Fla. State U., Inst. for Space Biosci. and Dept. of Chem., Tallahassee).

IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 317–325. Discussion p. 325–326.
5 refs.

The value of polyphosphoric acid (PPA) to prebiological theory has been its use in the thermal polymerization of amino acids, which is usually affected at 160° to 170°C, but can proceed at temperatures as low at 65°C in the presence of PPA. A procedure is described for the preparation of cytidylic acid polymer by mixing mononucleotides with PPA, limiting water uptake from the air, and heating the mixture at 65°C for 1 or 2 hours. Discussed are data on the ultraviolet absorption spectrum of cytidilyic acid polymer, enzymatic degradation of the polymer with bacterial phosphatase and pancreatic ribonuclease, effect of ribonuclease on molecular size of polymer, and ion exchange chromatography of polymer. Tables are included of the composition of reaction mixtures, optical properties of materials, and results of enzyme experiments.

A65-80484

THE PATHWAYS OF THE PRIMARY DEVELOPMENT OF METABOLISM AND ARTIFICIAL MODELING OF THIS DEVELOPMENT IN COACERVATE DROPS.

A. I. Ophrin (Acad. of Sci., A. N. Bach Inst. of Biochem., Moscow, USSR).

IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 331–341. Discussion p. 341–346.

Coacervate drops formed in polyadenine synthesis in the presence of histone were used as models to reproduce possible pathways followed by the primary development of metabolism. A very high concentration of polymers occurs upon the formation of coacervate drops. Electron micrographs of the drops show them to possess a certain internal structure, a marked interphase with the external medium, and an ability to selectively absorb and accumulate diverse substances from the surrounding solution. Outlined are studies dealing with coacervate drops containing polypeptides and polynucleotides, ribonucleic acid and polylysine; incubation of drops with ribonuclease; synthesis and hydrolysis of starch in coacervate drop; scheme of polyadenine synthesis by polynucleotide phosphorylase in drop; and scheme of ascorbic acid oxidation in coacervate drop containing chlorophyll. Systems similar to coacervate models which involve oxidation-reduction reactions, conjugated phosphorylation, and polymerization, besides existing for a long time, could also grow in solutions conceived for the primeval aqueous solution of diverse organic substances and their polymers formed abiogenically on the earth.

A65-80485

MORPHOLOGY AND CHEMISTRY OF MICROSPHERES FROM PROTEINOID.

Richard S. Young (NASA, Ames Res. Center, Exobiol. Div., Moffett Field, Calif.)

IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 347–356. Discussion p. 356–357.
9 refs.

The use of the microsphere as a cell (or precell) model to study the possible pathways for the origin of cellular life is discussed. These structures are produced by solution and then condensation of the proteinoid. They are derived from material synthesized under primitive conditions and are structurally very stable. Electron microscope studies of microspheres reveal a tremendous diversity of size and morphology which is dependent upon environmental variations. For example, changes in salt concentration, pH medium, temperature, or ionic species give corresponding variations in the resultant microspheres. It has been shown that guanine and fatty acids are synthesized during a typical proteinoid synthesis from amino acids.

A65-80486

SIMULATED NATURAL EXPERIMENTS IN SPONTANEOUS ORGANIZATION OF MORPHOLOGICAL UNITS FROM PROTEINOID.

Sidney W. Fox (Fla. State U., Inst. for Space Biosci., Tallahassee).

IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 361–373. Discussion p. 373–382.
17 refs.
NASA Grant NsG-173-62.

A review is presented of experiments dealing with properties of microspheres from thermal proteinoid. Approximately 2 dozen attributes of protein are found in thermal proteinoid, including some of each of the 18 common amino acids in peptide linkage, a susceptibility to proteolysis, nutritive quality, and a tendency to form cell-like multimacromolecular structures. Inasmuch as these attributes include a unique kind of morphogenicity, these microspheres may be considered in the theory of abiogenesis. Included are electron micrographs of proteinoid microspheres, associated microspheres, twinned microspheres, microspheres with double boundaries, and a time-lapse study showing several phenomena.

A65-80487

THE RECOGNITION OF HEREDITARY ORDER IN PRIMITIVE CHEMICAL SYSTEMS.

H. H. Pattee (Stanford U., Biophys. Lab., Calif.)

IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27–30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 385–402. Discussion p. 402–405.
52 refs.

Following a discussion of the terms hereditary, order, replication, selection, and evolution, a hypothesis for the origin of life is proposed. Briefly, it states that known properties of simple tactic polymer growth and conformation suggest an elementary type of hereditary process in which information may be both propagated in linear sequences and converted into structure, which in turn may exhibit specific control on monomer addition. The essential requirement for this behavior is some conditional rule of propagation which constrains the possible linear sequence to some functional dependence on the three-dimensional structure of the growing polymer. In such a primitive type of polymer growth, the influence of the local environment is capable of producing heritable changes in linear sequence. Primitive molecular evolution occurs in this case by direct feedback rather than by natural selection. Arguments are presented in support of the hypothesis. Suggestions are made for a new approach and new experiments in investigations of hereditary order in the sequence of synthetic polymers and proteins.

A65-80488

CODING TRIPLETS IN THE EVOLUTION OF HEMOGLOBIN AND CYTOCHROMES C GENES.

T. H. Jukes (Calif. U., Space Sci. Lab., Berkeley).

IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27-30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 407–435. Discussion p. 435–436.
37 refs.

Many changes can take place in the globins and cytochromes without interfering with their functions. The average number of amino acid changes in hemoglobins and myoglobins is 1.6 per locus excluding abnormal variants and 1.7 in the cytochromes. Interchanges in which hydrophilic amino acids are replaced by hydrophobic amino acids and vice versa are frequent. The parent molecule of hemoglobins and myoglobins is deduced to have been intermediate in composition and primary structure between myoglobin

and -hemoglobin, rather than being a strange primitive molecule. Similarly, archetypal cytochrome c was intermediate in composition between yeast and vertebrate cytochromes c. Human -hemoglobin and hemoglobin in lampreys may have diverged far from the parent "protoglobin". Tables and discussions are included of amino acid code triplets, amino acid interchanges resulting from single base changes in coding triplets postulated, mutational changes in amino acids in human - and -hemoglobins, evolution of hemoglobin genes, amino acid sequences, and their coding triplets in the hemoglobin series, amino acid sequences in 6 cytochromes c and a few amino acid substitutions in dog, rhesus monkey, and human, and comparisons of cytochromes c.

A65-80489
THE ROLE OF LIGHT IN EVOLUTION: THE TRANSITION FROM A ONE QUANTUM TO A TWO QUANTA MECHANISM.
Hans Gaffron (Fla. State U., Inst. of Molecular Biophys. and Dept. of Biol. Sci. (Fels Fund), Tallahassee).
IN: THE ORIGINS OF PREBIOLOGICAL SYSTEMS AND OF THEIR MOLECULAR MATRICES: Proceedings of a Conference Conducted at Wakulla Springs, Fla. on 27-30 Oct. 1963.
Edited by Sidney W. Fox.
New York, Academic Press, 1965, p. 437-455. Discussion p. 455-460. 25 refs.
Contract NONR 988-(10) and AT(40-1)-2687; and Grant AF-AFOSR-62-190.

An outline is presented of the photosynthetic process, and two photosynthetic reactions are distinguished which depend on chlorophylls, one with, the other without an evolution of oxygen. The anaerobic process, photoreduction, appears to be a less advanced or earlier form of potosynthesis. With transition from one to the other, large quantities of oxygen accumulated on the Earth's surface. A new version of the already existing one-step photochemical mechanism appeared, in which the overall oxidation-reduction potential gradually shifted to the point where the old and new mechanisms barely overlapped. The two pigment systems combined to form an electron transport chain which spanned the potential gap between an unknown oxygen precursor (peroxide ?) and reduced hydrogenase, with the result that water decomposed photochemically into elements in large quantities. Next came the one quantum light reactions initiated by single porphyrin molecules in solution through the time they were going on in protein- and lipid-bound complexes, until the very last transformation produced the two quanta mechanism of the green chloroplast. Current beliefs on the succession of evolutionary eras are tabulated.

A65-80490
PHYSIOLOGIC RESPONSES TO HEAT.
A. R. Lind (Edinburgh U., Dept. of Med.; Natl. Coal Board, Med. Serv., Physiol. Branch, Great Britain).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licth, Publisher, 1964, p. 164-195. 66 refs.

Various aspects of physiological responses to heat are reviewed and discussed. Included are the following: (1) tissue temperature in the body, (2) channels of heat exchange, (3) assessment of heat stress and strain (effective temperature scales, predicted 4-hourly sweat rate index, Belding-Hatch heat stress index), (4) physiologic mechanisms of thermoregulation (central control, sweat glands, circulation, endocrine glands), (5) acclimatization to heat (description, rate of development of acclimatization, long-term acclimatization, factors affecting rate of development of acclimatization, retention of acclimatization, causes of acclimatization), and (6) disorders of thermoregulation (circulatory instability, disturbances in electrolyte balance, failure of sweat production).

A65-80491
REACTIONS OF MAN TO COLD.
Loren D. Carlson (Ky. U., Coll. of Med., Lexington).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 196-228. 113 refs.
Contract AF 41(657)-335; and NIH Grant RG-8429.

Research on man's reaction to cold is reviewed. Man is treated as a vehicle capable of heat storage and temperature regulation. The main components of the system consist of a variable heat source distributed in a mass having a convecting fluid for distributing heat. Heat sensors are at the periphery as well as at the center of this mass. When exposed to temperatures from 5° C. to 40° C., at some fixed temperature, this system will be at equilibrium with its environment. Below this temperature, two possibilities exist separately or in combination: the system will cool, or heat production must increase. The human system operates like this model, with certain modifications. Man's physiologic defenses against cold are limited to heat production and changes in peripheral circulation. Acute exposure leads to marked peripheral vasconstriction. As skin temperature falls and the body cools, shivering occurs and heat production increases. Both of these responses are modified by continued cold exposure. Among the factors involved in cold exposure are metabolic and endocrine changes as well as a phenomenon called habituation. The control mechanisms use both the autonomic and the somatic nervous system and the endocrine glands. The evidence is strong that the endocrine response is mediated by the central nervous system.

A65-80492
EFFECTS OF SUNLIGHT ON THE HUMAN BODY.
Harold F. Blum (Princeton U., Dept. of Biol., N. J.; and Natl. Cancer Inst., Washington, D. C.)
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 229-256. 58 refs.

Direct effects of sunlight impinging on the human body are discussed. Included in this discussion are the following: (1) spectral composition of sunlight, (2) penetration of sunlight into the human body, (3) penetration into the skin, (4) penetration into the eye, (5) photochemical effects in the skin (sunburn complex, erythema, epidermal thickening, tanning, protection against the sunburning radiation, conversion of provitamin D to vitamin D, skin cancer, miscellaneous diseases caused by light, and effects on the eye), (6) heat effects (heatstroke), (7) sunlight and health, and (8) sunlight as a limiting environmental factor. The heating effects involve the whole broad spectrum of sunlight, whereas the photochemical effects are restricted to limited spectral regions. Vision, for example, falls between approximately 0.4μ and 0.65μ, which is the most intense part of sunlight; whereas vitamin D is produced only by wave lengths shorter than 0.32μ, which constitute a tiny and most variable part. No portion of sunlight penetrates very deeply into the hyman body, although some wave lengths go deeper than others. Only in the eye is more than a superficial depth attained.

A65-80493
THE PHYSIOLOGY OF ALTITUDE.
Horst Jungmann (Innsbruck U. Clin., Austria) and Max J. Halhuber (Innsbruck U., Fac. of Med., Austria).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 257-279. 124 refs.

Physiologic and pathologic manifestations occurring during high altitude exposure are reviewed, in relation to respiratory and circulatory systems, blood, metabolism, and endocrine and nervous systems. Long-term adaptation to high altitude with respect to the same systems, processes, and structures is also included. Reactions occurring following descent from high altitude are also reviewed and discussed. It is suggested that the time factor in the altitude acclimatization process has been neglected in most studies.

A65-80494
SIGNIFICANCE OF AIR IONIZATION.
Ivo Pavlik (Res. Inst. of Phys. Med., Bratislava; and Inst. of Postgraduate Med. Educ., Prague, Czechoslovakia).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 317-342. 85 refs.

Many observations indicate that light ions as well as electroaerosols have specific physiologic effects, dependent in particular on the quality of the electric charge. Physiologic effects of air ions on the following are reviewed: the body generally, nervous system, circulatory system, skin, respiratory system, blood, healing of wounds, biochemistry, and growth on transplanted tumors. Favorable effects were recorded in general following the inhalation of negative ions. Diseases for which benefits have been claimed after exposure to aeroions include those of the respiratory tract, early hypertension, burns, and wounds. Hypotheses have been suggested for the interpretation of meteorotropy in terms of the ionization of air.

A65-80495
EFFECTS OF WIND ON MAN.
Jozef Jankowiak (Med. Acad., Poznań; and Polish Inst. of Balneoclimatol, Poznań, Poland).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 343-357. 36 refs.

The biologic effects of air motion are reviewed and discussed. These effects depend upon the following: (a) the direct action of air, whether mechanical (skin massage) or thermoregulatory (loss of heat); (b) the role of wind in the thermal complex; (c) the effect of wind on air hygiene; (d) the influence of wind on climatotherapy; (e) wind as an air circulator; and (f) wind as a constituent of the biologic environment of man.

A65-80496
MORBIDITY AND WEATHER.
H. Brezowsky (Med.-Meteorol. Beratungsstelle des Deutschen Wetterdienstes, Bad Tolz, West Germany).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 358-399. 81 refs.

Weather influences on symptoms, disease, and death are reviewed and discussed. Included are the following: (1) meteorological accord or sum of all weather elements (temperature-humidity-environment and weather phases), (2) illness and weather (normal distribution, warm, unfavorable biosphere, mixed reactions to unfavorable biosphere, cold, pathogenic balance of biotropy, climatic balance of biotropy, individual balance of biotropy, and waves of change), (3) mortality and weather (daily findings, annual findings, and seasonal balance of biotropy), and (4) mechanism of the pathogenic weather stress (balance between stimulus change and strength, external and internal environments, laboratory investigations, thermodynamics, dynamics, and biologic influence of the Foehn, the north Foehn and other Foehns).

A65-80497
PATHOLOGIC EFFECTS OF HEAT EXPOSURE.
Joseph Gold (N. Y. State U., Upstate Med. Center Syracuse).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 400–427. 33 refs.

The three principal manifestations of exposure to excessive heat are heat cramps, heat exhaustion, and heat pyrexia (heatstroke, sunstroke). Heat cramps are painful spasms of skeletal muscles (especially those of the extremities and abdominal wall) due, presumably, to diminished osmolar concentration of body fluids as a result of sodium and chloride losses. Heat exhaustion is a mild, shocklike condition resulting from physical exertion in excessively hot weather, especially in persons not yet acclimatized to such weather. Heat pyrexia is a grave condition resulting from an overwhelming uptake of heat from the environment. The diagnosis and treatment of all three conditions are discussed. In addition, pathogenesis of heatstroke, protection of persons exposed to extreme heat, and various methods of heat prophylaxis are outlined and discussed.

A65-80498
PATHOLOGIC EFFECTS OF EXTREME COLD.
Marlin B. Kreider (U. S. Army Res. Inst. of Environ. Med., Natick, Mass.)
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol.8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 428–468. 298 refs.

Pathologic changes which may take place in the function and structure of tissues upon exposure to extreme cold are discussed. Temperature changes of the body may be divided into two major types: (a) total body cooling or hypothermia, and (b) local cooling, which generally involves extremites or exposed surfaces, such as the face and ears. The following are included: (1) total body cooling (accidental hypothermia from exposure to cold air, accidental hypothermia from immersion in cold water, therapeutic long-term hypothermia, profound hypothermia for surgery, variability in rates of cooling and survival, pathophysiology, causes of death, histopathology from total body exposure to acute cold, and pathology from continuous or repeated exposure from predisposition to cold); and (2) local cold injury (chilblain, frostbite, immersion and trench foot, and physiology of local cold injury).

A65-80499
EFFECTS OF HIGH ALTITUDE (OXYGEN LACK).
Charles S. Houston (U. S. Peace Corps for India, New Delhi).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 469–493. 49 refs.

Changes occurring in man climbing slowly to high altitudes while breathing normal air under ambient pressure are outlined and discussed. Included in the discussion are the following: (1) barometric pressure, (2) acute anoxia, (3) chronic anoxia, (4) detailed analysis of acclimatization, (5) buffer systems, (6) blood changes, (7) cardiovascular changes, (8) cerebral changes, (9) kidney, (10) endocrines, (11) metabolism, (12) supplementary oxygen, and (13) pathologic effects of chronic exposure to high altitude.

A65-80500
NUTRITION AND CLIMATE.
Marjorie Edman (Ill. U., Animal Sci. Dept., Urbana).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 533–556. 130 refs.

Discussions are presented of the role of nutritional elements in relation to climatic variations – the intake of water, food, minerals, and vitamins in relation to marked variations in environmental temperature. Requirements and variation in the consumption of nutritional elements in hot and cold environments are included. A comparison of protein requirements of a growing child and an adult is also included.

A65-80501
CLOTHING AND CLIMATE.
Alan H. Woodcock (U. S. Res. Inst. of Environ. Med., Div. of Cold Res., Heat Transfer Branch, Natick, Mass.)
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 557–580. 20 refs.

The function of clothing in altering heat loss from the skin to the environment so that it equals metabolic heat production is discussed. Included are the following: (1) climatic factors (air temperature, wind, radiation, and humidity), (2) physiologic requirements, (3) heat transfer and equilibrium, and (4) heat transfer without equilibrium (insulation of wet clothing, damp, penetrating cold, absorbency of clothing, and effect of sunlight on damp cold). The significance of sweating and skin temperature changes in facilitating man to adjust his heat loss is also discussed. Heat transfer properties of clothing are not fixed but variable. In hot climates, the range of variation is quite wide, except when the humidity is high, but the required heat losses are almost invariably at the upper end of the range. In temperate climates, the range, due to the light clothing worn, is still wide, and the whole extent of the range can be used. In colder climates, thicker and heavier clothing must be worn. This means that the range in heat loss that clothing can accommodate becomes less, and man is cold when inactive but overheated when active.

A65-80502
SPORTS AND CLIMATE.
Gerhard Hentschel (Forschungsinst. für Bioklimatol. des Meteorol. und Hydrol. Dienstes der Deutschendemokratischen Republik, Berlin-Buch, East Germany).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 581–593. 14 refs.

The importance of climate and reaction capacity and the influence of climate on physical performance capacity of man are reviewed and discussed. The discussion includes the following: (1) heat dispersion; (2) photoactinic influences; (3) influence of air composition; (4) influence of change of weather, climate, and locality, and (5) relation of climate to sports.

A65-80503
CONTROLLED CLIMATE (OUTDOOR AND INDOOR).
H. E. Landsberg (U. S. Weather Bureau, Washington, D. C.)
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 663–701. 121 refs.

Man's attempts to control various aspects of his environment are discussed. Included in the discussion are the following: climate (long-term manifestations of atmospheric environment in a given area), marcroclimate (conditions of broad geographic setting), mesoclimate (specific, more or less permanent, departure of values of climatic elements from regional norm), microclimate (primarily atmospheric layer close to the ground), and cryptoclimate (climates of caves, huts, tents, houses, ships, capsules, etc.) Therapeutic environments are also discussed.

A65-80504
THE CONTROLLED-CLIMATE CHAMBER.
Joseph Lee Hollander (Pa. U., School of Med. and Graduate School of Med.; and Hosp. of the U. of Pa. Arthritis Section, Philadelphia) and William J. Erdman II (Ill. U., Animal Sci. Dept., Urbana).
IN: MEDICAL CLIMATOLOGY. (Physical Medicine Library, vol. 8).
Edited by Sidney Licht.
New Haven, Conn., Elizabeth Licht, Publisher, 1964, p. 702–797.

A controlled-climate chamber or "Climatron" designed and built at the University of Pennsylvania in 1960 is described. This chamber permits the manipulation of temperature, humidity, barometric pressure, rate of air flow, and ion concentration and charge. The chamber or apartment is a room 15-feet square, which is equipped for continuous comfortable living by 2 patients at a time. Some conditions or diseases believed to show a periodicity related to weather changes include arthritis, fractures, phantom pain, scars, neuritis, asthma, respiratory problems, duodenal ulcer, and myocardial infarction. Experiments, using the controlled-climate chamber, designed to determine which, if any, of the varying climatic factors have a reproducible effect on rheumatic disease, individually or in combination, are described. Comparisons are also made between various constant conditions and combinations of climatic factors.

A65-80505
ORGANIC SYNTHESIS IN ALGAL CELLS SEPARATED INTO AGE GROUPS BY FRACTIONAL CENTRIFUGATION.
Constantine Sorokin (Md. U., Dept. of Botany, College Park).
Archiv für Mikrobiologie, vol. 49, 1964, p. 193–208. 15 refs.
NASA supported research.

Synthesis of organic matter was studied in cells of the green, high-temperature alga Chlorella 7-11-05 separated from a nonsynchronized population into fractions of predominantly small or large cells by centrifugation. Rates of synthetic activity were determined as changes in optical density, dry weight, and packed volume of cells in several suspending fluids and under various light intensity conditions. It was found that synthetic activity of the smaller (younger) cell fraction was invariably higher than that of the larger (older) cell fraction, provided a reasonably good separation of cells into size fractions was achieved during centrifugation, and the difference between size composition of these fractions was maintained throughout observation. An occasional lack of difference in the performance of the small- and large-cell fractions, or even a higher synthetic activity of the originally large-cell fraction, was traced to cell division taking place during observation. Under conditions favorable to cell division, the large-cell fraction was progressively enriched with smaller (younger) cells, the average age composition of the originally large-cell fraction was shifted toward younger age, and the metabolic activity of the large-cell fraction increased to the extent that, in some experiments, it surpassed that of the originally small-cell fraction. The decline in synthetic activity of cells in the course of cell development previously observed on synchronized cells was thus substantiated on nonsynchronized populations in the absence of the light-dark synchronizing agent and is, therefore, characteristic of normal cell development.

A65-80506
VIABILITY OF BACILLUS SUBTILIS SPORES IN ROCKET PROPELLANTS.
Rogene M. Godding and Victoria H. Lynch (Lockheed Missiles and Space Co., Res. Labs., Palo Alto, Calif.)
Applied Microbiology, vol. 13, Jan. 1965, p. 10–14. 7 refs.

The sporicidal activity of components used in liquid and solid rocket propellants was tested by use of spores of Bacillus subtilis dried on powdered glass. Liquid propellant ingredients tested were N_2O_4, monomethylhydrazine, and 1,1-dimethylhydrazine. N_2O_4 was immediately sporicidal; the hydrazines were effective within several days. Solid propellants consisted of ammonium perchlorate in combination with epoxy resin (EPON 828), tris-1-(2-methyl) aziridinyl phosphine oxide, bis-1-(2-methyl) aziridinyl phenylphosphine oxide, and 3 modified polybutadiene polymers. There was no indication of appreciable sporicidal activity of these components.

A65-80507
THE PERCEPTION OF VISUAL ANGLE.
Irvin Rock and William McDermott (Yeshiva U., New York, N. Y.)
Acta Psychologica, vol. 22, 1964, p. 119–134. 15 refs.

Perception in terms of visual angle was demonstrated in two experiments. In the first experiment observers compared two objects under complete reduction conditions. They matched sizes accurately. Assumed equidistance of the two objects as basis was ruled out by distance judgments. In the second experiment the observer compared the reduction standard with a variable object seen with full binocular cues. The variable object was presented at two different distances. If the judgments of the standard were in terms of objective size, matches at the two distances would remain about constant; if they were in terms of visual angle, matches at the two distances would have to differ. The latter proved to be the case. Judgments of relative distance again ruled out an interpretation in terms of assumed distance. The results were taken to mean that visual angle per se is available to phenomenal experience as a sensation of pure extensity, quite apart from its apparent objective size. Theoretical implications were discussed.

A65-80508
SIGNIFICANCE AND STATUS OF EXOBIOLOGY.
Gilbert V. Levin (Hazelton Labs., Inc., Falls Church, Va.)
(A.I.B.S., Annual Meeting, Boulder, Colo., Aug. 26, 1964.)
Bioscience, vol. 15, Jan. 1965, p. 17–20. 25 refs.

The significance of the term exobiology is in dispute, and there are those who declare that the subject has no status. The term is of recent origin and is intended to denote the study of extraterrestrial life. Arguments against the use of the term may have semantic merit, but exobiology has been adopted by the National Aeronautics and Space Administration and is now a part of the literature. A dispute over nomenclature should not discourage biologists from pursuing the subject. Although there are no direct data on extraterrestrial life, planetary observations and statistical considerations support the possibility of such life. The significance of the questions the science of exobiology may answer, warrants its active investigation. These questions range from whether life exists elsewhere, to fundamental inquiries in all the sciences.

A65-80509
RELATIVE EFFECTIVITY OF FOVEAL AND PARAFOVEAL STIMULI IN ELICITING FUSION MOVEMENTS.
Elek Ludvigh, Pauline McKinnon, and Lawrence Zaitzeff (Kresge Eye Inst., Detroit, Mich.)
Archives of Ophthalmology, vol. 73, Jan. 1965, p. 115–121. 14 refs.
Natl. Inst. of Neurol. Diseases and Blindness Grant B-3934.

The maximum amplitude of adduction elicited by standard duction stimuli consisting of black rectangles subtending 6 minutes of arc by 25 minutes of arc and imaged at 0, 1/4, 1/2, 1, 2, and 4 degrees from the fovea was determined for 3 subjects. The adduction was elicited at the rate of 1.1° per second. The subjects' eyes were light adapted. For all three subjects the amplitude of adduction declined precipitously as the stimuli were presented to more eccentric retinal regions. With stimuli presented only 1/4° from the fovea, the amplitude of adduction relative to the fovea had decreased to 67%, 18%, and 3% in the 3 subjects tested. This decline is much more pronounced than the decrease in relative Snellen visual acuity. Split bull's-eye targets, with long contours and large area, were used as peripheral stimuli in an effort to break up foveal bifixation of small central targets. These were found to elicit at least five degrees of adduction on five successive trials when no stimulus was presented to the fovea of the left eye. However, when a small stationary foveal stimulus was provided to the left eye, substantially no adduction was elicited by disparateness of the peripheral stimulus.

A65-80510
THE TIME COURSE OF THE DECLINE IN SWEATING PRODUCED BY WETTING THE SKIN.
D. F. Brebner and D. McK. Kerslake (Royal AF Inst. of Aviation Med., Farnborough, Great Britain).
Journal of Physiology, vol. 175, Dec. 1964, p. 295–302. 5 refs.

Three subjects were kept wet with water, sweat, or 15% saline solution for periods up to 5 hr., and sweat loss was measured during intermittent exposures to saturated air at 37.0° C. after preliminary heating to a mouth temperature of 38.5° C. Immersion in water or sweat caused a decline in sweat rate in a subsequent heat exposure, whether or not the subject was sweating profusely during the immersion. The decline began within 15 min. of immersion and proceeded exponentially for at least 5 hr. (at least 200 min. in 1 subject), tending towards zero sweat rate after infinite time. The decline did not occur with immersion in 15% saline solution. The results confirm and extend the description given by other investigation.

A65-80511
BOUND AND FREE CORTICOSTEROID IN THE PLASMA OF TWO SUBSPECIES OF DEER MICE (PEROMYSCUS MANICULATUS) AFTER EXPOSURE TO A LOW AMBIENT TEMPERATURE.
B. E. Eleftheriou (Kan. State U., Dept. of Zool., Manhattan).
Journal of Endocrinology, vol. 31, Nov. 1964, p. 75–80. 19 refs.

Paper and thin-layer chromatography were used to identify corticosterone as the only glucocorticosteroid in two subspecies of deer mice (Peromyscus maniculatus bairdii and P. m. gracilis). Free and bound corticosterone levels in plasma were determined fluorimetrically in both subspecies after exposure to cold (2 ± 0.5°) for 15 days. Initially, there was a significant rise in free and bound corticosterone in the plasma after cold exposure, with return to the levels before cold exposure within 3 days in P.m. bairdii and 10 days in P.m. gracilis. The differential response to cold by P.m. gracilis is discussed in terms of a possible shift in pituitary adrenocorticotrophin (ACTH) and thyroid stimulating hormone (TSH) levels, and decreased adrenal output. In general it is concluded that subspecies bairdii possesses a more sensitive pituitary-adrenal system than gracilis, and that the former has also greater ability to acclimatization to cold than the latter.

A65-80512
A SLIDE RULE FOR CALCULATING SINGLE-BREATH DIFFUSING CAPACITY FOR CARBON MONOXIDE.
Lyle H. Hamilton and Josef R. Smith (Woods V. A. Hosp.; and Marquette U. School of Med., Milwaukee, Wis.)
American Review of Respiratory Diseases, vol. 91, Jan. 1965, p. 112–116. 8 refs.
NIH Grant H 5530.

A circular slide rule was constructed that permits a simple calculation of diffusing capacity for carbon monoxide (D_{CO}) performed by the breath-holding technique. It can be used when the gas analyses are performed by conventional methods or with a gas chromatograph. Use of the D_{CO} slide rule provides an accuracy well within clinical requirements and permits the entire calculation to be completed in one or two minutes.

A65-80513
MYOCARDIAL LIPIDS AFTER INTENSE MUSCULAR WORK.
M. Rinetti, O. Visioli, L. Colombi, and F. Barbaresi (Parma U., Inst. of Clin. Med. and Biol. Chem., Italy).
Cardiologia, vol. 45, 1964, p. 269–275. 18 refs.

A study of myocardial lipids of rats undergoing intense muscular work showed a decrease of total lipids, triglicerides, nonesterified-fatty acid (NEFA), and cholesterol; on the other hand, phospholipids increased. Pronounced modifications were found in the fatty acid spectrum of NEFA; but the phospholipid spectrum was altered only to a small degree.

A65-80514
A COMPARISON OF TWO PAYOFF FUNCTIONS ON MULTIPLE-CHOICE DECISION BEHAVIOR.
David M. Messick and Amnon Rapoport (N. C. U., Chapel Hill).
Journal of Experimental Psychology, vol. 69, Jan. 1965, p. 75–83. 14 refs.
Grants AF-AFOSR-62-5 and AF-AFOSR-85-63.

An experiment was conducted to investigate the effect of two different payoff functions on the choice behavior of human subjects. The subjects, 36 undergraduates, were required to predict which of 10 stimuli would occur on each of 400 trials. One half of the subjects were paid according to an all-or-none payoff function, while the other half were paid according to a linear function. It was found that the relative frequency of response for the 10 alternatives differed markedly for the 2 groups. Moreover, it was found that the subjects' behavior was compatible with the expected-utility hypothesis as opposed to the probability-matching hypothesis and a generalization of it. In addition, large and stable individual differences were found in terms of the expected value of subjects' behavior, V, and in terms of the entropy, H, of subjects' response distributions.

A65-80515
THE EFFECTS OF STARVATION, HIGH FAT DIETS, AND KETONE INFUSIONS ON URIC ACID BALANCE.
Frank R. Lecocq and John J. McPhaul, Jr. (Aerospace Med. Div., Wilford Hall Hosp., Dept. of Med. and Metabolic Unit, Lackland AFB, Tex.)
Metabolism, vol. 14, Feb. 1965, p. 186–197. 28 refs.

Studies of factors arising during fasting which could influence uric acid excretion were carried out in 15 patients. Potassium supplementation and alkalinization did not influence the decreased urinary excretion of uric acid found during fasting, whereas probenecid and glucose administration effected a prompt uricosuria. Glomerular filtration rate was not altered by seven days of fasting, but changes in uric acid balance appeared to be related to changes in ketone concentrations. The effect of ketosis in the absence of fasting was studied by feeding high fat diets in six subjects and ketone infusions in five others. In both groups uric acid clearance was depressed. It is postulated that ketones compete with uric acid for a common tubular secretory site, the magnitude of the changes in ketones precluding normal uric acid secretion.

A65-80516
SENSORY DEPRIVATION, PERSONALITY, AND VISUAL IMAGERY.
Horace Stewart (Fla. U., Dept. of Psychol., Gainesville).
Journal of General Psychology, vol. 72, Jan. 1965, p. 145–150. 11 refs.

The relationship between certain personality measures and reported visual imagery was studied. Twenty-two of the 56 student nurses used as subjects reported visual imagery after a 10-minute exposure to chromatic, homogeneous visual stimulation. No significant relationships were discovered between 33 personality measures and the response of visual imagery during sensory deprivation. The personality measures investigated were the sensitizer-represser dimension, two measures of ego strength, three measures of anxiety, the Index of Hallucinatory Activity questionnaire, the Wilkins Embedded Figures Test, the Institute for Personality and Ability Testing 16 P.F. Questionnaire factors, and the clinical scales from the Minnesota Multiphasic Personality Inventory. The lack of a demonstrated relationship between these personality measures and visual imagery in this study may indicate that hallucinatory behavior is not personality specific, but rather an experience which is more dependent upon the environmental factors.

A65-80517
EFFECTS OF ROTATION SPEED, EXPOSURE TIME, AND DISTANCE ON THE SPIRAL AFTEREFFECT.
Alfred Baumeister, Thomas E. Smith, and Donald Urquhart (Central Mich. U., Dept. of Psychol., Mount Pleasant).
Journal of General Psychology, vol. 72, Jan. 1965, p. 151–156. 11 refs.
Central Mich. U. Res. Comm. supported research.

The purpose of this study was to investigate concomitantly the effects of certain parameters upon duration of the spiral aftereffects in normal subjects. The variables studied were speed of rotation, exposure time, distance, and trials. Eighty college students served as subjects. Analysis of variance indicated that the duration of the aftereffect was not significantly influenced by variations in speed, exposure, or distance. The only significant main effect was trials, subjects experiencing the aftereffect less on succeeding trials. Reliabilities of the criterion measure ranged between .68 and .91.

A65-80518
LIFT REACTION TIME AND TOPOGRAPHIC COMPATIBILITY OF THE S-R FIELD.
Irwin M. Spigel (Temple U., Dept. of Psychol., Philadelphia, Pa.)
Journal of General Psychology, vol. 72, Jan. 1965, p. 165–172. 7 refs.

The current investigation was designed to explore the relationship of lift reaction time to topographic compatibility of the stimulus-response field both within and across two-, three-, and four-choice situations. Eighty-eight subjects were employed in two experiments which required a response to a position corresponding to stimulus locations of light-on, light-off, a position of no change, and to a position of clockwise reorientation. A consistent trend emerged within each of the choice situations, though analagous differences within the latter were not all statistically significant. Reaction time to light-on was fastest, with response to light-off next. Latencies to the position of no change and to a clockwise advance were longest. The results supported the general determination that reaction time is independent of stimulus information in the case of highly compatible stimulus-response fields. No clear linear increments emerged with the increased number of response probabilities in the case of light-on and light-off signals. Other obtained differences represented further departures from strictly linear relationships.

A65-80519
AUDITORY SHORT-TERM MEMORY.
Jane F. Mackworth (Defence Res. Med. Labs., Toronto, Canada).
Canadian Journal of Psychology, vol. 18, Dec. 1964, p. 292–303. 10 refs.

Immediate recall of sets of digits, letters, and color or shape names presented aurally, resembled recall of visual material in the effects of material and message length, but more items were recalled when the messages were presented faster, in contrast to visual presentation. Vocal rehearsal during presentation reduced recall. Ten subjects were tested for each comparison.

A65-80520
ELECTROPHYSIOLOGICAL EFFECTS OF THE INTERACTION BETWEEN TASK DEMANDS AND SENSORY INPUT.
Robert M. Stern (Ind. U., Bloomington and Indianapolis).
Canadian Journal of Psychology, vol. 18, Dec. 1964, p. 311–320. 9 refs.
Contract Nonr 908(15).

It was the purpose of this study to investigate the effects of reduced sensory input on two task conditions. The effects were measured in terms of the electrophysiological activity of the autonomic nervous system and the skeletal muscle system. A Vigil group reported the movements of an autokinetic light; a Rest group simply relaxed. The autonomic indices revealed significantly higher activity for the Vigil group, thus supporting Duffy and Malmo's hypothesis concerning the importance of task demands in determining level of physiological activity.

A65-80521
EFFECTS OF VARIATION OF FOREARM POSITION IN ELBOW FLEXION.
Lynn W. McCraw (Tex. U., Austin).
Research Quarterly, vol. 35, Dec. 1964, p. 504–510. 17 refs.

Comparisons were made of the isotonic movement of the muscles in chinning and a similar isometric contraction with the hands held so that the forearms were in the positions of pronation, supination, and alternated; i.e. one pronated and one supinated. Data from 51 college men suggest that the position of the hands has little, if any, effect on scores. Differences were significant for chinning, the variation from position to position was no greater than that from trial to trial in the same position.

A65-80522
TIMING OF TWO SIMULTANEOUS MOVEMENTS OF ARMS AND LEGS.
Mary Lou Norrie (Calif. U., Berkeley).
Research Quarterly, vol. 35, Dec. 1964, p. 511–522. 14 refs.

The ability of people to perform simultaneous movements involving speed and accuracy, and the relationships among the several time measures for these movements were studied. Five movement tasks using two simultaneous movements of arms and legs were performed. Reliability of time measures ranged between 0.830 and 0.988. There were no significant differences between the two tasks involving an arm and a leg. Reaction time for tasks involving an arm and leg was slower than for tasks involving two arms. An increase in task complexity resulted in an increase in starting time difference and contact time difference. Common variance between tasks for several time measures was relatively high. For all tasks, except the one using identical movements for the two arms, a consistent movement pattern was found in which the right hand started first and finished last.

A65-80523
EFFECT OF ACTIVELY INCREASED MUSCLE TEMPERATURE ON LOCAL MUSCULAR ENDURANCE.

Antony W. Sedgwick (Adelaide U., South Australia).
Research Quarterly, vol. 35, Dec. 1964, p. 532–538. 11 refs.

The effect of actively warming the forearm musculature on dynamic grip endurance was investigated by comparing the performance of the left and right hands, with or without warming-up, on a spring-loaded grip ergometer. There were 21 male subjects, aged 19 to 23. Warming-up consisted of 9 min. of 4 hand and wrist exercises conducted in 30-sec. bouts, at a rate of 1 repetition per sec., with 15-sec. intervals between bouts. This warm-up was shown to lead to temperature increases of between 1.6° C. and 2.6° C. in the flexor digitorum sublimis muscles of 5 subjects. Warming-up had no effect on grip endurance.

A65-80524
EFFECT OF MUSCULAR STRETCH, TENSION, AND RELAXATION UPON THE REACTION TIME AND SPEED OF MOVEMENT OF A SUPPORTED LIMB.
Leon E. Smith (Iowa U., Iowa City).
Research Quarterly, vol. 35, Dec. 1964, p. 546–553. 12 refs.

Forty college men were tested under each of the three experimental conditions. A variance analysis revealed that reaction time and velocity of the arm during the state of stretch was not significantly faster than either condition when the arm was relaxed or tensed. An analysis of the final third of the arm movement revealed a significantly faster movement time when the prime movers of the limb were stretched. During the condition of tension, reaction and movement times were faster than when the arm was relaxed. A high degree of specificity of relationship was found between reaction time and movement time.

A65-80525
INFLUENCE OF STRENGTH TRAINING ON PRE-TENSED AND FREE-ARM SPEED.
Leon E. Smith (Iowa U., Iowa City).
Research Quarterly, vol. 35, Dec. 1964, p. 554–561. 11 refs.

During a period of 12 weeks, 26 college men participated in an isotonic-isometric training program. Pretraining static strength, pre-tensed static strength and speed, and free arm speed were recorded. Following the strength training program, significant increases were recorded in static arm strength and in free and pre-tensed speeds of movement. Very low relationships were found between the pre- and post-training strengths and speeds.

A65-80526
BINAURAL INTERACTIONS OF THREE CLICKS.
Newman Guttman (Bell Telephone Labs., Inc., N. J.)
(Presented to the 63rd Meeting of the Acoustical Society of America, New York, May 1962).
Journal of the Acoustical Society of America, vol. 37, Jan. 1965, p. 145–150. 12 refs.

Listeners tracked the trajectories of auditory images produced by a group of three clicks, of which two were temporally fixed in opposite ears and the third ranged freely in time. The fixed clicks were positioned in three time- and level-difference combinations to produce a centered image. The results indicate that the temporally variable click interferes with the fixed clicks image when it leads or lags by as much as approximately 25 msec. The leading interference is plausibly explained by monaural forward masking, but the lagging interference is puzzling, partly because it seems inconsistent with results of other experiments in which the two fixed clicks are in one ear and the variable click is in the other. It was also found that the variable click leading by 5 msec or less, completely governs lateralization. It was concluded that monaural forward masking obstructs determination of complex binaural interactions.

A65-80527
NUCLEAR SAFETY IN SPACE APPLICATIONS.
L. R. Shepherd.
New Scientist, vol. 25, Jan. 21, 1965, p. 142–143.

An accident to a nuclear power plant in a vehicle reentering the earth's atmosphere, or in one leaving a launching site but failing to achieve its intended orbit, is the main hazard against which the nuclear and space technologists have to provide safeguards. Likely applications of nuclear energy in space which might, in the event of an accident, result in radioactive contamination of the earth's surface include the following: (1) nuclear rocket engines employed as propulsion units in launching vehicles, (2) nuclear reactors used as energy sources in vehicles operating in orbits close to the earth's surface, and (3) radioisotope power sources in similar applications. The provision of safeguards against the failure of nuclear power devices for space will demand a great deal of attention and technical ingenuity. Some restrictions on the conditions and circumstances under which these devices are operated may be necessary, but these need not be so severe as to hamper this very important development

A65-80528
REAL-TIME VOICE COMMUNICATION TO MARS USING EAR-BRAIN ANALOG.
John L. Stewart (Santa Rita Technol., Inc., Calif.)
Space Aeronautics, vol. 43, Feb. 1965, p. 68–69.

A deep space communication system is described, which employs an ear-brain analog principle to achieve a very low data rate for voice transmission. The use of a low data rate in voice communications permits more speech channels per watt of power, and is compatible with narrow-band media previously not suited for speech. In manned deep space flights a low data rate can furnish a real-time two-way speech link. In contrast to other systems, the simulation is aimed at reproducing the same brain wave patterns in the listener as the original speech bypassing the reproduction of waveforms resembling human speech.

A65-80529
LUNAR MISSIONS AND EXPLORATION.
Edited by C. T. Leondes (Calif. U., Los Angeles) and R. W. Vance (Aerospace Corp., Tech. Develop. Program Office, Los Angeles, Calif.)
New York, John Wiley and Sons, Inc., 1964, xix + 669 p.

CONTENTS:

A65-80530
LIFE SUPPORT SYSTEMS FOR LUNAR BASE OPERATIONS.
R. A. Fischer (Div. of the Garrett Corp., Aires. Manufacturing Co., Space Environ. and Cryogenic Systems, Los Angeles, Calif.)
IN: LUNAR MISSIONS AND EXPLORATION.
Edited by C. T. Leondes and R. W. Vance.
New York, John Wiley and Sons, Inc., 1964, p. 452–497. 15 refs.

Life support systems currently being developed for the Apollo and Gemini programs will be adequate for early lunar missions. The principle differences will be in (1) heat rejection and (2) protection form lunar surface and solar radiation. Protection from secondary particles thrown up by impact of meteoroids on the lunar surface will present additional hazards beyond those in earth orbital flight. Advanced life-support system concepts currently in the research and development stages will make longer missions possible through the use of waste regeneration processes. These advanced systems will probably be available before the first lunar landings are made. Completely self-sufficient life support systems utilizing lunar materials and development of a food supply on the moon appear to be in the undeterminable future; these approaches require considerably more development and knowledge of lunar characteristics. Extensive improvement in space suit mobility is required.

A65-80531
CLINICAL AND THERAPEUTIC ASPECTS OF KEROSENE POISONING: A SERIES OF 200 CASES.
B. J. Baldachin and R. N. Melmed (Mpilo Central Hosp., Dept. of Med., Bulawayo, Southern Rhodesia).
British Medical Journal, vol. 2, Jul. 4, 1964, p. 28–30. 9 refs.

A series of 200 cases of kerosene ingestion is reviewed. Clinical and radiological findings suggest that the most significant complication is pulmonary damage following aspiration. Systemic effects of kerosene absorption appeared to be of little practical importance. A standard conservative regime of prophylactic penicillin, without gastric lavage, was employed. The mortality rate was 0.5%. A review of experimental reports and clinical findings indicate that treatment should be conservative, and that gastric lavage is contraindicated in the management of this condition.

A65-80532
FAA STATISTICAL HANDBOOK OF AVIATION.
Washington, D. C., U. S. Government Printing Office, Sep. 1964, vi+177 p. $1.00.

This handbook presents tables on (1) The FAA, (2) Airports, (3) Federal Airway System, (4) Aircraft and Airmen, (5) General Aviation Flying, (6) Aeronautical Production and Exports, (7) U.S. Civil Air Carrier Fleet, (8) U.S. Civil Air Carrier Operating Data, and (9) Aircraft Accidents and has a glossary and an index. Information concerning flying personnel includes data on approved flying schools, certificate ratings held by pilots and non-pilots, and ratings of women pilots. Statistics on accidents include figures of total fatalities, fatality rates, number of accidents, and comparison with other transportation modes.

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AEROSPACE MEDICINE AND BIOLOGY / *a continuing bibliography* APRIL 1965

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