NASA SP-7011 (31)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7011 (31)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during November, 1966

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. **DECEMBER 1966**

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:

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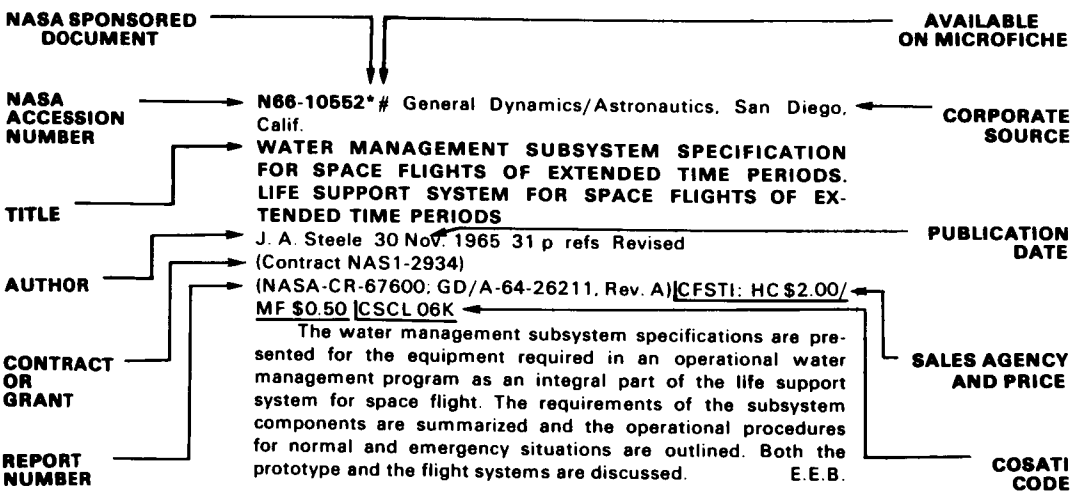

AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography DECEMBER 1966

STAR ENTRIES

N66-35372# Joint Publications Research Service, Washington, D. C.

***VESTNIK* OF THE USSR ACADEMY OF MEDICAL SCIENCES, VOLUME XXI, NO. 5, 1966**

9 Aug. 1966 112 p refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), v. 21, no. 5, 1966 p 3-95 (JPRS-36915; TT-66-33345) CFSTI: $4.00

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6. CORRELATIONAL ANALYSIS OF THE CARDIAC SINUS RHYTHM IN TRAINED ATHLETES AND PERSONS WITH A HISTORY OF MYOCARDIAL INFARCTION Z. I. Yanusitkevichyus and D. I. Zhemaytite p 55-58 refs

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9. PRELIMINARY DATA ON THE POSSIBLE ROLE OF CONNECTIVE TISSUE IN ACHIEVING DEEP HYPOTHERMIA A. Labori, B. Veber, Ts. Shekler and Ts. Baron p 73-83 refs (See N66-35374 21-04)

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N66-35373# Joint Publications Research Service, Washington, D. C.

RESULTS OF EXPERIMENTAL TREATMENT OF RADIATION ILLNESS

P. D. Gorizontov and V. D. Rogozkin *In its* Vestn. of the USSR Acad. of Med. Sci., Vol. 21, No. 5, 1966 9 Aug. 1966 p 10-22 refs (See N66-35372 21-09) CFSTI: $4.00

The article carries experimental materials about the effectiveness and mode of action proper to agents of chemical and biological protection, remedial preparations and patterns of complex therapy in diverse types of radiation injuries. The most effective chemical protective preparations are shown to alleviate the action of radiation upon hemopoietic organs, while in the mechanism underlying the activity of agents of biological protection account should be taken of their ability to raise the non-specific resistance and of changes which meanwhile take place in the functional state of the blood formation. As established, the most effective method of therapy in radiation sickness is not so much the use of individual curative agents, but that of pathogenic complex treatment patterns. These complexes should include as basic therapeutic means antibiotics, hemopoietic stimulators, antihemorrhagic agents, desensibilizing and detoxicating preparations, hormones and vitamins. Author

N66-35374# Joint Publications Research Service, Washington, D. C.

PRELIMINARY DATA ON THE POSSIBLE ROLE OF CONNECTIVE TISSUE IN ACHIEVING DEEP HYPOTHERMIA

A. Labori, B. Veber, Ts. Shekler, and Ts. Baron *In its* Vestn. of the USSR Acad. of Med. Sci., Vol. 2, No. 5, 1966 9 Aug. 1966 p 73-83 refs (See N66-35372 21-04) CFSTI: $4.00

Introduction of neuroplegic substances first, followed by sodium 4-hydroxybutyrate allows the obtaining of hypothermia in dogs within the limits of 18–20°, with final survival of the animals involving no application of extracorporeal circulation or artificial respiration machines. The desoxycorticosterone pre-treatment brought about an appreciable letality among the animals subjected to hypothermia, but in this case the apparent modifications, as it seems, should be attributed to the technique itself. Administration of potassium, which has to be practiced in control animals at the outset of hypothermia in these particular conditions seems to be inadvisable. In this aspect other cases must be studied. Author

N66-35376# Naval Submarine Medical Center, Groton, Conn. Research Lab.
VERTIGO AMONG DIVERS Interim Report
Lewis Terry and W. Landon Dennison 8 Apr. 1966 11 p refs (Rept.-66-2; AD-635518) CFSTI: HC $1.00/MF $0.50

Vertigo is a common symptom among divers, although its incidence has not heretofore been given the consideration it may deserve. The authors feel that the incidence of this symptom among divers is in consonance with the experience of the diver, that is, many divers will experience vertigo if they dive long enough. Vertigo must be recognized and differentiated from the more severe forms of dysbarism, particularly when it manifests itself by a loss of balance, nausea, and unconsciousness. Both pressure changes within the middle ear and caloric stimulation may play an important role in the development of vertigo among divers. Inequality of the caloric stimulation (between the right and left ear) appears to play only a minor role. The important factor seems to be the movement of endolymph, whether by eddy currents from movements of the stapes or convection current caused by caloric stimulation. Author (TAB)

N66-35384# School of Aerospace Medicine, Brooks AFB, Tex.
WHOLE SALIVA PROTEASE LEVELS IN RELATION TO PERIODONTAL STATUS IN MAN Final Report, Jun. 1962–Dec. 1963
Howard H. Chauncey (Tufts U., Boston) and Ira L. Shannon Apr. 1966 12 p refs
(SAM-TR-66-35; AD-635112) CFSTI: HC $1.00/MF $0.50

Whole saliva protease activity was measured in 83 randomly chosen subjects and in 59 persons with severe periodontal involvement. Thirty-three persons from the latter group were retested at least 3 months after periodontal surgery. Significant differences were found between these subject groupings, protease levels being high in subjects with periodontal disease and decreasing after therapy. Parotid and submaxillary fluids demonstrated no protease activity. The proteolytic enzymes present in whole saliva were observed to originate from both mammalian cellular elements and microorganisms. Author (TAB)

N66-35519*# Northrop Space Labs., Hawthorne, Calif.
THE PHYSICAL CAPABILITIES AND LOGISTIC SUPPORT REQUIREMENTS FOR MAN ON THE MOON
Walter Kuehnegger *In* AF Acad. Proc. of the Working Group on Extraterrest. Resources [1965] p 417–436 refs (See N66-35506 21-30) CFSTI: HC $8.50/MF $2.75
(Contract NAS1-4449)

This paper describes the application of biomechanical principles to the determination of his physical capabilities and those of work physiology in the determination of his logistic support requirements. A combination of biomechanical and physiological data has been used to derive the efficiency and optimization of man in the performance of simulated lunar working tasks. The data presented concerns itself primarily with self locomotion experiments. It is shown how the data developed by this method can be applied as a part of the basic guideline in the preparation of manned lunar surface missions. As such, it will contribute to the safe and successful completion of the mission objective. Author

N66-35520*# AiResearch Mfg. Co., Los Angeles, Calif.
THE COST OF LIFE SUPPORT IN MANNED LUNAR BASES
W. L. Burriss *In* AF Acad. Proc. of the Working Group on Extraterrest. Resources [1965] p 437–471 refs (See N66-35506 21-30) CFSTI: HC $8.50/MF $2.75
(Contract NAS8-11447)

This paper concerns the comparative costs for life support in relatively large lunar bases provided with crews ranging from 3 to 18 men. Early lunar bases will have relatively high expendable usage rates and consequently will be limited to mission durations of less than approximately 3 months (without logistic resupply). The ultimate lunar base, to be achieved by evolution through progressively more sophisticated systems, will incorporate extensive provisions for the reclamation of useful materials from human wastes. The life support system concept described is based upon use of modules to permit growth in mission capability by modular addition of life support equipment and supplies to the systems used in earlier missions. Consideration is given to the operational costs associated with base monitoring, housekeeping, and system support activities to determine the resources available for the performance of the scientific mission tasks. Author

N66-35521*# Agriculture Dept., Beltsville, Md.
TERRESTRIAL AGRICULTURE PLANT AND ANIMAL RESEARCH AS APPLICABLE TO EXTRATERRESTRIAL FOOD PRODUCTION
Robert G. Yeck *In* AF Acad. Proc. of the Working Group on Extraterrest. Resources [1965] p 472–480 refs (See N66-35506 21-30) CFSTI: HC $8.50/MF $2.75

The intent of this presentation is to alert the space scientist to agricultural research as a resource for solving problems of extraterrestrial food production. The general organization for agricultural research within the United States and a discussion of the range of activities that are being conducted is given. Included are some specific examples of research that might have direct application to space problems. For example, recent studies on the effect of CO_2 concentration on vegetables have shown head weight of lettuce to increase progressively with each successive level of CO_2 concentration. The levels of exposure were 500, 800, 1200, and 1600 ppm. The average weight of okra plants were about four times greater in beds with 1600 ppm of CO_2 than in beds with 400 ppm exposure. Rates of heat dissipation and the identification of the method in which it is dissipated are subjects of some of the animal research. Skin vaporization has been identified as an important means of heat dissipation among animals previously considered as "non-sweating." Author

N66-35522*# RAND Corp., Santa Monica, Calif.
WEIGHTS OF ENVIRONMENT-CONTROL SYSTEMS
S. H. Dole *In* AF Acad. Proc. of the Working Group on Extraterrest. Resources [1965] p 481–487 refs (See N66-35506 21-30) CFSTI: HC $8.50/MF $2.75

Some generalized relationships are presented that can be used for estimating weights of environmental-control equipment and expendables required for supporting human beings on space missions. Dry weights are extracted from contractor reports and defined as items of equipment employed in

breathing-gas supply, carbon dioxide removal, humidity control, trace contaminants removal, fresh water supply, thermal control, and waste management. Weights are correlated by using a single mathematical expression. Total weights of environmental-control systems are estimated by adding weights of expendables to dry weights. Expendables include metabolic supplies, reactants, make-up for leakage of atmospheric gases, and metabolic stores for contingencies. These empirical correlations are presented for quick estimating purposes when all details are not available. S.P.

N66-35523*# Litton Industries, Inc., Beverly Hills, Calif.
LEAKAGE IN LIFE SUPPORT SYSTEMS
Arthur F. Sullivan *In* AF Acad. Proc. of the Working Group on Extraterrest. Resources [1965] p 489–494 refs (See N66-35506 21-30) CFSTI: HC $8.50/MF $2.75

This paper briefly considers a small, but nevertheless essential, element of any extraterrestrial exploration activity—the leakage of gases from life support systems. In particular, we will examine both the logistic and the design consequences of leakage from space suits during extraterrestrial activity. To date space suits have been characterized by very high leak rates. In spite of the moderate, 3.7 psi, operating pressures employed by the current generation of operational suits, leak rates in excess of 160 scc/min are typical. To a reasonable approximation one can, in fact, assume that all of the life support system leakage occurs in the suit. Further, marked increases in suit leakage with wear, and as the result of don/doff manipulations, have come to be accepted as inevitable. Increases in gas losses resulting from wear generally range from 50 to 100% during the useful life of current suit types. Author

N66-35542# Naval Submarine Medical Center, Groton, Conn.
OXYGEN BREATHING EFFECTS UPON NIGHT VISION THRESHOLDS Interim Report
Paul R. Kent 2 Feb. 1966 19 p refs
(Rept.-469; AD-634798) CFSTI: HC $2.00/MF $0.50

Two series of experiments were conducted; one was concerned with the effects of mask breathing, and the other with breathing 100% oxygen at ambient (sea level) pressure. It was found that the effect of oxygen excess upon rod and cone scotopic threshold is subject to individual variation. Rod and cone scotopic thresholds are only exceptionally affected by breathing near-100% oxygen for periods up to 140 minutes. When administered at higher pressure, even for periods as short as 20 minutes, the incidence of effects is sharply higher. Rod and cone scotopic thresholds, measured while breathing near 100% oxygen are sensitive to blood sugar levels. Breathing through a mask-demand valve system of the type used in these experiments may cause an elevation of the rod and/or cone scotopic threshold(s) of some individuals, apart from any effect of the inhalant. Author (TAB)

N66-35564# Battelle Memorial Inst., Columbus, Ohio.
EFFECTS OF RADIATION ON THE SUBMICROSCOPIC STRUCTURE OF THE SYMPATHETIC NEURON Final Report, 16 Mar. 1962–15 Jul. 1964
Richard M. Roppel, Carl W. Melton, Arthur C. Peters, Wayne H. Allton, and John E. Prince Brooks AFB, Tex., School of Aerospace Med., Apr. 1966 17 p refs
(Contract AF 41(609)-1585)
(SAM-TR-66-32; AD-634405) CFSTI: HC $1.00/MF $0.50

Hamsters were irradiated with supralethal, single doses and with sublethal, fractionated doses of Co^{60} gamma radiation. Autonomic ganglia were dissected from these animals at various times after irradiation and were studied by electron microscopy for evidence of morphologic change resulting from irradiation. When fixation was accomplished by direct immersion of tissues in permanganate solution, only minimal cellular changes that could be attributed to radiation were observed in sympathetic tissues following single massive doses of 10,000 to 100,000 R. When perfusion fixation was attempted, however, extensive fixation artifact was observed in the tissues of irradiated animals but not in controls. Fractionated-dose irradiation to a total of 500 R administered as ten 50 R doses resulted in an increase in the number of densely straining, cytoplasmic inclusion bodies observed in sympathetic neurons. A permanganate-sodium plumbate staining procedure which results in an electron microscope image of high contrast is described. Author (TAB)

N66-35590# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
A STUDY OF TECHNIQUES AND EQUIPMENT FOR THE EVALUATION OF EXTRAVEHICULAR PROTECTIVE GARMENTS Final Report, Aug. 1964–Jun. 1965
David G. Parry, Le Roy R. Curry, Jr., Donald B. Hanson, and George B. Towle Wright-Patterson AFB, Ohio, AMRL, Feb. 1966 427 p refs
(Contract AF 33(615)-1780)
(HSER-3671; AMRL-TR-66-4; AD-635206) CFSTI: HC $3.00/MF $2.00

The purpose of this study was to establish a test methodology and a test system for objective, quantitative, and accurate evaluation of extravehicular space protective garments. Areas of testing studied include functional performance, life support, and environmental protection. Emphasis is placed on the problem of suit torque restraints, i.e., mobility. Concepts for appropriate evaluation criteria are discussed. The information presented and conclusions reached are the results of experience in suit testing, technical analysis, search of the literature, and discussions with experts. The nature and causes of suit torque restraint are discussed and a pin jointed model is developed for precise description of suit torques and body interlink angles. Various techniques for torque vector and body angle measurements are explored and it is concluded that a powered articulated dummy and an intrasuit exoskeletal electrogoniometer with off-line computer coupling are required to produce accurate data and useful figures of merit. Measurement techniques for reach envelope, glove evaluation, and comfort are also discussed. Various approaches to thermal and respiratory system evaluation were studied and steady state manned tests at moderate altitudes with minimum suit-wall heat transfer are recommended. The meteoroid, vacuum, thermal, and radiation hazards of space are reviewed and direction for further study in these fields is suggested. Overall facility requirements for suit evaluation are discussed and a digital data acquisition system for conditioning, editing, recording, and processing of functional and life support data is described. Author (TAB)

N66-35608# Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.
MANUAL OF RADIATION DOSIMETRY EXPERIMENTS
Kent C. Humpherys, ed. Bethesda, Md., Armed Forces Radiobiology Res. Inst., Nov. 1965 230 p refs
(Contract DA-49-146-XZ-226)
(EG&G-S-305-MN; AFRRI-CR65-4; AD-631318) CFSTI: HC $6.00/MF $1.25

Experimental procedures covering the general field of radiobiological dosimetry techniques and dosimetric systems, used in support of reactor operations and radiobiological research studies, are presented. The experiments are intended as a self taught course for technical personnel who have little or no knowledge of dosimetry techniques. Each experiment contains a theoretical discussion, detailed experimental procedures, suggestions for the concluding discussion, and a list

of equipment. For more specific information concerning the individual experiments, see N66-35609–N66-35618. N.E.N.

N66-35609# Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.

EXPERIMENTAL CAVITY IONIZATION

A. C. Lucas *In its* Manual of Radiation Dosimetry Expt. Nov. 1965 p 9–24 refs (See N66-35608 21-04) CFSTI: HC $6.00/MF $1.25

The determination of absorbed dose using an ionization chamber is investigated. The theoretical treatments of Bragg–Gray and Spencer–Attix are tested by varying the atomic number of both wall material and gas, and by varying gas pressure. The two theories are briefly reviewed. For general information, see N66-35608. N.E.N.

N66-35610# Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.

TISSUE EQUIVALENT IONIZATION CHAMBERS

R. L. Lynn *In its* Manual of Radiation Dosimetry Expt. Nov. 1965 p 25–38 refs (See N66-35608 21-04) CFSTI: HC $6.00/MF $1.25

The calibrations of a 50 cc tissue equivalent ionization chamber and of a 50 cc graphite ionization chamber with Co^{60} and PuBe sources are studied. The neutron and gamma tissue dose components of a mixed radiation field are measured. The ionizing radiations affecting biological tissue are described. For general information, see N66-35608. N.E.N.

N66-35613# Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.

MEASUREMENT OF FAST NEUTRON TISSUE DOSE WITH THE HURST PROPORTIONAL COUNTER

J. A. Sayeg *In its* Manual of Radiation Dosimetry Expt. Nov. 1965 p 97–116 refs (See N66-35608 21-04) CFSTI: HC $6.00/MF $1.25

A proportional counter is used to measure the absorbed dose in tissue due to fast neutrons while discriminating against gamma radiation. The data recording system is calibrated with an alpha source and a Pu–Be neutron source. The fast neutron dose is measured with a reactor steady state exposure. For general information, see N66-35608. N.E.N.

N66-35617# Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.

MEASUREMENT OF DEPTH DOSE

V. A. Sayeg *In its* Manual of Radiation Dosimetry Expt. Nov. 1965 p 165–181 refs (See N66-35608 21-04) CFSTI: HC $6.00/MF $1.25

Depth dose measurements are made in tissue equivalent phantoms using tissue equivalent ionization chambers. An X-ray machine is used as a radiation source. The dose pattern throughout the phantom in relation to the entrance and exit dose is determined. Typical graphs of depth dose relation and distributions are included. For general information, see N66-35608. N.E.N.

N66-35624# Aerospace Medical Div. Arctic Aeromedical Lab., Fort Wainwright, Alaska.

PHYSIOLOGICAL OBSERVATIONS ON SUBARCTIC BEARS UNDER WINTER DEN CONDITIONS

C. Edgar Folk, Jr., Richard C. Simmonds, and Mary A. Folk Mar. 1966 19 p refs

(AAL-TR-65-15; AD-635342) CFSTI: HC $3.00/MF $0.50

Heart rates, body temperature, and urinary output were studied in a variety of activity states in one or all of a group of four bears (two grizzly bears, Ursus horribilis, and two black bears, Ursus americanus Pallas). In addition, the cardiac activity of three black bears was studied during whole body hypothermia. The resting heart rates obtained during winter dormancy from three bears were significantly lower (75–91%) than those obtained during the summer. The physiological activity cycle of the dormant bears did not change appreciably as they continued to show a relatively high heart rate (40 beats/minute) in the morning hours. Body temperatures obtained from one black bear during winter dormancy showed only a 4°C depression. One dormant bear did not urinate for at least three months, and it was not until the third day post-arousal that voiding occurred. The three black bears subjected to whole body hypothermia experienced asystole and cardiac arrest at body temperatures of 16–21°C. At the time of cardiac arrest, heart rates as low as 1 beat/minute were recorded, indicating that bears could maintain low hypothermic heart rates.

Author (TAB)

N66-35637# San Jose State Coll., Calif.

A REVIEW OF EFFORTS TO ORGANIZE INFORMATION ABOUT HUMAN LEARNING, TRANSFER, AND RETENTION Final Report, Jul.–Nov. 1965

Rose Ginsberg, John C. Mc Cullers, John J. Meryman, Calvin W. Thomson, and Robert S. Witte Wright-Patterson AFB, Ohio, AMRL, Mar. 1966 42 p refs

(Contract AF 33(615)-2951)

(AMRL-TR-66-23; AD-635491) CFSTI: HC $2.00/MF $0.50

Efforts pertaining to organizing available information on human learning, transfer, and retention are summarized and evaluated on six criteria: behavioral significance of categories, scope, objectivity and reliability of categories, prognosis for the system, logical structure, the heuristic value of the system. Attention is also given to several other sources of guidance for organizing information on human learning. The review indicates at least six major approaches to a taxonomy of human learning. The bases for these different approaches are: (1) general or limited theoretical factors, (2) conditions of learning including the learner, (3) individual differences, (4) physical characteristics of learning tasks, (5) task characteristics in relation to empirical variables, and (6) task characteristics in relation to learning principles. In some cases the approaches are combined. The major conclusion is that although some contributions have been made to a general organization of information on human learning, intense and detailed efforts toward a comprehensive taxonomy are only in a preliminary formative phase.

Author (TAB)

N66-35696# Argentina. Comision Nacional de Energia Atomica, Buenos Aires.

PLASMA VOLUME AND GLOBULAR MASS DETERMINED WITH SERUM ALBUMIN WITH I-131 AND WITH RED GLOBULES LABELED WITH Cr-51 [VOLUMEN PLASMATICO Y MASA GLOBULAR DETERMINADOS CON SEROALBUMINA CON I-131 Y CON GLOBULOS ROJOS MARCADOS CON Cr-51]

Guillermo Rey, Alfredo Macchi, and Osvaldo Degrossi 1966 10 p refs In SPANISH

(CNEA-172) CFSTI: HC $1.00/MF $0.50

The plasmatic volume and corpuscular mass of 10 normal and 6 subjects suffering from anemia and polycythemia were determined using seralbumin labelled with I^{131} and red corpuscles labelled with Cr^{51}. The values obtained using the combined methods were used to calculate the total blood volume. Any differences noted were not significant from a statistical point of view. In comparing the erythrocyte mass of women with men, the women had less. Plasmatic volume in women was also less. However, there were no statistically significant differences between normal and pathological subjects in either corpuscular or total blood volume. For more

exact measurements, the volume should be determined separately. The study demonstrated the value and feasibility of the two procedures. I^{131} is easier to use than Cr^{51} but is affected by the purity of the albumen used. R.N.A.

N66-35706# Stanford Research Inst., South Pasadena, Calif. Southern Calif. Labs.

FEASIBILITY OF REMOVING GASEOUS CONTAMINANTS FROM MANNED SPACE-CABIN ATMOSPHERES BY IONIC PROCESSES Final Technical Report, 1 Mar.-31 Oct. 1965

George J. Doyle and Robert G. Caldwell Wright-Patterson AFB, Ohio, AMRL, Feb. 1966 71 p refs

(Contract AF 33(615)-2405)

(SSU-5396; AMRL-TR-66-22; AD-635522) CFSTI: HC $3.00/MF $0.75

The application of ionic processes to the purification of manned space-cabin atmospheres was investigated in anticipation of a need for a radically new atmospheric purification system for some of the presently scheduled space journeys. Processes considered are (1) ion-molecule reactions of contaminant molecules with specific added molecule ions (O_2^+, O_2^-) and (2) clustering of contaminant molecules about specific ions (H_3O^+). Either reaction type can lead to charging of the contaminant molecules (or molecules derived therefrom), allowing collection by an externally applied electric field. Ion-molecule reactions were found to be potentially useful for removal of a large class of contaminant species. However, charge-trapping reactions involving such species as water and oxygen-occurring or energetically capable of occurring concurrently or subsequently to the desired reaction-could interfere, thereby allowing no clear-cut decision as to the applicability of ion-molecule reactions to purification. Clustering was investigated in greater detail than ion-molecule reactions. Detailed calculation of ion-polar molecule interaction energies for typical molecules were carried out. Author (TAB)

N66-35725# Atomic Energy Commission, Washington, D. C. Div. of Operational Safety.

PROCEEDINGS OF THE USAEC FIRST SYMPOSIUM ON ACCELERATOR RADIATION DOSIMETRY AND EXPERIENCE

[1965] 697 p refs Conf. held at Upton, N. Y., 3-5 Nov. 1965 (CONF-651109) CFSTI: HC $6.75/MF $2.75

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1. ACCELERATOR PRODUCED RADIATION ENVIRONMENTS p 3-160 refs
2. SPECIAL TECHNIQUES p 163-323 refs
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4. SPECIAL PROBLEM AREAS—PRESENT AND FUTURE p 429-598 refs
5. BIOLOGICAL ASPECTS p 601-652 refs

N66-35739# Aviation Safety Engineering and Research, Phoenix, Ariz.

TEST RESULTS—HEMISPHERICAL SPECIMENS. SUPPLEMENT II TO HELMET DESIGN CRITERIA FOR IMPROVED CRASH SURVIVAL

J. W. Turnbow (Ariz. Univ.) and J. L. Haley, Jr. Jan. 1966 21 p (Contract DA-44-177-AMC-254(T))

(USAAVLABS-TR-65-44B, Suppl. 2; AD-628680) CFSTI: HC $1.00/MF $0.50

The results of impact tests on 27 different types of helmet construction are presented. Materials used in each specimen and the total weight of each are given in tabular form, as well as acceleration onset rate, maximum (peak) acceleration, rebound height, and deformation of the simulated scalp. The 90-degree corner impactor drops were compared at 6 and 4 ft, and the flat impactors at 5 and 6 ft. A comparison of the acceleration values indicated that only three specimens yielded acceptable acceleration values combined with reasonably low specimen weights (0.10 in. thick 8-ply nylon-epoxy, 0.40 annealed magnesium, and 0.40 annealed aluminum specimens). Two other specimens (0.04 magnesium and 0.04 aluminum) could be acceptable if the foam density were reduced. L.E.W.

N66-35755# Joint Publications Research Service, Washington, D. C.

SLEEP AND ELECTRIC SLEEP IN CHILDREN

L. Ya. Rabichev 25 Aug. 1966 12 p Transl. into ENGLISH from Pediatrya (Moscow), v. 45, no. 6, Jun. 1966 p 7-10 Presented at the 1st Rep. Sci. and Pract. Conf. of Pediatricians of the Moldavian SSR, 31 Oct. 1964

(JPRS-37218; TT-66-33647) CFSTI: $1.00

Standards of physiological sleep established in relation to age are discussed, and a simple scheme is suggested for determining the average norms of sleep duration in children and adolescents. The importance of the depth of sleep is also discussed, with differentiation made between somnolence, superficial sleep, sleep of medium depth, and deep sleep. Hygienic and therapeutic measures for normalizing sleep are mentioned. The effectiveness of electric sleep therapy for treating sleep deficiencies in children is evaluated, based on the results of clinical observations over a 10-year period. It is pointed out that the treatment is carried out simultaneously with medicinal and physiotherapeutic measures. The recommendation is made that this therapy should be used in treating certain neuropsychic and neurosomatic diseaseases of children. M.G.J.

N66-35762# Joint Publications Research Service, Washington, D. C.

LIGHT MEASUREMENTS IN THE STUDY OF PRIMARY PRODUCTION IN THE SEA

O. I. Koblents-Mishke and Yu. Ye. Ochakovskiy 16 Aug. 1966 17 p refs Transl. into ENGLISH from Okeanologiya (Moscow), v. 6, no. 3, 1966 p 535-542

(JPRS-37033; TT-66-33463) CFSTI: $1.00

Several approaches to the problem of determining what light measurements are necessary for biological oceanography are examined, and proposed apparatus and measurement methods are assessed. The possibility of constructing and using an equivalent detector is discussed, and the design requirements for such instruments are listed. The difficulties caused by the complexity of the measurements, and computations of the radiant energy propagating in the sea are pointed out. Two principal measurement classifications are defined: (1) direct measurements of total energy; and (2) optical measurements for subsequent computations of this energy at some horizon. A simpler approach is considered in which underwater irradiation measurements are carried out in one narrow region of the spectrum. Recommendations for standardizing measurement methods are also proposed. M.G.J.

N66-35763# Joint Publications Research Service, Washington, D. C.

THE INFLUENCE OF ELECTROMAGNETIC AND MAGNETIC FIELDS ON THE CENTRAL NERVOUS SYSTEM

Yu. A. Kholodov 18 Aug. 1966 30 p Transl. into ENGLISH from Vliyaniye Elektromagnitnykh i Magnitnykh Poley na Tsentral'nuyu Nervnuyu Sistemu (Moscow), 1966 p 100, 137-138, 199-200, 223-224, 252-259, 281-283

(JPRS-37102; TT-66-33531) CFSTI: $1.00

Research results are presented for studies conducted to determine the influence of the superhigh frequency field (SHF), and the continuous magnetic field (CMF) on the electric activity of the rabbit brain; on the development of conditioned reflexes to electromagnetic fields (EMF) in rabbits, pigeons, and fish; to analyze the production mechanism of conditioned reflexes to a magnetic field in fish; and on the histological changes of the brain under the influence of electromagnetic fields. General conclusions based on the overall study of electromagnetic and magnetic field effects on the central nervous system are also presented. Among the findings discussed are: (1) Electrophysiological experiments showed elements of similarity between the physiological action of CMF, UMF, and SHF fields, and ionizing radiation. (2) The fact that EMF has the strongest influence on the main regulatory center of the brain, where neural and humoral pathways of integration converge, led to the assumption that even weak exposure of this center may induce significant physiological changes. M.G.J.

N66-35772*# IIT Research Inst., Chicago, Ill.
LIFE IN EXTRATERRESTRIAL ENVIRONMENTS Quarterly Status Report, 15 May–15 Aug. 1966
Charles A. Hagen [1966] 31 p ref
(Contract NASr-22)
(NASA-CR-77612; IITRI-L6023-6) CFSTI: HC $2.00/MF $0.50 CSCL 06F

Simulated Martian environment experiments designed to determine the effects of barometric pressure and carbon dioxide concentration on germination of *Bacillus cereus* spores were concluded. It was found that *B. cereus* spore germination was inhibited by CO_2 concentrations of 37, 67, and 100% at all pressures. Pressures as low as 10-mb with Earth atmosphere were not inhibitory to spore germination, however, vegetative cell growth was less than that at 98-mb. Similar experiments to determine the effects of the same barometric pressures and CO_2 concentrations on *Staphylococcus aureus* indicated that earth atmosphere at 40-mb pressure with a constant temperature of 35°C or diurnal temperature cycling did not inhibit the growth of this organism. Soil ecology experiments on the growth response of *B. cereus, Lactobacillus plantarum, Pseudomonas aeruginosa,* Putrefactive Anaerobe (PA 3679), and *S. aureus* in an alkaline California desert soil with 99% relative humidity and a constant temperature of 35°C or diurnal temperature cycling indicated that: (1) *L. plantarum, P. aeruginosa,* and *S. aureus* do not survive even at cell populations of 10^5 cells/g of soil; and (2) *B. cereus* and PA 3679 spores survive at spore populations as low as 10^2 spores/g of soil with less than a one log die-off after 56 days. S.C.W.

N66-35774*# Naval School of Aviation Medicine, Pensacola, Fla. Naval Aerospace Medical Inst.
THE INVERSION ILLUSION IN PARABOLIC FLIGHT: ITS PROBABLE DEPENDENCE ON OTOLITH FUNCTION
Ashton Graybiel and Robert S. Kellogg 20 Jul. 1966 19 p refs
(NASA Order R-93)
(NASA-CR-77628; NAMI-974) CFSTI: HC $1.00/MF $0.50 CSCL 06S

Observations were made on normal subjects and deaf persons with bilateral labyrinthine defects (L–D subjects) under three different conditions in parabolic flight: (1) free-floating, (2) restrained in a Fiberglas mold, and (3) standing on the overhead during a modified parabola generating about −0.05 G unit. There were interindividual differences in the reactions among the normal but not among the L–D subjects. Some normal but none of the L–D subjects experienced a reversal of their personal orientation with regard to up–down under all three conditions. This reversal was considered to have its genesis in the vestibular organs, probably the otolith apparatus. Our findings are in accord with Russian reports describing feelings of inversion among cosmonauts in orbital flight. Attention is called to the necessity of distinguishing between information furnished by touch-pressure, kinesthesis, and stereagnosis under ordinary conditions and agravic touch-pressure, agravic kinesthesis, and agravic steragnosis. Author

N66-35785*# Miami Univ., Coral Gables, Fla. Inst. of Molecular Evolution.
RADIATION AND THE FIRST BIOPOLYMERS
Sidney W. Fox [1965] 34 p refs Presented at the Symp. on Radiation and the Origin of Life of the 3d Intern. Congr. of Radiation Res., Cortina D'Ampezzo, Italy, 28 Jun. 1966
(Grant NsG-689)
(NASA-CR-77588) CFSTI: HC $2.00/MF $0.50 CSCL 07E

Models attempting to portray the stuff and structure of the life protocell are reviewed and discussed; and the effects of radiation in the formation and durability of the polymers implicated are considered. The role of polyanhydro-α-amino acids, and polynucleotides in the synthesis of the cellular polymers, and the thermodynamics of peptide bond formation in an open system are discussed. The catalytic activities indicated in thermal polyanhydro-α-amino acids are tabulated. Some of the evidence for the limited heterogeneity of a 2:2:3-proteinoid is also given in a table. The compositions of the hydrolyzates of these proteinoids after repeated fractionation are almost identical. Also presented is a table showing the distribution of three kinds of assayable amino acids in two proteinoids. The evidence indicates that the interactions of individual amino acids lead to a high degree of order in the resultant polymers. Other properties (solubilities, optical activity, etc.) which the thermal polymers possess in common with proteins; and properties which proteinoid microspheres have in common with cellular systems, are also listed. The effect of radiation on the amino acids in ovalbumin in aqueous solution; and the origin of prebiotic and nonenzymic polynucleotides are also discussed. L.S.

N66-35824# Argonne National Lab., Ill.
RADIOLOGICAL PHYSICS DIVISION ANNUAL REPORT, JULY 1964–JUNE 1965
[1965] 140 p refs
(Contract W-31-109-ENG-38)
ANL-7060) CFSTI: HC $4.00/MF $1.00

Research is reported on biphenyl transitions, spectra of aromatic molecules, energy transfer in Ar–N mixtures, gas-phase ion recombination, photo-excitation, isotope effects in photoionization of benzene, isotope effects in ionization, energy transfer effects on luminescence, properties of the generalized oscillator strength, radioinduced osteosarcoma, radiosensitivity of rotifers, beta dosimetry, response of LiF to fast neutrons, LiF neutron image storage, NEUTBAK and RPY 157X programs for cosmic neutrons, ionization of gases by electrons, status of thorotrast-dosed personnel, whole-body counting methods, RPY-139 program for mixtures of gamma-emitters, underground counting facility air measurements, Mössbauer effect from bones, Mossbauer effect in ^{133}Cs, Ra and Sr concentrations in bone, blood, and soft tissue, bone-seeking radioisotopes, ^{226}Ra effects on bones, ^{133}Ba retention by beagles, natural distribution of Th and U, estimation of Th and U in bone, Sr retention by mice, collagen formation and ossification in mice, gamma emission by thorotrast patients, background in low-level

gamma facility, multi-channel analyzer data processing, multitube preamplifiers, detection of atmospheric ionized columns, ^{222}Rn measurements, air pollution survey instruments, atmospheric vertical heat flux determinations, and instrumentation for atmospheric turbulence studies. NSA

N66-35804*# Missouri Univ., Columbia.
TEMPERATURE PREFERENCE IN GOLDEN HAMSTERS
M. R. Gumma, F. E. South and J. N. Allen (N. Mex. St. Univ.) [1966] 17 p refs Prepared in Cooperation with N. Mex. St. Univ.
(Grants NGR-26-004-025; Nonr(G)-0001; NIH-GM-09584)
(NASA-CR-77562) CFSTI: HC $1.00/MF $0.50 CSCL 06C

The preference of pre- and post-hibernative hamsters and rats for relatively cool (8°C) or relatively warm (19°C or 24°C) environmental temperatures was tested in a T-maze using the method of forced choice to equate number of visits to and total time spent in each environment. The findings of the experiment showed that rats had a strong preference for 24° as opposed to 8°C environments. Pre-hibernative hamsters preferred an 8° environment to either a 19° or 24°C environment. Following arousal, hamsters shift their preference for an 8° environment to a 24°C environment. The significance of these results is discussed in terms of possible purposive thermoregulatory behaviors. Author

N66-35823# Argonne Cancer Research Hospital, Chicago, Ill.
SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION
Leon O. Jacobson and Margot Doyle, ed. Sep. 1965 195 p refs
(Contract AT(11-1)-69)
(ACRH-24) CFSTI: HC $3.00/MF $1.00

Information concerning activities in various biological and medical fields associated with cancer research is presented in nineteen papers. The information in these papers was published previously. NSA

N66-35835# Department of National Health and Welfare, Ottawa (Ontario). Radiation Protection Div.
DATA FROM RADIATION PROTECTION PROGRAMS, VOLUME 4, NO. 2
Feb. 1966 41 p refs
(NP-15951)

Procedures used by the Radiation Protection Division to ensure that exposure of radiation workers and of the general public will remain within the acceptable limits as defined by the guides are discussed. Guide levels in radiation protection programs are considered. Data are presented on: Canadian fallout data for January 1966; ^{137}Cs activity in seal samples; and reactor environment monitoring for January 1966. A selected list of 10 divisional reports and bulletins available to the public on request is included. NSA

N66-35919*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SAFETY PROBLEMS ASSOCIATED WITH CRYOGENIC SYSTEMS FOR SPACE ENVIRONMENT FACILITIES
Daniel J. Peters *In its* High-Vacuum Technol., Testing, and Meas. Meeting Aug. 1966 p 101-106 ref (See N66-35906 21-11) CFSTI: HC $6.00/MF $1.50

An accident that occurred while operating a space environment simulator is described. The accident exemplifies the existence of safety hazards when operating cryogenic systems and emphasizes the need for strict adherence to regulations to ensure the safety of operating personnel. The symptoms of anoxia are discussed and safety practices to guard against the exclusion of oxygen in confined areas are examined. The hazardous conditions arising from the inadvertent buildup of high pressures in lines or containers are also cited. H.S.W

N66-35937*# TRW Systems, Redondo Beach, Calif.
VISUAL DETECTION OF POINT SOURCE TARGETS
R. A. Shea and L. G. Summers Washington, NASA, Sep. 1966 71 p refs
(Contract NAS2-2742)
(NASA-CR-563) CFSTI: HC $2.50/MF $0.75 CSCL 05H

An experimental investigation of an observer's ability to detect, with the unaided eye, a target satellite in a rendezvous mission is presented. The target was represented by a point source of light moving in a simulated starfield background. Efforts centered on determining the time taken and the accuracy attained by an observer to detect the target, and on delineating the search techniques used by the observer in performing the task. Experimental results showed that detection time depends on target velocity, starfield density, and field-of-view. Other experimental data showed that there was an appreciable difference in mean detection time between modes of starfield presentation—15 sec for the same starfield background contrasted with 150 sec for the unique starfield group. There was no positive or negative transfer of training from one type of starfield presentation to the other. Two models are proposed to explain the observer's search strategy, one for each type of presentation. S.P.

N66-35981*# Martin Co., Denver, Colo.
GNOTOBIOTIC SURVEY REPORT
Jul. 1966 30 p refs
(Contract NASw-1407)
(NASA-CR-77779; VOY-CR-66-5) CFSTI: HC $1.00/MF $0.50 CSCL 06M

This report on gnotobiotic technology contains a concise summary of the historical development and present status. Selected abstracts related to gnotobiotic technology are provided. These abstracts, selected from files on sterilization technology, have been included to show the scope of gnotobiotic work as well as to identify valuable papers. Author

N66-35999# Federal Aviation Agency, Oklahoma City, Okla.
EVALUATION OF HEAD AND FACE INJURY POTENTIAL OF CURRENT AIRLINE SEATS DURING CRASH DECELERATIONS
John J. Swearingen Jun. 1966 20 p refs
(AM-66-18)

A large percentage of deaths in commercial-airline crashes is produced as the body and lower limbs flail around the seat belt. According to a previous study, a 10-foot-diameter sphere of clear area would be necessary to prevent a person from striking some portion of his body against surrounding structures. This study is concerned primarily with head impacts that may occur against most portions of the seats. Thirty-five impact studies were made with an instrumented dummy head against various portions of eight different makes of airline seats to determine the "g" time-force parameters of metal deformation and seat break-over. Until recently these data could not be interpreted in terms of head injury or unconsciousness because data on human tolerance to impact against deformable structures were not available; however, a recently published study presents detailed data concerning these tolerances. These data are used here to determine the injury potential of the eight seats studied. Applying the earlier data to the seat-impact studies, 30% of these impacts would have produced fatal

head injuries, 80% would have caused facial fractures, 97% would have rendered the passenger unconscious, and only 3% would have caused no injury or unconsciousness.
Author

N66-36043# Army Biological Labs., Fort Detrick, Md.
MICROBIOLOGICAL BARRIER TECHNIQUES
G. Briggs Phillips Dec. 1965 38 p refs *Its* Tech. Manuscript No. 260
(AD-626085) CFSTI: HC $2.00/MF $0.50

Microbiological barriers prevent the migration of microbial contaminants. Historically, the use of barriers in laboratory operations was documented as early as in the 19th century. In relation to the steps normally taken to detect and control microbiological contamination, the tests used with microbiological barrier systems include air sampling, surface sampling, filter and air incinerator testing, and gas-tightness testing. Microbiological barrier systems can be classified according to purpose, size, and degree of containment. Sterilization and decontamination agents are used with barrier systems for initial or terminal treatment, for the treatment of supplies and equipment moved in or out of the system, and for the maintenance of its microbiological state during use. Irrespective of the shape and material used for microbiological cabinet barriers, there are certain desirable minimum features. Photographs of a number of present day microbiological barriers and barrier systems are presented.
Author (TAB)

N66-36058*# Florida State Univ., Tallahassee. Dept. of Statistics.
BIOSTATISTICS OF SPACE EXPLORATION: MICROBIOLOGY AND STERILIZATION
Richard G. Cornell 24 Aug. 1966 15 p refs
(Grant NGR-10-004-029)
(NASA-CR-77803) CFSTI: HC $1.00/MF $0.50 CSCL 06M

Statistical analyses of problems arising in the decontamination of spacecraft and related studies of microbial life are discussed. Work towards developing a probability distribution function for representing the information available on the probability of contaminating Mars was started. Appropriate distributions for spacecraft parts of components which are of a type that can be subjected to microbial assay are being developed. The distributions will be combined to obtain a probability distribution of contamination for the spacecraft as a whole. In addition to the work on these contamination probability models, research on nonlinear statistical estimations which is directly applicable to microbial assays is also reported. Other efforts discussed which relate to the study include: (1) the development of nonparametric, distribution-free procedures for testing parallelism of regression lines (a problem which occurs often in bioassay), and (2) the estimation of parameters in a bioassay model with logarithmic die-off and with microbial counts observed for each plate studied.
L.S.

N66-36062# RAND Corp., Santa Monica, Calif.
A DOCUMENTARY ON WEIGHT, DIET AND EXERCISE
R. C. Drebelbis May 1966 91 p refs
(P-3196-1; AD-633860) CFSTI: HC $3.00/MF $0.75

The paper presents authentic scientific data on correct weight, diet and exercise as essential to physical fitness and general good health. It contains a chart to determine your metabolism or the calories per day that you will require to lose weight and then to maintain a desired level. A complete nutritive calorie chart of foods arranged in alphabetical order is included. The caloric value of the foods listed is shown in convenient measurements of average portions or servings. There is a conversion table which relates weights and measurements to standard food portions in daily use. The document is organized into two parts: Part I deals with weight and diet and Part II discusses exercise and physical fitness. Part II also includes a series of back flexion exercises recommended for those individuals who suffer recurring back problems.
Author (TAB)

N66-36070* Miami Univ., Coral Gables, Fla. Inst. of Molecular Evolution.
[STUDIES OF THE PREPARATION AND PROPERTIES OF THERMAL POLY-α-AMINO ACIDS AND THERMAL POLYNUCLEOTIDES] Semiannual Status Report, 1 Jun.–1 Dec. 1965
[1965] 11 p refs
(Grant NsG-689)
(NASA-CR-77856) CFSTI: HC $1.00/MF $0.50 CSCL 06A

Properties of thermal poly-α-amino acids and polynucleotides, and the behavior of microscopic units which organize spontaneously when amino acids condensates are brought into contract with water are studied. The catalytic property of protenoids is discussed, and it is pointed out that protenoids, like proteins, have many activities because of their chemical polyfunctionality. Examinations on the degree of heterogeneity of thermal protenoids are mentioned, and results from the optical resolution of amino acids by a stereoselective ligand exchange and by inoculation of supersaturated solutions of racemate are covered. Research on protenoid microspheres subjected to increased pH is described, and a photograph from the microscopic examination is included.
A.G.O.

N66-36075*# Florida State Univ., Tallahassee. Dept. of Statistics.
DILUTION MODEL: A BAYESIAN APPROACH Technical Report No. 6
Andres Petrasovits 24 Aug. 1966 30 p refs
(Grant NGR-10-004-029)
(NASA-CR-77799) CFSTI: HC $2.00/MF $0.50 CSCL 06A

A Bayesian approach is applied to the dilution method as a means for estimating, without any direct count, the density of bacterial organisms in a liquid. Two main problems are investigated: (1) Bayes estimation of the bacterial density for a given set of dilution levels, and (2) design of the typical dilution experiment, making use of the existing prior information about bacterial density, so as to minimize the expected value of an appropriate cost function. The probability model for this method is based on the assumptions that the organisms are distributed randomly throughout the liquid, and that each sample from the liquid when incubated in the culture medium is certain to exhibit growth whenever the sample contains one or more organisms. The Bayes estimate and Bayes risk used in the determination of the density parameter and experiment design are expressed in the form of polygamma functions, and several suggestions of extensions to the Bayesian treatment of the estimation and design problems involved in dilution experimentation are also given.
A.G.O.

N66-36081*# Florida State Univ., Tallahassee. Dept. of Statistics.
A NOMENCLATURE OF SYMBOLS RELEVANT TO THE PROBABILITY OF CONTAMINATING MARS Technical Report No. 5
Richard G. Cornell 24 Aug. 1966 12 p
(Grant NGR-10-004-029)
(NASA-CR-77753) CFSTI: HC $1.00/MF $0.50 CSCL 06T

A nomenclature of symbols is given which is useful in developing expressions for the probability of contaminating

Mars under a variety of conditions. The symbols designating probability concepts are presented, and the conventions regarding the designation of events are delineated. It is shown that many pertinent probability symbols can be developed from these basic event symbols using the defined conventions and operations. It is also pointed out that an advantage of this system is that it is easy to incorporate new events into the definitions either by operating on events already defined or by introducing new basic event notation. A.G.O

N66-36089*# General Mills, Inc., Minneapolis, Minn. Atmospheric and Aerosol Physics Research.

MICROSCOPIC SYSTEM FOR MARS STUDY PROGRAM (FEASIBILITY STUDY) Final Report, 30 Oct. 1961-31 Mar. 1962

R. E. Peterson, R. Ginsberg, V. W. Greene, D. Lundgren, D. Rotenberg et al 30 Apr. 1962 168 p refs Prepared for JPL *Its* Rept.-2274

(Contracts NAS7-100; JPL-950123)

(NASA-CR-50429) CFSTI: HC $5.00/MF $1.00 CSCL 06D

The results of a five-month study program have indicated that a feasible design concept can be developed for a remote, automatic microscopic system of Martian life-detection. Environmental samples would be collected, refined, and microscopically observed; video-micrographs of specimens with a high probability of containing biological constituents (if indeed, they are present) would be transmitted back to Earth. The individual study phases have included environmental factors, inferred characteristics of Martian microorganisms, sample collection, sample processing, microscopic observation and detection, and overall system analysis. Author

N66-36110*# Serendipity Associates, Los Angeles, Calif.

A STUDY OF POTENTIAL ROLES OF SUPERSONIC TRANSPORT CREWS AND SOME IMPLICATIONS FOR THE FLIGHT DECK. VOLUME I: WORKLOAD, CREW ROLES, FLIGHT DECK CONCEPTS, AND CONCLUSIONS

Harold E. Price, William D. Honsberger, and William J. Ereneta Washington, NASA, Aug. 1966 319 p refs

(Contract NAS2-2209)

(NASA-CR-561) CFSTI: HC $3.75/MF $1.75 CSCL 05H

The data developed from a study of the potential roles of supersonic transport crews was analyzed to investigate crew workload, distribution of this workload among different numbers of crew members to define potential crew roles, and implications of these potential roles for flight deck design. The results obtained substantiated the general conclusions that a realistic workload must be developed and utilized for SST crew simulation studies; the full time capabilities of a three man crew may be required for SST operations; monitoring tasks will contribute substantially to the crew workload and unique monitoring techniques may be necessary; and flight management operations are changing to a more cognitive performance rather than neuromuscular, and new man-machine interface concepts must be developed to support this role. Additional conclusions are drawn and recommendations for further study are made. H.S.W.

N66-36131*# General Dynamics Corp., Groton, Conn. Electric Boat Div.

WATER RECLAMATION SUBSYSTEMS FOR SPACE STATIONS

J. A. Steele, J. A. Lubitz, H. Wallman, H. Miner, and V. Speziali 3 Jul. 1963 79 p refs

(Contract NAS1-2208)

(NASA-CR-66168; U413-63-103) CFSTI: HC $3.00/MF $0.75 CSCL 06K

Three multi-filter subsystems were designed, built, and tested; they were found to give recovered water of the required quality. The dehumidification water subsystem produced potable water from air-conditioning condensate obtained from a space simulator. The washwater subsystem and the fecal water subsystem both produced water suitable for use as wash water. The actual weights of the multifilter subsystems for a 1-year mission are: dehumidification water subsystem—9.3 lb, wash water subsystem—100.1 lb, fecal water subsystem—28.9 lb, and storage racks for spare canisters—6.9 lb. These weights are not minimum and could be reduced by further design and development. The frequency of canister replacement, and hence subsystem weights, are highly dependent on the composition of the waste waters. Canister life can best be determined by test operation in a manned space simulator. Based on the amount of water remaining in the subsystems, the following water recovery efficiencies were calculated: dehumidification water subsystem—99.5%, wash water subsystem—99.0%, and fecal water subsystem—96.0%. Author

N66-36144# Bureau of Mines, Pittsburgh, Pa. Respirator Section.

GAS MASKS FOR RESPIRATORY PROTECTION AGAINST AMINES

Edwin J. Kloos, Leno Spinetti, and Lewis D. Raymond 1966 13 p refs

(BM-IC-8296) GPO $0.15

Previously approved gas masks were evaluated to determine their ability to provide respiratory protection against each of the following six selected amines: ethylenediamine, diethylamine, n-butylamine, ethylamine, methylamine, and hydrazine. Minimum requirements were a 24-minute service life at a flow rate of 64 liters per minute (32 liters per minute for hydrazine) and an amine concentration of 1.0 volume-percent (0.5 volume-percent for hydrazine). The three masks meeting these requirements were the LG4, Willson Products Division, The Electric Storage Battery Co.; the GMD-SS, Mine Safety Appliances Co.; and the 084-PHOV-R, Acme Protection Equipment Co. Author

N66-36152# Eidgenossische Technische Hochschule, Zurich (Switzerland).

COMPARISON OF THE EFFECT OF VARIOUS DRUGS ON A PAIN REACTION AND ON THE MOTOR PERFORMANCE OF RATS [VERGLEICH DER WIRKUNG VERSCHIEDENER PHARMAKA AUF EINE SCHMERZREAKTION UND AUF DIE MOTORISCHE LEISTUNGSFAEHIGKEIT VON RATTEN]

Silvio Schudel 1965 100 p refs In GERMAN

(Rept.-3660) CFSTI: HC $3.00/MF $0.75

Simultaneous analgetic and sedative effects of drugs on albino rats were studied by their subjective responses to electrical irritation of their anal skin folds and their swimming speed and endurance, respectively. Various tests showed that morphine and chlorpromazine possessed both, analgetic and sedative effectiveness; aspirin, pyramidon, phenacetin, butazolodin, and combinations of phenacetin/coffein, phenacetin/pyramidon, pyramidon/coffein, and phenacetin/pyramidon/coffein had weaker sedative effects; veronal-sodium pharmaceutica proved more sedative than analgetic, and coffein did not produce any analgetic or sedative results. Transl. by G.G.

N66-36160# Turin Univ. (Italy). Hematology Lab.

RESEARCH ON CELLS AND CHROMOSOMES IN HUMAN LEUKEMIA [INDAGINI SULLE CELLULE E SUI CROMOSOMI DI LEUCEMIA UMANA] Final Report, 1962-1965

F. Gavosto, A. Pileri, and L. Pegoraro Brussels, EURATOM, Apr. 1966 48 p refs In ITALIAN; ENGLISH summary
(Contract EURATOM-016-62-1 BIOI)
(EUR-2764.i) CFSTI: HC $2.00/MF $0.50

In the research on cells and chromosomes in human leukemia, the following lines of enquiry were pursued: (a) cytogenetic studies, (b) DNA duplication in the chromosomes of normal and leukemic blood cells, (c) proliferative and maturative potential of acute leukemia cells, (d) RNA metabolism in acute leukemia cells, and (e) effect of exogenous RNA on the protein metabolism of normal and leukemic cells. It emerged from the cytogenetic study that in about 60% of cases of acute leukemia the karyotype is morphologically normal, whereas in chronic myeloid leukemia cases approaching the acute stage the Ph^1 anomaly is persistent. With regard to the chromosomes, DNA synthesis was found to follow a characteristic pattern in both leukemic and normal cells. It was found that the reduction in the proliferative capacity of the acute leukemia cells is related to the degree of such cells' failure to differentiate. It was also observed that within a given population of acute leukemia blasts the proliferative failure becomes increasingly pronounced with age. In systems incubating in vitro, it was found that the addition of exogenous RNA increases the leucine uptake in both leukemic and normal blood cells. Author

N66-36178# United Kingdom Atomic Energy Authority, Harwell (England). Health Physics and Medical Div.
THE MEASUREMENT OF THE DOSE-EQUIVALENT FROM THERMAL AND INTERMEDIATE-ENERGY NEUTRONS WITH PERSONNEL DOSIMETERS
J. A. Dennis, J. W. Smith, and S. J. Boot Jul. 1966 19 p refs
(AERE-R-5238) CFSTI: HC $1.00/MF $0.50

Factors influencing the readings of personnel neutron dosimeters, particularly the cadmium covered film and the nuclear emulsion types, are discussed. The influences of the intermediate-energy and fast neutrons back-scattered from the body at thermal energies and of the gamma radiation generated in the body by the $^1H(n\gamma)^2D$ reaction are considered. It is shown that these phenomena enable reasonably accurate estimations of the dose-equivalent from neutrons with energies in the range thermal to 10 KeV to be made and, with certain assumptions about the neutron spectra, also an approximate estimate over the range thermal to 0.3 MeV. Author

N66-36226# Honeywell, Inc., St. Paul, Minn. Systems and Research Div.
A COMPUTER SYSTEM FOR INTRASPECIES BIOLOGIC AND BEHAVIORAL VARIABILITY STUDIES, 1-28 FEBRUARY 1966
Norman A. Sidley, David C. Brown, and Stirling P. Stackhouse Brooks AFB, Tex., School of Aerospace Med., Jun. 1966 9 p
(Contract AF 41(609)-2937)
(SAM-TR-66-60; AD-636913) CFSTI: HC $1.00/MF $0.50

An analytical system is described for the computer analysis of variables pertinent to the study of intraspecies biologic and behavioral variability. This program can be used for the selection of appropriate variables, for predicting which variables should be selected for future study on radiation effects, and for statistical significance testing. Author (TAB)

N66-36227# Prodesco, Inc., Perkasie, Pa.
DEVELOPMENT OF REVISED SIMPLEX FABRIC FOR SUMMER FLYING GLOVES
Hal E. Brockmann Johnsville, Pa., Naval Air Develop. Center, 1 Jul. 1966 10 p
(Contract NADC-5243/65)
(NADC-MR-6607; AD-636423) CFSTI: HC $1.00/MF $0.50

An improved simplex knitted fabric was developed for use in summer flying gloves which would effect better protection in the event of exposure to flames and reduce or eliminate the difficulties encountered with the filament simplex fabric. The fabric was to conform to all the requirements needed for comfort, serviceability and protection. All manufacturing techniques utilized in this effort were to conform to and be compatible with standard commercial methods for reproducing the finished product. The primary difficulties encountered in the fleet evaluation of the filament glove were limited to seam slippage and glove fit. Since the seam slippage presents a problem in serviceability, it is proposed that the yarn structure be modified from a continuous filament yarn to a yarn spun from short length staple fibers. This in itself would effect a greater degree of surface cohesiveness within the fabric structure and thus help to hold the seams in place. As far as the glove fit in the thumb area was concerned, a simple modification of the pattern accomplished the change. TAB

N66-36232# Federation of American Societies for Experimental Biology, Washington, D. C. Life Sciences Research Office.
STUDY OF RESEARCH METHODOLOGY FOR USE IN THE DEVELOPMENT OF ANTI-RADIATION AGENTS
Wendell H. Griffith and Helen M. Dyer 15 Jan. 1966 50 p refs
(Contract DA-49-092-ARO-70)
(AD-633394) CFSTI: HC $2.00/MF $0.50

Contents: Evaluation of research procedures employed in the screening and development of effective and safe anti-radiation agents; properties of an ideal anti-radiation agent; present status of research methodology employed in the search for and development of anti-radiation agents; nature and general manifestations of radiation damage and protection; methodology and significance of the mouse screening test and of other procedures employed in the search for anti-radiation agents and in the evaluation of radiation protection potency; survival of irradiated mice with and without a protective agent; determination of radiation protection by measurement of intracellular recovery and of the reparative proliferation of tissues; method of assessment of radiation protection potency; chemical, pharmacologic, and toxicologic properties of anti-radiation agents. TAB

N66-36236# Bureau of Social Science Research, Inc., Washington, D. C.
THE TRANSFORMATION OF FEAR Technical Report, 1963-1966
Samuel Z. Lkausner Jan. 1966 41 p refs
(Contract AF 49(638)-1510)
(AFOSR-66-0123; AD-631020) CFSTI: HC $2.00/MF $0.50

Hypothesis: (1) Fear and enthusiasm are negatively correlated components of affectual excitement. (2) In acting despite fear, fear is transformed into enthusiasm (the affectual valence shift from negative to positive); i.e., fear at one point is posivitely correlated with enthusiasm at a later point in the act. A sample of 825 American sport parachutists indicated the degrees of fear and enthusiasm experienced during their first jump. The data were examined by regression analysis of the fear and enthusiasm scores. During the jump preparation both fear and enthusiasm increase. At the start of the jump run, fear decreases and enthusiasm increases. A nadir and zenith, respectively, are reached when the parachute is opened.

Fear again increases and enthusiasm decreases near landing. Upon touching the ground, fear drops to a new nadir and enthusiasm rises to a zenith above the first. The mean scores for fear and for enthusiasm at successive points during the jump are negatively correlated. At single points, individual fear and enthusiasm scores are also negatively correlated. These findings support the first hypothesis. The individual fear scores at the first zenith of fear are less negatively and then more positively correlated with individual enthusiasm at successive subsequent points; this finding supports the second hypothesis. A deviant case analysis showed that those who transform their fear into a relatively great amount of enthusiasm tend to be independent, energetic personalities, while those who fail, relatively, to transform the fear into enthusiasm tend to be passive, dependent personalities. Author (TAB)

N66-36241# Electronic Systems Div., Bedford, Mass.

DIRECT VS INDIRECT ASSESSMENT OF SIMPLE KNOWLEDGE STRUCTURES Technical Report, May 1964-Jan. 1965

H. Edward Massengill and Emir H. Shuford, Jr. Mar. 1966 55 p refs

(ESD-TR-65-542; AD-632609) CFSTI: HC $3.00/MF $0.50

The report compares two types of classroom testing in terms of efficacy in guiding instruction. One type of testing is the traditional indirect method based on the observation of choices. The other type is the direct method based on admissible probability measurement. The general finding is that the direct methods always perform as well as and in most cases better than the indirect methods. This deficiency in the indirect method can be alleviated in theory by introducing redundancy into the test and asking the same question over and over again. The performance of indirect methods depends in a very critical manner upon the information available to the instructor from other sources about the current state of knowledge of each student. The performance of the direct methods is unaffected by this. The gain in effectiveness achieved by using direct methods must be balanced off against the cost of using these new methods. A direct method may require more student time per item than does an indirect method. This, however, may be more than compensated for by the requirement for redundancy when using the indirect method. In addition, since a direct method does not require additional information from the instructor as to the current state of knowledge of each student, the possibility exists that much larger classes may be taught with no loss in effectiveness thus implying even further economic benefits from the use of direct methods to guide classroom instruction.

Author (TAB)

N66-36251# Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine.

AVIATION MEDICINE REPORTS: AN ANNOTATED CATALOG OF OFFICE OF AVIATION MEDICINE REPORTS, 1961 THROUGH 1965

Mary Ellen Allen and Stanley R. Mohler Jan. 1966 34 p refs (AM-66-1)

An annotated catalog of Office of Aviation Medicine Reports is presented as a quick referehce for those engaged in civil aviation and related activities. It provides an applied summary, Author Index, and Subject Index of each OAM Report published from 1961 through 1965. Author

N66-36252# European Atomic Energy Community, Brussels (Belgium). Medical Service.

ACTION OF PADUTIN ON ACUTE AND CHRONIC RADIODERMATITIS [WIRKUNG VON PADUTIN BEI AKUTER UND CHRONISCHER RADIODERMATITIS]

S. Simon (Brussels Univ.), A. Massart, and J. Rodesch Jun. 1966 36 p refs In ENGLISH, GERMAN, ITALIAN, FRENCH, and DUTCH Presented at the 11th World Radiol. Congr., Rome, 22-28 Sep. 1965

(EUR-2752-d.f.i.n.e.) CFSTI: HC $2.00/MF $0.50

Deinsulinized pancreatic extracts (Padutin) have a cicatrizing trophic action on torpid wounds. When used in the treatment of acute and chronic radiolesions they give promising results. In man, the treatment of accidental radio-necroses and serious effects of radiotherapy gives good results in 80% of cases, failures in 16%, resistance in 4%. A marked diminution of pain recurs almost immediately. The extreme diversity of radio-lesions makes it necessary to draw up a therapeutic plan for each individual case. The treatment period varies from two months to one year. It is helpful to continue administering booster doses. The same treatment can be re-applied successfully should the lesions recur. Positive results have been obtained in cases of acute and chronic cutaneous radio-necrosis, radio-myositis, radio-necrosis of the cervix, the bladder, the mucous membranes, the bones, and in instances of delayed cicatrization, etc. Author

N66-36270# California Univ., Berkeley. Lawrence Radiation Lab.

SCINTILLATION PHOTOGRAPHY OF INTRAVASCULAR CLOTS *IN VIVO* WITH ^{131}I-LABELED PLASMINOGEN

William C. Berger 9 Feb. 1966 15 p refs

(Contract W-7405-ENG-48)

(UCRL-16691) CFSTI: HC $1.00/MF $0.50

The injection of 5 μC of ^{131}I-labeled human plasminogen (SK activated) demonstrated within 5 minutes the presence of a fresh, experimentally made intravenous clot in an otherwise intact living rabbit. The Anger scintillation camera was used to produce photographic representation of the clot. Author (NSA)

N66-36349# Eidgenossische Technische Hochschule, Zurich (Switzerland).

PHYSICAL-CHEMICAL PROPERTIES AND LOCAL ANESTHETIC RESULTS OF AN ETHER SUBSTITUTE OF PROCAIN . [PHYSIKALISCH-CHEMISCHE EIGENSCHAFTEN UND LOKALANAESTHETISCHE WIRKUNG EINIGER ESTER-ANALOGEN VON PROCAIN]

Guido Fischer (Ph.D. Thesis) 1965 87 p refs In GERMAN (Rept.-3675) CFSTI: HC $3.00/MF $0.75

Synthesis and properties of several isosteric procaine derivatives were described and their local-anesthetic effects on nerve fibers were evaluated. These derivatives showed the greatest anesthetic effectiveness when their distribution coefficient, surface activity, and carbon adsportion index was high, their pH degree of turbidity was deep, and their solubility in water was low. A substitution of the carbonyl group in procaine derivatives by —S—, —O—, —CH_2—, —NH—, and —SO_2—groups generally decreased their anesthetic effectiveness. Transl. by G.G.

N66-36356# European Atomic Energy Community, Ispra (Italy).

VALUE OF GAMMA SPECTROMETRY APPLIED TO BIOLOGICAL SAMPLES [VALEUR DE LA SPECTROMETRIE GAMMA APPLIQUEE AUX ECHANTILLONS BIOLOGIQUES]

H. Tanguy and V. Camera Jul. 1966 26 p refs In FRENCH; ENGLISH summary

(EUR-2998.f) CFSTI: HC $2.00/MF $0.50

The analysis of biological samples has not as many applications as wholebody counting, nevertheless, it has some value when applied to biological specimens such as urine and feces. The authors establish the normal spectra for urine and

feces and find a net increase in ^{137}Cs in urine after the middle of 1963. Body burdens calculated from the concentrations in the urine were higher at Ispra than in other places where the same measurements were done. The authors report results on spectra of some cases of slight contamination that were found at Ispra. Contamination was due to ^{203}Hg, ^{154}Cs, $^{152,154}Eu$ and other uranium fission products. Author

N66-36371*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

DESERT ALGAE: SOIL CRUSTS AND DIAPHANOUS SUBSTRATA AS ALGAL HABITATS

R. E. Cameron and G. B. Blank 15 Jul. 1966 41 p refs
(Contract NAS7-100)
(NASA-CR-77982; JPL-TR-32-971) CFSTI: HC $2.00/MF $0.50 CSCL 06F

In terrestrial desert environments, favorable microenvironments are found in the soil that promote the development of algae and associated organisms and a subsequent accumulation of organic matter. The most favorable habitats in desert soils occur in algal and lichen soil crusts, and on the undersurface of translucent or transparent materials partially imbedded in the soil surface. Algal abundance is increased and ecological factors are much less restrictive in these ecological niches than in the surrounding desert soil. Insolation is modified, more moisture is retained, desiccation is reduced, and organic matter accumulations are noticeable. Characteristics of translucent materials, such as white or milky quartz and chalcedony, which are partially imbedded in the surface of desert soils, permit the existence of mesophilic algal inhabitants, such as species of coccoid, blue-green algae, that do not normally occur as components of xeric soil populations. Other species are cosmopolitan forms occurring in a wide range of environments, including habitats at low or high elevations in hot or cold deserts. The probable occurrence of a number of translucent and transparent minerals in extraterrestrial soils and other geological materials may also provide a favorable ecological niche or microenvironment for organisms and associated organic matter in an otherwise harsh macroenvironment. Author

N66-36373*# National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography, Jul. 1966

Aug. 1966 178 p refs With Indexes
(NASA-SP-7011(27)) CFSTI: HC $1.00/MF $1.25 CSCL 06S

This continuing bibliography serves as an abstracting and announcement medium for references on aerospace medicine, exobiology, radiation effects on biological systems, physiological and psychological factors, life support systems, human engineering, protective clothing and equipment, crew training and evaluation, and piloting. Subject, corporate source, and personal author indexes are included. H.S.W.

N66-36377# Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine.

PROBLEMS IN AVIATION PERSONNEL: INFLUENCE OF A TRANQUILIZER ON TEMPERATURE REGULATION IN MAN

P. F. Iampietro, V. Fiorica, J. R. Dille, E. A. Higgins, G. Funkhouser et al May 1966 10 p refs
(AM-66-14)

The effects of a tranquilizing drug of the propaediol group, meprobamate, on thermal balance of men exposed to a cold (50°F, 10°C), hot (110°F, 43.3°C), or neutral (80°F, 26.7°C) environment have been investigated. Results show that a single dose of meprobamate (800 mg) has no effect on temperature regulation of men resting in a neutral environment. During exposure to hot or cold environments, however, the drug groups showed impairment in thermal balance. In the cold, heat production and core temperature of the drug group were lower than the placebo group. In the heat, only moderate elevations in the core temperatures of the drug group were detected. Possible physiological mechanisms responsible for these differences are discussed. Author

N66-36427*# New York Academy of Sciences, N. Y.

HUMAN ECOLOGY IN SPACE FLIGHT, VOLUME I

Doris Howes Calloway, ed. 1966 308 p refs Proc. of the 1st Intern. Interdisciplinary Conf., Princeton, N. J., 13-16 Oct. 1963; sponsored in part by ONR
(NASA Order R-144)
(NASA-CR-77922) CFSTI: HC $7.00/MF $1.75 CSCL 06K

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1. CABIN ATMOSPHERE A. Du Bois (Pa. Univ.) p 9-81 refs (See N66-36428 22-04)
2. REGENERATIVE SYSTEMS A. H. Brown (Pa. Univ.) p 82-119 refs (See N66-36429 22-05)
3. GRAVITY AND ACCELERATION H. Bjurstedt (Karolinska Inst.) p 120-204 refs (See N66-36430 22-04)
4. RADIATION IN SPACE W. F. Neuman (Rochester Univ.) p 205-242 refs (See N66-36431 22-04)

N66-36428*# New York Academy of Sciences, N. Y.

CABIN ATMOSPHERE

Arthur Du Bois (Pennsylvania Univ.) *In its* Human Ecol. in Space Flight, Vol. I 1966 p 9-81 refs (See N66-36427 22-04) CFSTI: HC $7.00/MF $1.75

The composition, partial pressures, and total pressures of the gases within a manned space flight cabin atmosphere are discussed. Problems concerning: (1) bends, (2) oxygen toxicity (at the cellular level), (3) atelectasis due to absorption of gas in the lungs, (4) acceleration effects on the lungs, (5) instrument cooling effects and fire hazard, and (6) the CO_2 level allowable in the capsule are considered. Comparisons between gaseous concentrations and pressures used by the U.S. and U.S.S.R. in the cabins are made, and the implications are discussed. L.S.

N66-36429*# New York Academy of Sciences, N. Y.

REGENERATIVE SYSTEMS

Allan H. Brown (Pennsylvania Univ.) *In its* Human Ecol. in Space Flight, Vol. I 1966 p 82-119 refs (See N66-36427 22-04) CFSTI: HC $7.00/MF $1.75

The use of microorganisms for regenerating the gases needed to maintain a proper space cabin ecology over prolonged periods of flight, are discussed. A block diagram of one such chemosynthetically balanced closed ecological system in which hydrogen bacteria are used for biosynthesis, is depicted. Factors considered are: (1) the possibilities of spontaneous mutations that may occur in the bacterial systems, (2) the matching of assimilatory and respiratory quotients, (3) the fixation of hydrogen, (4) the effect of oxygen concentration in the system on the rate of bacterial growth, (5) carbon dioxide consumption rates, and (6) intermediate bacterial wastes. A chart indicating the power and weight requirement estimates for algal and bacterial regenerative systems for a theoretical 270 man-day mission is presented. Also discussed are the edibility of algae, and the question of a chemically defined diet. L.S.

N66-36430*# New York Academy of Sciences, N. Y.

GRAVITY AND ACCELERATION

Hilding Bjurstedt (Karolinska Inst.). *In its* Human Ecol. in Space Flight, Vol. I 1966 p 120–204 refs (See N66-36427 22-04) CFSTI: HC $7.00/MF $1.75

The effects of both high and low G forces, which occur in the launch and reentry phases of space flight, on human physiological systems are discussed. The primary effects of acceleration on the systemic and pulmonary circulation, and on gas exchange in the blood are considered. Also discussed are adaptive cardiovascular responses; functional disturbances secondary to insufficient adaptation; the need for protection; and the means of protection. Data obtained from monitored human subjects in laboratory environmental stress situations are discussed. Residual effects of atelactasis; and symptomology studies of normal and deaf students in a counterrotating room are also discussed. L.S.

N66-36431*# New York Academy of Sciences, N. Y.
RADIATION IN SPACE
William F. Neuman (Rochester Univ.) *In its* Human Ecol. in Space Flight, Vol. I 1966 p 205–242 refs (See N66-36427 22-04) CFSTI: HC $7.00/MF $1.75

A broad discussion of the galactic and solar flux radiation encountered by space flights; the earth's geomagnetic belts; and the possibility of exposure from a nuclear propulsion unit that might be part of the space vehicle system, is presented. Data from balloon flights, and satellite probes concerning the intensity of these radiations are considered. Also discussed are the radiation damage effects to biological molecules; the linear transfer of radiation; and the synergistic effect of radiation with oxygen for increased toxicity. Tentative exposure limits, based on conventional X-rays and gamma rays, are considered. L.S.

N66-36432*# New York Academy of Sciences, N. Y.
MARINE BIOLOGY, VOLUME II
Carl H. Oppenheimer, ed. 1966 388 p refs Proc. of the 2d Intern. Interdisciplinary Conf., Princeton, N. J., 21–24 Oct. 1962; sponsored in part by ONR
(NASA Order R-144)
(NASA-CR-77921) CFSTI: HC $7.00/MF $2.00 CSCL 08A

CONTENTS:

N66-36433*# New York Academy of Sciences, N. Y.
COMPOSITION
E. Steeman Nielsen (Danish Pharm. Coll.) *In its* Marine Biol., Vol. II 1966 p 11–35 (See N66-36432 22-04) CFSTI: HC $7.00/MF $2.00

Various factors, such as temperature and pH differences, and geographical location, which influence the composition and distribution of natural phytoplankton species in separate lakes and oceans (separate ecological systems) are discussed. Problems in pinpointing the transport of species from one ecological system to the other are consideres; and chemical experimental attempts to follow the motions of the microorganisms in the particular water system are described. L.S.

N66-36434*# New York Academy of Sciences, N. Y.
LIGHT AS A CONTROLLING FACTOR
Per Halldal (Gothenborg Univ.) *In its* Marine Biol., Vol. II 1966 p 37–83 ref (See N66-36432 22 04) CFSTI: HC $7.00/MF $2.00

The role of sunlight intensity as it affects the photosynthesis of plankton organisms, and their distribution in the sea is discussed. The intensity, spectral composition, angle of penetration, and spectral portion of sunlight absorbed by the atmosphere and water systems change for a particular region as the sun traverses the sky in the course of a day. These factors control the mechanisms of pigment photosynthesis and of the motions of plankton in the waters involved. Experiments regarding the influence of light on different species of plankton organisms are discussed. L.S.

N66-36435*# New York Academy of Sciences, N. Y.
NUTRITIONAL FACTORS
M. R. Droop (Scottish Marine Biol. Assoc.) *In its* Marine Biol. vol. II 1966 p 85–112 (See N66-36432 22-04) CFSTI: HC $7.00/MF $2.00

The role of various nutritional factors in the growth mechanism, and ecological habits of algae and plankton microorganisms were investigated. Experiments in which organisms are isolated into bacteria-free culture, and then grown in media containing natural fluids, are described. In order to find out what nutrients the organism requires, substitutions of known shelf chemical are made in the media. When an organism can be cultivated indefinitely in a completely known media, the concentrations of chemical in the media make up the organisms absolute requirements. Experiments of this type are discussed. Tables listing the vitamin requirements of various algae species; and a table listing the specificity of B_{12} requiring algae toward vitamin B_{12} variants are given. Data showing vitamin influences on the growth rates of various algae are discussed. L.S.

N66-36436*# New York Academy of Sciences, N. Y.
TECHNICAL PROBLEMS IN SAMPLING

T. Braarud (Oslo Univ.) *In its* Marine Biol., Vol. II 1966 p 113-137 (See N66-36422 22-04) CFSTI: HC $7.00/MF $2.00

A pumping technique for obtaining representative samples of large bodies of seawater is described, and the system is schematically depicted. Echo sounding techniques for studying zooplankton populations and movements; and fluorescence and chemical dye staining techniques are discussed. A method to preserve the naked flagellates in a satisfactory way so that they can be estimated is needed. Also discussed are problems of receiving data, particularly tabulated data on IBM cards. L.S.

N66-36437*# New York Academy of Sciences, N. Y.
SEASONAL CYCLES AND SUCCESSION OF SOCIETIES
G. A. Riley (Yale Univ.) *In its* Marine Biol., Vol. II 1966 p 145-176 (See N66-36432 22-04) CFSTI: HC $7.00/MF $2.00

Factors that bear on the cyclic nature of the appearance and seeming disappearance of phytoplankton species are discussed. The differing periodic cycles for different species; the cell volume of a particular species (which influences the rate of sinking of the species); environmental factors such as the temperature and relative placidity of the water area; and the varying light intensity striking the water with the changing seasons, are all discussed. Also considered are the different growth rates for individual species; the methods of measurement used to collect sea water samples; and the relative importance of the data sampled. L.S.

N66-36438*# New York Academy of Sciences, N. Y.
INITIAL STOCK VERSUS INVASION, GRAZING, AND SINKING
T. Braarud (Oslo Univ.) *In its* Marine Biol., Vol. II 1966 p 177-197 (See N66-36432 22-04) CFSTI: HC $7.00/MF $2.00

The role of oceanic current systems which carry water from one area to another is considered as a major mechanism for phytoplankton invasions. Species may be picked up from coastal regions into a current and carried to great distances away. Some species from land areas may be carried along by icebergs as they break off from these land areas and melt in distant waters. Experimental methods to study these mechanisms of invasion are proposed. Also discussed are the transport of population from deep water layers up to euphotic layers by vertical mixing; and the enhancement of growth by mixing of waters rich in nutrients and scarce in individuals with waters bringing in the inoculum. The role of the initial population in an area where species growh is about to begin is also considered. L.S.

N66-36439*# New York Academy of Sciences, N. Y.
EXPERIMENTS WITHIN NATURAL AND ARTIFICIAL SOCIETIES
J. H. D. Strickland (Fisheries Res. Board of Canada) *In its* Marine Biol., Vol. II 1966 p 199-225 (See N66-36432 22-04) CFSTI: HC $7.00/MF $2.00

Sea water samples containing plankton were trapped in large translucent plastic bags, and mineralization enrichment experiments were then conducted with those closed ecological systems. The experiments gave clear differential results for different species, giving insight into the effect of nutrients on the competition of species in quasi-natural populations. The data are given in graphic form, and are discussed. The expected set of ammonia, nitrite and nitrate curves were not obtained. The amount of carbon evolved as CO_2 was much greater than the particulate matter produced. Since detritus still appeared to be present, it was concluded that the dissolved organic matter believed to be excreted by the algae was responsible for the apparent excess of CO_2. Thus, it is indicated that the oxygen minima in the oceans should not be attributed to a slow combustion of small detritus particles. Also discussed are sampling techniques in which long columns are used. L.S.

N66-36440*# New York Academy of Sciences, N. Y.
NUTRITIONAL PROBLEMS
M. R. Droop (Scottish Marine Biol. Assoc.) *In its* Marine Biol., Vol. II 1966 p 251-274 (See N66-36432 22-04) CFSTI: HC $7.00/MF $2.00

Various considerations that must be taken into account during metabotic investigations with plankton cultures are discussed. Factors considered include: (1) the effects of putting too much of an inorganic nutrient or iron into a culture, (2) increased requirements of nutrients for batch systems, (3) the diluteness of the suspension studied, (4) pH of the solution, (5) solubilities of the cells studied and of precipitated minerals and by-products, (6) growth rate of the culture, (7) buffering of the solution, (8) rate of mineral uptake by the particular species, (9) cell weights, (10) transfer of species from a rich medium to another medium lacking a particular nutrient, (11) and percent changes in composition of off-gases evolved. L.S.

N66-36441*# New York Academy of Sciences, N. Y.
MORPHOLOGICAL AND PHYSIOLOGICAL RESPONSE OF ORGANISMS DURING LIFE CYCLES
G. E. Fogg (Westfield Coll.) *In its* Marine Biol., vol. II 1966 p 275-298 (See N66-36432 22-04) CFSTI: HC $7.00/MF $2.00

The effects of media environmental factors (such as temperature, pH, turbulence, etc.); light intensity; and nutrient and mineral diets on the structure and size of plankton microorganism culture populations, and on the metabolic paths of their enzyme systems (resulting from cell expansion), are discussed. It is noted that the fat accumulation that occurs when algal is deprived of nitrogen, may result from the fact that the enzymes affected are themselves protein which utilize nitrogen in their molecular make up. Other factors discussed include morphological changes related to the sexual life cycle; cell wall thickness changes; formation of auxospores; species stability; and influences on the enzymatic activity when iron or amino acids are introduced into the culture. L.S.

N66-36442*# New York Academy of Sciences, N. Y.
ECOLOGICAL IMPLICATIONS OF IN VIVO DATA
G. E. Hutchinson (Yale Univ.) *In its* Marine Biol., Vol. II 1966 p 299-320 (See N66-36432 22-04) CFSTI: HC $7.00/MF $2.00

The spatial limitations of bottle experiments for correctly simulating the gradients of pressure, temperature, turbulence, surface area, etc. encountered in natural large bodies of water are discussed with respect to phytoplankton enzymatic activity. Field work studies of lake water compositions, and the response of cultures from lake water placed in bottles to various nutrient additions are described. The amounts of light and heavy metals, and the salt concentration in natural water environments and in bottled samples influence enzymatic activity to a great extent. Enrichment studies are discussed. The general tendency of algae to come back to a fairly constant division rate after being moved to a different condition is illustrated by three dimensional models of Monochrysis lutheri which show the cell division rate (vertical) of the microorganism as a function of temperature and light at 10, 32, and 56 hrs growth. L.S.

N66-36443*# New York Academy of Sciences, N. Y.
CONTINUOUS CULTURE VERSUS NATURAL POPULATIONS
L. Provasoli (Haskins Labs.) *In its* Marine Biol., Vol. II 1966 p 321-335 (See N66-36432 22-04) CFSTI: HC $7.00/MF $2.00

A continuous culture laboratory apparatus, designed to bridge the gap of relating batch culture data to what is going on in the ocean, is described. A photograph, and schematic labelled diagrams of the equipment are depicted. The continuous culture technique offers a number of advantages over batch culture methods because (1) concentration-dependent factors are controlled, (2) growth rates can be measured within short periods of time, (3) the measurement operation does not interrupt the culture regime, and (4) studies can be carried out at low cell concentrations. The last factor is particularly important in studying the ecology of phytoplankton organisms. Test runs on some cultures are described. L.S.

N66-36444*# New York Academy of Sciences, N. Y.
MARINE BIOLOGY. VOLUME III: ECOLOGY OF INVERTEBRATES
W. T. Edmondson, ed. 1966 333 p refs Proc. of the 3d Intern. Interdisciplinary Conf., Princeton, N. J., 19-22 Jan. 1964; sponsored by the Am. Inst. of Biol. Sci., ONR, and AEC
(NASA Order R-144)
(NASA-CR-77920) CFSTI: HC $7.00/MF $1.75 CSCL 06C

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N66-36445*# New York Academy of Sciences, N. Y.
SAMPLING ORGANISMS AND RELATED PROBLEMS
John D. H. Strickland (Calif. Univ., La Jolla) et al *In its* Marine Biol. Vol. III: Ecol. of Invertebrates 1966 p 11-68 refs (See N66-36444 22-04) CFSTI: HC $7.00/MF $1.75

Methodological techniques for determination of biomass and energy contents by calorimetry and metabolic rates are discussed. A procedure for partitioning particles into several different size categories by differential filtration is illustrated by a flow diagram. Three criteria for use in observing non-random distributions during sampling are considered, and the limitations of available collecting gear and techniques for investigating epibenthic ecology are described. Several viewpoints on the determination of the energetic content of organisms by direct calorimetry are also given. L.E.W.

N66-36446*# New York Academy of Sciences, N. Y.
FEEDING
C. Barker-Jorgensen (Copenhagen Univ.) et al *In its* Marine Biol. Vol. III: Ecol. of Invertebrates 1966 p 69-133 refs (See N66-36444 22-04) CFSTI: HC $7.00/MF $1.75

Suspension feeding, i.e., the uptake of food particles that are mostly too small to be sensed and seized individually, is discussed in relation to three main topics: the extent to which continuous feeding is characteristic of suspension feeding; the extent to which it is true that the surrounding water is transported to or through the feeding organs at rates that are independent of the quality of the particular matter in suspension in the water, and also of the quantity of the concentration and to what extent the selection of food is occurring in the various suspension feeding groups and which types of selection are realized. The feeding mechanisms in the appendicularian, Oikopleura, are considered in detail and illustrated by a series of figures and electronmicrographs. Observations on nutritional biology and its ecological consequences in the Sacoglossa are related, and its feeding apparatus is described. L.E.W.

N66-36447*# New York Academy of Sciences, N. Y.
THE QUALITY OF FOOD
Dixy Lee Ray (Wash. Univ., Seattle) *In its* Marine Biol. Vol. III: Ecol. of Invertebrates 1966 p 134-169 refs (See N66-36444 22-04) CFSTI: HC $7.00/MF $1.75

Methods of determining the nutritional value of food are discussed, including measuring the loss of a food organism in terms of what disappears from what is offered, measuring the increase in size or weight or in numbers of individuals in a population, measuring the reaction products, measuring the amount of waste material that is produced, or forming a balance between what is taken in and what is given out. An experiment is described in which two-membered aseptic cultures of prey and predator were established to define the nutritional value of single species of algae. In relation to the selection of foods experiments are reported in which small populations of copepods (Calanus hyperboreus) were set up and fed a given algae. After a month, the weight of the population and the weight of the food that the population had eaten were compared. Assimilation efficiency, gross growth efficiency, and net growth efficiency data of the Calanus hyperboreus are presented in tabular form. L.E.W.

N66-36448*# New York Academy of Sciences, N. Y.
SEASONAL ASPECTS OF FOOD RELATIONSHIPS AND BREEDING
Dixy Lee Ray (Wash. Univ., Seattle) et al *In its* Marine Biol. Vol. III: Ecol. of Invertebrates 1966 p 170-204 refs (See N66-36444 22-04) CFSTI: HC $7.00/MF $1.75

The growth of organisms as a function of temperature rather than of food is discussed, and it is pointed out that if food is not sufficiently abundant these animals (Sagitta elegans and Pseudocalanus minutus) do not grow to a smaller ultimate size but simply stop growing. Graphs illustrate the adult size of these animals in four different localities plotted against estimates of mean temperature during their development. It was demonstrated that the amount of food did not distort the pattern. An experiment is also reported on the examination of the digestion of brown algae by the purple sea urchin. The approach, consisting of weighing a fraction of the algae being eaten to get the wet-dry weight ratio and then weighing the feces as they were produced, is described in detail. Four different species of brown algae were fed to the sea urchins, but the digestibility coefficient was about 80% on one type, Macrocystis. L.E.W.

N66-36449*# New York Academy of Sciences, N. Y.
EFFECTS OF QUANTITY, QUALITY, CHANGE OF DIET AND NUTRITIONAL VALUE OF FOOD
L. Provasoli (Haskins Labs.) et al *In its* Marine Biol. Vol. III: Ecol. of Invertebrates 1966 p 205-242 refs (See N66-36444 22-04) CFSTI: HC $7.00/MF $1.75

Some fundamental questions concerning marine animals are discussed, e.g., why some animals have one-year cycles, why they copulate and spawn only in certain seasons, whether external conditions like temperature, photoperiod, and water composition act directly on the animals or indirectly through the phytoplankton food, whose changes in species composition and quantity are governed by these ecological factors. Variation in environmental factors are considered in relation to Brachyura; results of the experiment indicated that the numbers of the intermediate states of development can differ depending on food. Effects of the diet on reproduction and life span were also covered in relation to rotifers in lakes. An examination of the data collected indicated that the reproductive rate tended to vary in concert with variations in abundance of edible algae and temperature. A linear relation was drawn between the amount of food expressed as the mean number of Pseudocalanus remaining at the end of winter and the numbers of predators remaining. The number of prey did not appear to depend on the number of predators, but was felt to be a function of other things in the lake. L.E.W.

N66-36450*# New York Academy of Sciences, N. Y.
ALGAL MUTUALISM
C. M. Yonge (Glasgow Univ.) et al *In its* Marine Biol. Vol. III: Ecol. of Invertebrates 1966 p 243-251 refs (See N66-36444 22-04) CFSTI: HC $7.00/MF $1.75

The question of imprisoned phytoplankton, or of symbiosis between unicellular algae and marine invertebrates, is discussed. Two general ways in which this association may originate are delineated: in herbivorous animals, whose normal food is algae, it is the algae which must become specialized to resist digestion by the animals; in carnivorous animals it is the animal which has to develop the capacity to take in algae and tolerate their presence in the tissues. The theory that the nutritive value of the algae to the animal is the reason for association is discarded, and it is stated that the purpose of the algae is to provide an automatic excretory system and aid in calcium deposition. L.E.W.

N66-36451*# New York Academy of Sciences, N. Y.
PLANKTON
C. M. Yonge (Glasgow Univ.) et al *In its* Marine Biol. Vol. III: Ecol. of Invertebrates 1966 p 252-267 refs (See N66-36444 22-04) CFSTI: HC $7.00/MF $1.75

Various viewpoints on grazing and exclusion of animals by overconcentration of phytoplankton are presented. Several experiments in this field are briefly discussed, including one on zooplankton exclusion by phytoplankton, in which it was felt that the evidence did not support the theory of exclusion. The molting frequency of the planktonic form Euphausia was investigated, and results indicated that the molts average out to be about 10% of the dry weight of the animal. L.E.W.

N66-36452*# New York Academy of Sciences, N. Y.
VERTICAL MIGRATION
Ian A. Mc Laren (Mc Gill Univ.) et al *In its* Marine Biol. Vol. III: Ecol. of Invertebrates 1966 p 268-286 refs (See N66-36444 22-04) CFSTI: HC $7.00/MF $1.75
(Grant PHS-NB-02841)

In relation to vertical migration, observations of Euphausia pacifica are reported. These were found in a closed situation 150 or 200 m above the area which it normally inhabits in pelagic conditions. The spectral sensitivity of E. pacifica was tested to ascertain whether there had been any adaptation in these animals and how they had adapted. A spectral sensitivity curve was determined, and it was concluded that these inshore animals are more sensitive to the light in which they are living, this greener light of greater intensity, than they are to the light in which the parent community lives. Arguments are presented, and future work is briefly outlined. L.E.W.

N66-36453*# New York Academy of Sciences, N. Y.
BENTHOS
W. T. Edmondson (Wash. Univ., Seattle) et al *In its* Marine Biol. Vol. III: Ecol. of Invertebrates 1966 p 287-294 refs (See N66-36444 22-04) CFSTI: HC $7.00/MF $1.75

Factors affecting the benthic community are briefly discussed, using a comparative ecological approach. Reference was made to concepts of species diversity. It was urged that particular attention be given to the characteristics of populations as opposed to mass extension of individual physiology, which would mean analysis of the ways in which individuals react to others, either directly or through modification of the environment. Areas in which considerable progress has been made in marine ecology are pointed out. L.E.W.

N66-36466*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
BIOLOGY AND THE EXPLORATION OF MARS
Colin S. Pittendrigh, Wolf Vishniac, and J. P. T. Pearman, ed. 1966 528 p refs Rept. of Study held at Stanford Univ. and New York, 1964-Oct. 1965 *Its* Publ.-1286
(Contract NASr-239)
(NASA-CR-77938) CFSTI: HC $8.27/MF $2.75 CSCL 06C

Reports of a systematic study of the Martian surface and atmosphere, with emphasis on such problems as the recognition of living organisms, planetary observation from a distance, remote-controlled landings, manned landings, and the avoidance of contamination of other planets by earth organisms are presented. For individual titles see N66-36467-N66-36497.

N66-36467*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
WHAT IS LIFE ?
Daniel Mazia (Calif. Univ., Berkeley) *In its* Biol. and the Exploration of Mars 1966 p 25-40 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

A discussion of the salient properties and characteristics of living organisms is presented which focuses on the nature and origin of life. Considered is the task of identifying those properties (forms, substances, and processes) that are comprehended in the idea of life. Included is an analysis of the molecular approach and the evolutionary approach to the study of life. It is surmised that the most feasible approach to the study of life is through the use of the principles of molecular biology since life is a molecular operation. S.C.W.

N66-36468*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
THE ORIGIN OF LIFE
Stanley L. Miller (Calif. Univ., San Diego), and N. H. Horowitz (Calif. Inst. of Tech.) *In its* Biol. and the Exploration of Mars 1966 p 41-69 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

On the basis of contemporary views on the chemical and physical processes leading to the appearance of life on Earth, the probability of finding evidence of biological activity on

Mars, is assessed. Laboratory syntheses of biologically significant compounds are also reviewed in the light of their geochemical pertinence. Based on the premise that life originated on Earth at some time in the distant past the following are considered: the nature of living matter and the properties which serve to differentiate it and inanimate matter; the chemical basis for the special properties of living matter; the chemistry of the primitive Earth and the conditions that are believed to have been present during prebiotic times; and experiments dealing with the production of biologically interesting compounds under primitive Earth conditions. S.C.W.

N66-36469*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
THE SOLAR SYSTEM AS AN ABODE OF LIFE
Carl Sagan (Harvard Univ.) *In its* Biol. and the Exploration of Mars 1966 p 73–113 refs (See N66-36466 20-04) CFSTI: HC $8.27/MF $2.75

Presented is an assessment of the a priori likelihood of indigenous life on the physical environments of the moons and planets of the solar system. Considered are: Mars, Venus, satellites and asteroids, and the Jovian planets. Included is a discussion of the range of planetary parameters which are consistent with the existence of living systems, such as: temperature requirements, primary solvent systems (water), the presence of atmosphere, and carbon replacement. It is concluded that of all the possible extraterrestrial habitats within our solar system and beyond, Mars is clearly the most promising. The initiation of a comprehensive program of observation from the vicinity of the Earth, from the vicinity of Mars, and eventually from unmanned and manned vehicles on the surface of Mars; is proposed. S.C.W.

N66-36470*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
BIOLOGICAL MATERIALS IN CARBONACEOUS CHONDRITES
Harold C. Urey and James R. Arnold (Calif. Univ., San Diego) *In its* Biol. and the Exploration of Mars 1966 p 115–124 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

The reported presence of organic compounds in Class I and Class II carbonaceous chondrites is discussed in terms of possible origins. Also reviewed are concepts regarding the fundamental problem of what life is and under what conditions it might have evolved. In view of the premise that the requirements for the evolution of life include the existence of liquid water and a continuous supply of energy from the Sun; Venus, the Earth, and Mars are excluded as sources of meteorites showing evidences of life. It is concluded that the carbonaceous chondrites probably originated from smaller bodies, as for example, the asteroids or the Moon. Speculation is made concerning the validity of Urey's hypothesis that life evolved on one object and contaminated for a brief period of time a more primitive object, and Urey's suggestion that the Earth was the object on which life evolved, and that the Moon may have been the primitive object contaminated by material of this nature. More extensive studies of the Moon are proposed as a possible answer to the question of the origin of carbonaceous chondrites. S.C.W.

N66-36471*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
SIGNS OF LIFE: A CRITERION SYSTEM OF EXOBIOLOGY
Joshua Lederberg (Stanford Univ.) *In its* Biol. and the Exploration of Mars 1966 p 127–140 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Inherent systematic problems associated with theoretical and operational methods in exobiology which are used in the experimental detection of biological activity, are reviewed. Emphasized is the lag in instrumentation development for studies on Mars and the wide range of theoretical possibilities which have not yet been narrowed by the experimental process. The development of Earth-based telescopes, the development of a Mars-orbiting observatory, and the design of a general purpose laboratory for planetary investigation in which many investigators can participate, and which has the flexibility of being readily reprogrammed in the light of new data, are proposed approaches to the systematic appraisal of spaceflight experiments. S.C.W.

N66-36472*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
OPTICAL ASYMMETRY
Lubert Stryer (Stanford Univ.) *In its* Biol. and the Exploration of Mars 1966 p 141–146 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Optical symmetry, which is characteristics of terrestrial life, is discussed in terms of its diagnostic significance to studies of life on Mars. Three hypotheses generated to explore the question of whether there can be net optical activity without life, are analyzed. It is surmised that net optical activity in the absence of life is highly improbable and that a positive finding of net optical activity would be highly suggestive of the existence of life. It is further surmised that although net optical activity might conceivably go undetected due either to inadequacies of sampling and fractionation procedures, or to limitations of instrumental sensitivity, these potential difficulties are imperfections reflecting the present state of experimental methods and are not intrinsic to the use of optical activity as a criterion of the existence of life. It is concluded that the absence of net optical activity precludes the possibility of life possessing a degree of complexity resembling ours and although the existence of primitive forms of life without optical activity is a matter of conjecture, the possibility cannot be excluded on the basis of optical rotary measurements. The further development of the rotary measurement method using chemical means is discussed. S.C.W.

N66-36473*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
THE BIOCHEMISTRY OF TERRESTRIAL SOILS
A. D. Mc Laren (Calif. Univ., Berkeley) *In its* Biol. and the Exploration of Mars 1966 p 147–163 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Special properties of terrestrial soils reviewed in relation to the problem of detecting biological activity. Primary emphasis is placed on biochemical reactions in soil and the nature of soil organic matter. Included is an analysis of ecological conditions in soil, metabolic processes, soil structure and development, enzyme action in soil, and methods for testing or distinguishing living organism and products of metabolism. S.C.W.

N66-36474*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
PROPERTIES OF DESERT SOLIDS
R. E. Cameron (JPL) *In its* Biol. and the Exploration of Mars 1966 p 164–186 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Special properties of desert soils are reviewed in relation to the problem of detecting biological activity. Considered are: moisture content, soil temperatures, gas exchange and variations in concentrations of gases in the soil atmosphere, salt and organic matter content, cation exchange capacity; buffer, pH, and Eh capacities; porosity, texture, structure, and bulk

density; mineralogy and soil color, and the kinds of microorganisms that are characteristic of dessert soil ecosystems. The information presented is based primarily on investigations of soils occurring in the Great Basin, Mohave, and Colorado Deserts. Additional information is derived from soil investigations of volcanic deserts in the Kau Desert of Hawaii, the Valley of 10,000 Smokes Desert in Alaska, high altitude areas in the relatively arid White Mountains of California; and unpublished data that contains details of methods and results of desert soil investigations. Speculation is made concerning the assumption that measurements of desert soils will yield information of economic value, or that measurements obtained for typical terrestrial soils should be relied upon for purposes of testing and evaluating extraterrestrial life detection systems. S.C.W.

N66-36475*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
REMOTE DETECTION OF TERRESTRIAL LIFE
Carl Sagan (Harvard Univ.) *In its* Biol. and the Exploration of Mars 1966 p 187–209 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

The feasibility of detecting intelligent life (roads, bridges, and canals) and simpler forms of life on earth from earth satellite altitudes, using optical frequency reconnaissance, near infrared reflectivity, and infrared thermal mapping techniques is discussed. Both a priori considerations, based on terrestrial ground truth, and photographs taken by meteorological satellites and high altitude aircraft showed that it is very difficult to detect life on earth by photographic reconnaissance unless the ground resolution is about 0.1 km. High reflectivities in the near-infrared are indicative of the presence of the vegetation, although not uniquely so, since many inorganic materials show similar behavior. Comparison of photographs of a body of water with vegetation along its banks, obtained in the visible, with similar photographs obtained in the infrared should show a significant reversal in relative contrasts. Thermal mapping and other infrared techniques may be useful in specifying biologically promising locales which are warmer or wetter than their surroundings. Other than high resolution (~ 10 m) imaging of the surface, the most reliable technique for the detection of intelligent life on earth from satellite altitudes appears to be observations of monochromatic emission in the radio frequency range. S.C.W.

N66-36476*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
THE DEVELOPMENT OF RIGOROUS TESTS FOR EXTRATERRESTRIAL LIFE
Sidney W. Fox (Miami Univ.) *In its* Biol. and the Exploration of Mars 1966 p 213–228 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Potentially useful criteria of life, the physical conditions on the earth and on Mars, and examples of the potential development of the various criteria for the detection of life on Mars are discussed. Biochemical staples, macromolecules, antigenicity, optical activity, morphological variety, organized metabolic pathways, mutability, and death are among the criteria considered. Brief mention of the appearance of such phenomena in synthetic systems produced under geologically plausible conditions is also made to provide an understanding of the need for rigorous tests. S.C.W.

N66-36477*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
A MODEL OF MARTIAN ECOLOGY
Wolf Vishniac (Rochester Univ.) *In its* Biol. and the Exploration of Mars 1966 p 229–242 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Presented is a theoretical outline of a hypothetical anaerobic ecological system that is capable of operating under presumed Martian conditions. Suggested are those possibilities for which life detection experiments should be prepared, among which are cited: (1) Instrument landings should take place in a dark area and sampling should take place during and after the wave of darkening has passed. (2) If more than one landing is feasible then light and dark areas should be compared. (3) Attempts to cultivate microorganisms should make use of sampling devices that are capable of gathering particles as large as 100μ in diameter. (4) Culture media should accommodate the major ecological niches, with allowance for halophilic organisms. S.C.W.

N66-36478*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
EXOTIC BIOCHEMISTRY IN EXOBIOLOGY
George C. Pimentel (Calif. Univ., Berkeley) *In its* Biol. and the Exploration of Mars 1966 p 243–251 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Speculative possibilities for the existence of biochemical systems radically different from the terrestrial are discussed in relation to adaptation to the environment and implications for experimental procedures for detection of life. It is concluded that no matter how exciting the prospects of discovering an exotic biochemistry, the search for life on Mars will begin with an emphasis on the search for evidence of terrestrial biochemistry. The following two principles are suggested as rigid guidlines in the quest for life on Mars: (1) The conclusion that life does not exist in a given environment cannot be established by experiments directed solely toward the biochemistry we know on earth. (2) Every set of exobiological experiments should yield some definite results that will serve to improve the next set of experiments, even if all direct tests for evidence of life are negative. S.C.W.

N66-36479*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
HIGHER ORGANISMS ON MARS
Carl Sagan (Harvard Univ.) *In its* Biol. and the Exploration of Mars 1966 p 252–255 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Presented is a brief discussion of the improbability of the existence of higher organisms on Mars. On the basis of extrapolations from terrestrial technology, it is argued that: (1) Statistically, the likelihood of an indigenous civilization on Mars seems very small; and if the putative Martians are behind us, it is most likely that they are far behind us, and have not yet achieved a technical civilization. (2) If the Martians are even slightly more advanced than we, their presence should be discernible; however, neither telescopic nor radio observations have revealed obvious signs of intelligent signals or a reworking of the Martian environment by intelligent beings. (3) An advanced Martian civilization might be expected, by this time, to have arrived on earth; however, there is no evidence for such visits. Also discussed are arguments supporting the concept of the existence of intelligent life on Mars that are based on observations of the motions of the Martian satellites, Phobos and Deimos. S.C.W.

N66-36480*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
SOME TERRESTRIAL PROGRAMS
Stanley L. Miller (Calif. Univ., San Diego), George C. Pimentel (Calif. Univ., Berkeley), and Carl Sagan (Harvard Univ.) *In its* Biol. and the Exploration of Mars 1966 p 259–263 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Presented is a discussion of practical means for confirming and enlarging our knowledge of Mars by laboratory work and astronomical observation. Included are suggestions for Earth-based research in prebiological chemistry, laboratory programs in support of a search for exotic biochemistries; and the use of terrestrial, balloon, rocket-borne, and orbiting observatories in astronomical studies. S.C.W.

N66-36481*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
POTENTIAL YIELDS OF BIOLOGICAL RELEVANCE FROM REMOTE INVESTIGATIONS OF MARS
Carl Sagan (Harvard Univ.) *In its* Biol. and the Exploration of Mars 1966 p 264-282 ref (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Scientific investigations of biological relevance that might be performed with projected Martian orbiters in the period 1969 to 1971, are discussed. Although the direct detection of life on Mars from an orbiter vehicle is considered unlikely, for experiments of biological significance, the principle advantages of a Mars orbiter are the prospects of (1) obtaining high topographical resolution; (2) observing at phase angles greater than 43°; and (3) detecting seasonal changes on Mars. Possible instrumental techniques for 1969 to 1971 Mars orbiters are also discussed. Analyzed are: ultraviolet spectroscopy and photometry, television, optical polarimetry, infrared radiometry and spectroscopy, and active and passive microwave radiometry and polarimetry. Four experimental packages for Mars orbiters are suggested and it is recommended that immediate instrument development and early near-Earth test flights with these devices be performed. Also recommended is the development of large, ground-based, phased-array deep space communication facilities, the performance of high-angular resolution ultraviolet spectroscopy of Mars from the vicinity of Earth, observations of Mars with gas cell calibration, and a search in the near infrared for molecular oxygen on Mars. S.C.W.

N66-36484*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
BIOLOGICAL OBJECTIVES AND STRATEGY FOR THE DESIGN OF A SPACE VEHICLE TO BE LANDED ON MARS
Donald A. Glaser (Calif. Univ., Berkeley) *In its* Biol. and the Exploration of Mars 1966 p 325-330 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

An analysis of biological objectives for studies of extraterrestrial life on Mars, and instruments and measurements suggested for the use of known biochemical and biological techniques for detecting life on Mars; is presented. Suggested is the use of a compact general purpose computer aboard the spacecraft to correlate, organize, and program the sequence of experimental operations and the transmission of data to Earth. Also suggested is the establishment of large Earth-based computer facilities to increase the effective data rate from Mars to Earth. The design of the strategy of operation of the Mars spacecraft along the same general logical lines as those used for a well designed experiment in a terrestrial laboratory, is proposed; and a procedure focusing on the study of the physical, chemical, biochemical, and biological conditions on Mars, is discussed. S.C.W.

N66-36485*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
THE AUTOMATED BIOLOGICAL LABORATORY
Donald A. Glaser (Calif. Univ., Berkeley), John Mc Carthy (Stanford Univ.), and Marvin Minsky (MIT) *In its* Biol. and and Exploration of Mars 1966 p 331-344 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Means by which various devices can be coordinated into an automatic biological laboratory for determining whether there is life on Mars and estimating the state of its chemical evolution, are suggested. Considered are: the state-of-the-art in computer control; a simple automated laboratory and control of the laboratory from the Earth; television systems, transmission of pictures, and the problems and uses of computer picture pattern recognition; sample collection and the computer controlled hand; and the advantages and the problem of making the biological automated laboratory mobile. Research and development projects that may be undertaken in support of the automated biological laboratory are also identified. S.C.W.

N66-36486*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
ANALYTICAL METHODS FOR LANDERS
Donald G. Rae, ed (Calif. Univ., Berkeley) *In its* Biol. and the Exploration of Mars 1966 p 347-426 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Analytical techniques of potential application for biological studies of extraterrestrial life on Mars, are discussed. Analyzed are the following: separation methods and sample preparation; atomic spectroscopy; neutron activation analysis; electron and X-ray fluorescence; X-ray diffraction; sensitivity of fibers to the physical and chemical environment; gas chromatography; mass spectrometry; infrared, ultraviolet, and visible spectroscopy; fluorimetry; optical shifts in dye complexes; nuclear magnetic and electron paramagnetic resonance; colorimetry; optical microscopy; electron microscopy and electron-optical techniques; and morphological criteria for recognizing life. S.C.W.

N66-36487*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Lab.
THE USE OF MARTIAN MATERIALS IN THE SEARCH FOR MARTIAN LIFE
Alexander Rich (MIT) *In its* Biol. and the Exploration of Mars 1966 p 427-430 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Experiments for the detection of life and for the chemical processing of Martian material to collect nutrients, are analyzed. It is surmised that it may be possible to detect life on Mars using chemical nutrients extracted on the planet since this type of experiment minimizes assumptions regarding the nature of Martian life, and obtains direct information regarding the chemical composition of the planet. S.C.W.

N66-36488*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
THE IMPACT OF MANNED SPACEFLIGHT ON THE EXOBIOLOGY PROGRAM
N. H. Horowitz (Calif. Inst. of Tech.) *In its* Biol. and the Exploration of Mars 1966 p 433-435 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

The impact of manned spaceflight on the exobiology program, and problems of quarantine that might arise, are discussed. It is surmised that the possibility of manned missions to Mars has great significance for the exobiology program since it implies that Martian samples may become available for terrestrial study in the foreseeable future. The disadvantages of returning Martian samples to Earth such as the risk of contaminating Mars with terrestrial microorganisms and the risk of contaminating Earth with returned Martian organisms, are also cited. It is concluded that the exobiology program should retain enough flexibility so that it can take full advantage of new advances in the art of space flight, and

that among these developments, none will be more significant than the development of the means for prolonged manned missions. S.C.W.

N66-36490*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
"BACK CONTAMINATION" AND QUARANTINE PROBLEMS AND PERSPECTIVES
Allan H. Brown (Penn. Univ.) *In its* Biol. and the Exploration of Mars 1966 p 443–445 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Summarized are conclusions reported at a conference on the Potential Hazards of Back Contamination from the Planets (Space Science Board, 19 February 1965), which focused on the possibility and consequences of transferring to the Earth organisms that are indigenous to another planet or to the Earth's Moon. Various lines of reasoning which argue either for or against the seriousness of back contamination are as follows: (1) The danger of direct infection of man with resulting disease manifestations is unlikely but possible; (2) The harmful infection of terrestrial plants or animals other than man is far more likely; and (3) The introduction of nonpathogenic organisms seems more probable than that of agents that could cause disease. Protective measures recommended at the Conference include the retention of returned samples behind absolute bacterioiogical barriers for examination under conditions of rigid biological and chemical isolation; the development of techniques for minimizing contamination of astronauts and equipment while on the lunar or planetary surface; and the confinement of the spacecraft, astronauts, and all persons coming in contact with them for a period of strict quarantine (three weeks in the case of a Martian mission). S.C.W.

N66-36491*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
STERILIZATION AND CONTAMINATION: THE NATURE OF THE PROBLEM
K. C. Atwood (Ill. Univ.) *In its* Biol. and the Exploration of Mars 1966 p 449–462 ref (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Presented is an assessment of the consequences of Mars contamination and a discussion of procedures that might be followed if contamination were known to have occurred. Included are data on prospects for significant contamination of Mars; the spread of contaminants; the extent to which the spread of contaminants would obfuscate scientific investigation; standards for spacecraft sterilization; sterilization methods; adjunctive strategems; and criteria for discontinuance of sterilization. S.C.W.

N66-36492*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
THE OBJECTIVES AND TECHNOLOGY OF SPACECRAFT STERILIZATION
Lawrence B. Hall (NASA, Washington) *In its* Biol. and the Exploration of Mars 1966 p 463–466 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Objectives and technology of spacecraft sterilization are reviewed. Summarized are efforts to develop flight hardware that will withstand the sterilizing agent employed without significant loss of reliability; reduce the biological loading of the lander to a low level during manufacture and assembly; achieve surface and internal sterilization of the completely assembled lander; and protect the spacecraft from recontamination during testing and launch. S.C.W.

N66-36493*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
SPACECRAFT STERILIZATION
N. H. Horowitz (Calif. Inst. of Tech.) *In its* Biol. and the Exploration of Mars 1966 p 467–469 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

A preliminary attempt to assess the magnitude of risk that would be involved if interplanetary spacecraft were subjected only to ethylene oxide sterilization, is reported. Analyzed is the degree of internal contamination from bacteria on exposed surfaces and from bacteria which are sequestered within electronic or other components. Data suggest that electronic components are very clean from a bacteriological viewpoint. It was further indicated that organisms which are the most dangerous from a cosmoecological point of view are those which, being located on exposed surfaces, are most easily killed by gaseous sterilants such as ethylene oxide. These considerations suggest the possibility that reasonable sterility levels might be attained without terminal heat-sterilization of spacecraft. Cited are areas requiring further research which would allow a more thorough assessment of this possibility. S.C.W.

N66-36494*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
DECONTAMINATION STANDARDS FOR MARTIAN EXPLORATION PROGRAMS
Carl Sagan and Sidney Coleman (Harvard Univ.) *In its* Biol. and the Exploration of Mars 1966 p 470–481 refs (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

To provide a means of computing the level of spacecraft sterility as a function of some estimate of what constitutes an acceptable risk of planetary contamination, a method is proposed for quantitatively determining the probability of successfully performed biological experiments on Mars before the occurrence of biological contamination. S.C.W.

N66-36495*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
THE SPECIAL PROBLEMS OF ENCAPSULATED CONTAMINANTS
Allan H. Brown (Penn. Univ.) *In its* Biol. and the Exploration of Mars 1966 p 482–484 (See N66-36466 22-04) CFSTI: HC $8.27/MF $2.75

Inherent operational problems affecting spacecraft sterilization requirements, which are posed by viable contaminants lodged within spacecraft solid materials, are discussed. Analyzed are efforts to develop sterilization procedures which would be compatible with spacecraft design requirements and which would not impose restrictions on the design of scientific experiments to be included in the mission. Sterilization of the entire spacecraft by dry heat soak and efforts to construct a fragmentation proof spacecraft which would ensure confinement of contaminants and reduce the total hazard associated with their presence, are discussed. It is surmised that the principal difficulty involved in measuring the resistance of encapsulated organisms to contemporary sterilization methods lies with the nondevelopment of a satisfactory quantitative assay method for encapsulated components. To overcome this problem, the initiation of the policy of starting with components having the lowest achievable levels of contamination; and of maintaining rigorous standards of cleanliness throughout the spacecraft assembly, is proposed. S.C.W.

N66-36496*# National Academy of Sciences—National Research Council, Washington, D. C. Space Science Board.
INSTRUMENTATION FOR THE DETECTION OF EXTRATERRESTRIAL LIFE

Carl W. Bruch (NASA, Washington) *In its* Biol. and the Exploration of Mars 1966 p 487–502 (See N66-36466 22-04) CFSTI: HC $8.27–MF $2.75

The characteristics and state of development of instrumentation and experimental methods for the detection of extraterrestrial life are reviewed in terms of the kinds of evidence (morphological, chemical, and physiological) they are intended to provide. S.C.W.

N66-36517# Boeing Co., Seattle, Wash.
OPTIMIZATION OF CREW COMFORT SYSTEM
John R. Malcolm and Roland K. Moir *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 156–172 refs (See N66-36506 22-30)

An engineering evaluation of the environmental parameters that affect man's comfort during shirtsleeve operation under conditions of weightlessness is presented. To obtain a minimum weight system, the penalty for providing convective, radiative, and evaporative cooling was established. Mathematical expressions were developed to relate how the total metabolic heat generated by a crew member is divided among radiation, convection, and evaporation. These expressions included the vehicle design parameters—air temperature, relative humidity, air velocity, and mean radiant temperature (MRT)—and the crew-oriented parameters of clothing thermal resistance and effective wetted surface area. A basic premise was that the system be designed so that the crew member's effective wetted skin is 10 percent of the total area, and the crew member is comfortable under these conditions. Author

N66-36518# Goodrich (B. F.) Co., Akron, Ohio. Aerospace and Defense Products Div.
TRANSIENT THERMAL STUDY OF A SPACE SUIT CLAD ASTRONAUT ON THE MOON
Robert J. Martin *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 173–184 (See N66-36506 22-30) (Contract NOw-61-0554-c)

A transient thermal analysis of a space suit clad man on the moon is presented. No refrigeration system is considered for his suit, and it is assumed that the only evaporative cooling is that achieved through the saturation of the occupant's exhalation. These restrictions are imposed because the primary concern is to determine whether useful mission times are possible without recourse to special cooling devices. Practicable exposure times are demonstrated for the lunar day. The analysis also shows that extended mission times are easily feasible for the lunar night side. Author

N66-36519# Aeronutronic, Newport Beach, Calif.
AUTOMATIC CHEMICAL PROCESSING SYSTEMS FOR EXTRATERRESTRIAL BIOCHEMICAL INVESTIGATIONS
Donald C. Garwood and Harry A. Taussig *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 185–200 refs (See N66-36506 22-30)

Mechanisms capable of automation for use in batch chemical processing of surface samples for scientific payloads were devised and tested. Elemental processing operations common to a wide variety of possible life detection and biochemical characterization experiments were identified. It was determined that one device could perform a multiplicity of analyses if it could perform a limited number of elemental processing operations. Mechanisms were then designed for performing such elemental processing operations, and a breadboard processing device was fabricated incorporating the various processing operations, some completely automated (such as reagent metering) and others manually operated. The tremendous flexibility of the device to perform a wide variety of chemical procedures is evident. Tests of the breadboard in performing aqueous and organic extractions of soil samples indicate that completely automated, flight worthy chemical processing systems possessing great experimental flexibility are feasible and reliable. Author

N66-36520# Air Force Systems Command, Kirtland AFB, N. Mex.
AN EXPERIMENTAL APPROACH FOR DETERMINING THE SPACE RADIATION HAZARD TO MANNED SPACE FLIGHT
Dean E. Ewing *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 201–205 refs (See N66-36506 22-30)

An experimental program is described which uses a multidisciplinary approach to develop a sophisticated technique for the measurement, interpretation, and evaluation of the space radiation environment and its potential danger. This many faceted program includes the particle accelerators, computer analyses, and sophisticated radiation measuring devices. The end result of this work will be a radiation monitoring system, simple and economical, with adequate readout for the astronaut in the space vehicle, as well as biologically meaningful dose, dose rate, and depth dose profile, rapidly available to the ground control facilities. Author

N66-36526# Brown Engineering Co., Inc., Huntsville, Ala.
A METHODOLOGY TO ANALYZE AND EVALUATE CRITICAL HUMAN PERFORMANCE
M. A. Barone *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 270–283 refs (See N66-36506 22-30)

A methodology to evaluate, analyze, and predict critical human performance is presented. The aim of the program is to develop a methodology to control and minimize the natural subjectivity associated with evaluation programs. The typical approach is: (1) analyze the system or task, (2) select evaluation factors, (3) establish and prevalidate a rating manual or check list. (4) perform an analysis and evaluation, (5) estimate potential error probabilities, and (6) perform critical comparison studies. Author

N66-36597# Joint Publications Research Service, Washington, D. C.
ON THE ROLE OF ELECTRICAL AND MAGNETIC FIELDS IN THE VITAL ACTIVITIES OF BIOLOGICAL SYSTEMS
L. K. Chernova *In its* Electron. Treat. of Mater., No. 3, 1965 2 Sep. 1966 p 89–96 refs (See N66-36590 22-15) CFSTI: $4.00

The role of magnetic fields as an important parameter in processes of the self-regulation and self-organization of biological systems is discussed. Various theories are proposed on the subject of cellular processes and the relation of protoplasmic polarity to electrical polarity. The concept of positive and negative feedback of self-regulating biological systems is considered. An example of positive feedback is presented in the case of a cell radiating mitogenetic (ultraviolet) rays as a result of cell division. These mitogenetic rays intensify the division of cells. The paramagnetic properties of free radicals, formed when a photon of light strikes a chloroplast, are examined. The role of electrical and magnetic fields in the circulation of blood is also considered. These studies are presented to demonstrate the need for further investigation of electrical, magnetic, and electromagnetic interactions as factors in the vital activity of organisms. S.P.

N66-36601# Michigan State Univ., East Lansing. Div. of Engineering Research.
A SYSTEMS APPROACH TO HIGHER EDUCATION—A COMPREHENSIVE REPORT OF PROGRESS

H. E. Koenig, M. G. Keeney, M. J. King, P. Gindre, J. E. Griggs et al 15 May 1966 101 p refs
(Contract NSF C-396)
(IR-3)

The report presents a first generation model characterizing the dynamic relationship between the flow of students and resources and their associated imputed values at the "input and output terminals" of an institution of higher education. The model is a system of simultaneous difference equations whose coefficients are stated as an explicit function of the academic programs of the students and the administrative policies of the institution; it identifies 96 internal student population levels and the demands placed on the institution by their academic programs and the resources and the associated unit costs required to meet these demands. Data acquisition and processing procedures are given for evaluating those parameter matrices in the model for which a data base accessible to a computing machine is currently available. A data processing system that will provide the additional required data base is also described. The model enables the administrator to experiment with various combinations of policy and resource allocations. The interaction of higher education with the national economy is demonstrated in terms of a simplified version of the basic model. In addition to the number of students, manpower and resources, and their associated imputed values, other dimensions of education are given as they relate to academic and administrative policy, cost, and student interest. Author

N66-36686# Joint Publications Research Service, Washington, D. C.
TRACE ELEMENTS IN EXPERIMENTAL AND CLINICAL MEDICINE
Georgiy Avksent'yevich Babenko 14 Sep. 1966 24 p refs Transl. into ENGLISH from the book "Mikroelementy v Eksperimental'-noy i Klinicheskoy Meditsine" Kiev, Zdorov'ye Publishing House p 3-18; 84-92; 182-183
(JPRS-37590; TT-66-34018) CFSTI: $1.00

CONTENTS:
1. INTRODUCTION p 1-3
2. GENERAL INFORMATION ON THE DISTRIBUTION AND BIOLOGICAL ROLE OF TRACE ELEMENTS IN THE HUMAN AND ANIMAL ORGANISMS p 4-12
3. METABOLISM OF TRACE ELEMENTS IN THE TISSUES AND ORGANS OF MAN IN DIFFERENT PHYSIOLOGICAL STATES OF THE ORGANISM (CONCLUSION) p 13-18

N66-36688# Joint Publications Research Service, Washington, D. C.
BIONICS—ITS STATUS AND TRENDS IN ITS DEVELOPMENT
A. Berge and B. Sotskov 13 Sep. 1966 31 p refs Transl. into ENGLISH from Nauka i Zhizn (Moscow), no. 6, Jun. 1966 p 2-12
(JPRS-37552; TT-66-33980) CFSTI: $2.00

Attention is drawn to four main groups of problems encountered in informational aspects of bionics. These areas include the obtaining of information; information processing (transformation, storage and comparison with input information); the formulation of new information; and the use of information for the control of substantial or energetic processes. General aspects related to these problems are examined. Advances in biological investigations are discussed from an engineering point of view to emphasize the need for the perfection of technical means of communications to effectively disseminate this information. The importance of creating a common language for biologists, medics, and specialists in cybernetics and electronics is also assessed. H.S.W.

N66-36721# Joint Publications Research Service, Washington, D. C.
SOVIET COMMUNICATIONS RESEARCH WITH DOLPHINS
S. Osokin 13 Sep. 1966 10 p Transl. into ENGLISH from Krasnaya Zvezda (Moscow), 11 Jun. 1966 p 6
(JPRS-37559; TT-66-33987) CFSTI: HC $1.00

Various accounts of the dolphin's sympathy for man are related to show its intelligence and superiority to other species of the animal world. Exploring the dolphin's capability is mentioned with respect to its use in anti-submarine warfare. It is suggested that modern technology produce a means of communicating with these creatures. S.P.

N66-36724# Joint Publications Research Service, Washington, D. C.
SECOND ALL-UNION CONFERENCE ON AEROSPACE MEDICINE
9 Sep. 1966 21 p Transl. into ENGLISH from Med. Gazeta (Moscow), v. 29, no. 55, Jul. 1966 p 3
(JPRS-37524; TT-66-33952) CFSTI: $1.00

Psychological and biological problems encountered in interplanetary space flights are briefly discussed. Life support systems, especially those for regeneration of oxygen and water, and decomposition of CO_2 into carbon and oxygen, are considered. The effect of accelerations on the processes of intracellular metabolism is examined, and means of resistance by the organism are proposed. The psychological compatibility of the crew over long periods of time in a confining environment is investigated. Other problems reviewed are pressure chamber and high-altitude hypoxia, weightlessness and hypodynamics, and psychophysiological adaptations. S.P.

N66-36759# Joint Publications Research Service, Washington, D. C.
COORDINATION OF MOTOR AND VEGETATIVE FUNCTIONS IN MAN DURING MUSCULAR ACTIVITY
Yu. I. Dan'kov, N. V. Zimkin, and K. M. Smirnov, ed. 18 Aug. 1966 42 p refs Transl. into ENGLISH from the publ. "Koordinatsiya Dvigatel'nykh i Vegetativnykh Funktsiy Pri Myshechnoy Deyatel'nosti Cheloveka" Moscow, 1965 p 5-17, 117-133
(JPRS-37103; TT-66-33532) CFSTI: $2.00

CONTENTS:
1. CORRELATION BETWEEN MOTOR AND VEGETATIVE FUNCTIONS DURING MUSCULAR ACTIVITY N. V. Zimkin p 3-15 refs (See N66-36760 22-04)
2. PROBLEMS OF TRANSFER OF TRAINING IN MOTOR ACTS V. M. Zatsiorskiy p 16-34 (See N66-36761 22-05)

N66-36760# Joint Publications Research Service, Washington, D. C.
CORRELATION BETWEEN MOTOR AND VEGETATIVE FUNCTIONS DURING MUSCULAR ACTIVITY
N. V. Zimkin *In its* Coord. of Motor and Vegetative Functions in Man During Muscular Activity 18 Aug. 1966 p 3-15 refs (See N66-36759 22-04) CFSTI: $2.00

The problems of hypokinesia with insufficient motor activity and the variability of adaptive reactions developed in the course of training are investigated. The influence of muscular activity on nonspecific increase in resistance to a number of adverse environmental factors is considered, and the general principles of interrelationship between various components of the motor and vegetative functions during muscular activity

are discussed. It is noted that the problem of the general mechanisms and distinctions of this interrelationship is one of the most important ones in industrial and athletic physiology, and its comprehensive development will be particularly effective if in using research methods various indices of physiological functions at rest as well as during movement will be recorded simultaneously. A.G.O.

N66-36761# Joint Publications Research Service, Washington, D. C.
PROBLEMS OF TRANSFER OF TRAINING IN MOTOR ACTS
V. M. Zatsiorskiy *In its* Coord. of Motor and Vegetative Functions in Man during Muscular Activity 18 Aug. 1966 p 16–34 (See N66-36759 22-04) CFSTI: $2.00

Transfer of motor task training results to the successful performance of other movements is considered. The forms of training transfer such as direct, mediated, and unilateral, are discussed, and the investigation method which uses variation statistics and factorial analysis is described. The problems of homogeneous transfer of speed and endurance are analyzed, and a correlation between the magnitude of transfer and training level is related. A.G.O.

N66-36763# Eidgenossische Technische Hochschule, Zurich (Switzerland).
ON THE CONSTITUTION AND CONFIGURATION OF LAGOPODINE A, B, AND C [UEBER DIE KONSTITUTION UND KONFIGURATION DER LAGOPODINE A, B UND C]
Pietro Bollinger (Ph.D. Thesis) 1965 99 p refs In GERMAN (Rept.-3595) CFSTI: HC $3.00/MF $0.75

The following three metabolic substances were isolated from a culture filtrate of fungus Corpinus lagopus Fries: lagopodin A, $C_{15}H_{18}O_3$, lagopodin B, $C_{15}H_{18}O_4$, and lagopodin C, $C_{30}H_{34}O_8$. Chemical decomposition and numerous physical–chemical measurements of these metabolic substances established their structures as (101), (110), and (115), respectively. The possible syntheses of all three structures through biogeneses over sesquiterpene compounds were discussed. Transl. by G.G.

N66-36845# Stanford Research Inst., Menlo Park, Calif.
FALLOUT SIMULANT DEVELOPMENT: THE SORPTION REACTIONS OF CERIUM, CESIUM, RUTHENIUM, STRONTIUM, AND ZIRCONIUM–NIOBIUM
William B. Lane Nov. 1965 34 p refs
(Contract N228-(62479)65414)
(AD-635547) CFSTI: HC $2.00/MF $0.50

The report describes the preparation of synthetic fallout. Methods are discussed for simulating selected properties of radioactive fallout so that experiments can be conducted to evaluate radiological hazards. The experiments measured solubility of radionuclides which would be available to cycle in the food chains. Heating the fallout particles to high temperatures reduced the solubility of all nuclides studied. The methods described can be used by other researchers to prepare synthetic fallout with selected solubility and availability properties. Author (TAB)

N66-36848*# Lockheed Missiles and Space Co., Palo Alto, Calif.
DESIGN AND DEVELOPMENT OF A WATER VAPOR ELECTROLYSIS UNIT
W. J. Conner, B. M. Greenough, and G. M. Cook Washington, NASA, Sep. 1966 126 p refs
(Contract NAS2-2630)
(NASA-CR-607) CFSTI: HC $3.00/MF $1.00 CSCL 06K

Development of a water vapor electrolysis cell using sulfuric acid as the electrolyte proved that this system is competitive with other zero-gravity methods of generating breathing oxygen. The properties of sulfuric acid were studied and the results indicate that it is a suitable electrolyte with a high water absorption characteristic. The immobilizing gel matrix materials tested were generally unsuitable for the water vapor electrolysis cell. Experimental gelled matrix cells were operated under adverse operational conditions to determine failure modes. Unique liquid electrolyte-absorbent matrix cells were efficiently operated at high current densities and water absorption rates. A 1-man unit of this design would require 14 cells, 284 W, 2.24 V at100 mA/cm^2, weigh 19.7 lb, and occupy 0.19 ft^3. Author

N66-36854*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF ACUTE AND CHRONIC HYPOHYDRATION ON TOLERANCE TO $+G_z$ ACCELERATION IN MAN. I: PHYSIOLOGICAL RESULTS
John E. Greenleaf, M. Matter, Jr., L. G. Douglas, S. A. Raymond, J. S. Bosco et al Washington, NASA, Sep. 1966 42 p refs (NASA-TM-X-1285) CFSTI: HC $2.00/MF $0.50 CSCL 06S

Two groups of male subjects were hypohydrated approximately 3.6 percent of their total body weight either by means of a sauna bath (acute group) or a 48-hour water restriction period (chronic group). Following hypohydration each group underwent four centrifugation runs at an acceleration build-up of +3.7 G/min—held at 6.0 G until blackout occurred. The results indicated (a) no significant difference in mean tolerance times between the acute and chronic group; (b) a significant decrease ($p<0.005$) in mean tolerance times between the normohydration and hypohydration groups; and (c) a significant decrease ($p<0.001$) in mean tolerance times over the four successive runs. The mechanisms of reduced tolerance to $+G_z$ acceleration when hypohydrated are complex because there was very little relationship between percent body weight loss, red cell volume, plasma volume, and total blood volume and tolerance time. The concept of free circulating water was advanced as a possible explanation for the conflicting results regarding the effects of water depletion on tolerance to $+G_z$ acceleration. Author

N66-36886# Sassari Univ. (Italy). Faculty of Sciences.
ENERGETICS TRANSFER IN THE PHOTODYNAMIC REACTIONS Final Technical Report
Leonida Santamaria 31 Oct. 1965 36 p refs
(Grant AF-EOAR-63-116)
(AFCRL-66-296; AD-632293) CFSTI: HC $2.00/MF $0.50

CONTENTS:

1. THE NATURAL PHOTODYNAMIC SENSITIVITY OF THE RETINA. RESPIRATION, GLYCOSIS AND THE "S-POTENTIALS" IN FISH RETINA L. Santamaria p 4–20 refs (See N66-36887 22-04)

2. EFFECTS OF LIGHT ON 3,4-BENZPYRENE CARCINOGENICITY L. Santamaria p 21–25 refs (See N66-36888 22-04)

3. PHOTOCHEMICAL SYNTHESIS OF AMINO ACIDS FROM PARAFORMALDEHYDE CATALYSED BY INORGANIC AGENTS L. Santamaria p 26–30 refs (See N66-36889 22-04)

N66-36887# Sassari Univ. (Italy). Faculty of Sciences.
THE NATURAL PHOTODYNAMIC SENSITIVITY OF THE RETINA. RESPIRATION, GLYCOLYSIS AND THE "S-POTENTIALS" IN FISH RETINA

Leonida Santamaria *In its* Energetics Transfer in the Photodyn. Reactions 31 Oct. 1965 p 4–20 refs (See N66-36886 22-04) CFSTI: HC $2.00/MF $0.50

The behavior of the slow changes in potentials (S-potentials) in response to light stimuli of individual cells in the retina of certain fish was investigated. The results show that the S-potentials of fish retina are dependent on relatively high concentration of oxygen, and on the physiological integrity of the receptors. Therefore, the natural photodynamic system responsible for the oxygen-dependent damage in irradiated retina should exert also a physiological activity in normal conditions, and it appears important in the process of vision. Preliminary data indicate that the light passing 380–500 mμ is active, whereas light passing 510–700 mμ is inactive in producing the oxygen-dependent damage of the retina. Author

N66-36888# Sassari Univ. (Italy). Faculty of Sciences.
EFFECTS OF LIGHT ON 3,4-BENZPYRENE CARCINOGENICITY
Leonida Santamaria *In its* Energetics Transfer in the Photodyn. Reactions 31 Oct. 1965 p 21–25 refs (See N66-36886 22-04) CFSTI: HC $2.00/MF $0.50

The long-ultraviolet irradiation on mice painted with 3,4-benzpyrene produces acceleration or inhibition of cancer induction according to the dosage of light. The 3,4-benzpyrene is carcinogenic independently of light. This is shown in three experiments carried out on 955 mice. Author

N66-36889# Sassari Univ. (Italy). Faculty of Sciences.
PHOTOCHEMICAL SYNTHESIS OF AMINO ACIDS FROM PARAFORMALDEHYDE CATALYSED BY INORGANIC AGENTS
Leonida Santamaria *In its* Energetics Transfer in the Photodyn. Reactions 31 Oct. 1965 p 26–30 refs (See N66-36886 22-04) CFSTI: HC $2.00/MF $0.50

The study by Bahadur, Ranganayaki, and Santamaria demonstrating the photochemical synthesis of amino acids in abiogenic conditions is re-examined to give further contributions to the photochemistry and photobiology in space research as well as to the problem of the origin of life. The photochemical synthesis in acqueous mixture of paraformaldehyde and inorganic catalysts under visible light occurs either in the presence or in the absence of a fixed nitrogen inorganic source. The type of amino acid produced and the rate of its formation are dependent on the inorganic catalyst employed. Author

N66-36898# Tufts Univ., Medford, Mass. Dept. of Mechanical Engineering.
A STUDY IN MOLECULAR SENSATION Semiannual Report
Dwight W. Batteau and William M. Hemmes 24 Mar. 1966 39 p refs
(Contracts Nonr-4863(00); N123(60530)52597A)
(SAR-1; AD-635955) CFSTI: HC $2.00/MF $0.50

The hypothesis is posed that organic sensation is provided by shifting the probability of transition of electrons from excited states to the ground state in organic molecules. Also hypothesized is that the action potentials observed are metabolic artifacts and not carriers of sensory signals. A description of applicable theory and two experiments are presented, as well as a few abstracted corollary remarks from the literature. Author (TAB)

N66-36906# School of Aerospace Medicine, Brooks AFB, Tex.
PHARMACOLOGY AND TOXICOLOGY OF PROPELLANT FUELS—BORON HYDRIDES
James H. Merritt Jun. 1966 13 p refs *Its* Rev. 3-66
(AD-636910) CFSTI: HC $1.00/MF $0.50

The effects of boron hydrides on animals and humans are described, and methods of treatment are discussed. Since boranes have strong electron-acceptor properties and are good reducing agents, they react with NH_3, organic amines, unsaturated hydrocarbons, various heterocyclic amines, and other compounds, including those of biological origin. Diborane, pentoborane, and decaborane are readily absorbed through the skin and by inhalation, and are particularly toxic to the central nervous system. Neurologic symptoms are the most prominent feature of pentaborane intoxication, while decaborane has produced performance decrements of reinforced tasks in the monkey. In addition to CNS disturbances, the boron hydrides produce cardiovascular effects and damage to both liver and kidney. The cardiovascular effects, as well as certain of the autonomic effects, are similar to those produced by reserpine. Glucose tolerance curves, similar to those in diabetes, are produced by decaborane and boron hydride derivative fuel. Therapy of boron hydride intoxication has been empirical with drugs used to control convulsions. Methylene blue, a stable oxidizing agent, has been found effective after decaborane exposure. E.A.O.

N66-36929# John B. Pierce Foundation of Connecticut, New Haven.
OXYGEN TRANSPORT THROUGH HEMOGLOBIN SOLUTIONS Final Report, Mar. 1963–Mar. 1965
Harold T. Hammel Wright-Patterson AFB, Ohio, AMRL, Feb. 1966 25 p refs
(Contract AF 33(657)-11103)
(AMRL-TR-66-19; AD-635623) CFSTI: HC $1.00/MF $0.50

Scholander discovered that the steady state flux of oxygen through a thin film of water could be enhanced many times by adding hemoglobin to the water. Several authors have ascribed this facilitated flux of oxygen to the diffusion of oxyhemoglobin down its gradient although the details of their formulations have not been rigorously supported by experimental evidence. A series of measurements of oxygen and nitrogen flux through a film of hemoglobin solution were made for which the PO_2 and PN_2 on one side were always 16.5 and 62.5 mm Hg respectively while the PO_2 on the other side was increased from 0.5 to 14 mm Hg by adding increasing thicknesses of Teflon film to this side. When the facilitated oxygen flux was small, it was found to equal the calculated flux assuming that the oxygen was carried by the diffusing oxyhemoglobin and that Henry's law and the equilibrium dissociation curve for oxyhemoglobin apply at the two surfaces of the hemoglobin film. When the facilitated oxygen flux was greatest, it was found to be only one half the calculated flux, presumably because the PO_2 on the solution side of the gas-solution interface was considerably less than the 16.5 mm Hg prevailing on the gas side. Author (TAB)

N66-36937# Zaret Foundation, Inc., Scarsdale, N. Y.
OCULAR EFFECTS OF MICROWAVE RADIATION Annual Progress Report, 1 Sep. 1965–1 Jul. 1966
Milton M. Zaret [1966] 24 p
(Grant DA-MD-49-193-66-G188)
(AD-635943) CFSTI: HC $1.00/MF $0.50

The experimental data reported represents a major accomplishment in that for the frequency used, 5500 mc/sec, it was demonstrated that lens opacification was directly related to average power density irrespective of whether the energy was in a continuous or pulsed mode of emission. By using a closed waveguide system, it was possible to avoid all of the free-field variables of microwave radiation and to accurately determine the quantity of energy entering the eye.

Comparison to a similar investigation at a different frequency (10, 050 mc/sec) revealed that the lenticular effects had practically the same time-power dose relationship. The findings demonstrate not only that various microwave emission factors can be segregated and controlled but also that exact time-power relationships for cataractogenesis can be determined by biological assay. Thus, with confidence in the replicability of the exposure methodology, it is planned to obtain additional data in accordance with the experimental protocol developed for this study. Author (TAB)

N66-36965# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.

PLATELET ENVIRONMENT: STUDY OF FACTORS II AND VII. MODIFICATIONS BROUGHT ABOUT BY X-RAYS [ATMOSPHERE PLAQUETTAIRE: ETUDE DES FACTEURS II AND VII. MODIFICATIONS APPORTEES PAR LES RAYONS X]

Daniel Hollard, Jean Darnault, Francoise Rambaud, Michel Suscillon, and Genevieve Marcille 1 Mar. 1966 8 p In FRENCH; ENGLISH Summary

(CEA-R-2953)

Factors affecting blood coagulation were studied using blood platelets exposed to various environmental factors and doses of 0 to 70,000 R X-radiation. Applications of the findings in clinical studies are discussed. NSA

N66-37041*# Stanford Research Inst., Menlo Park, Calif.

FEASIBILITY STUDY FOR THE USE OF IOPHENOXIC ACID AS A REFERENCE MARKER FOR PLASMA PROTEINS Final Report

Nicholas E. Kontaxis and C. Mitoma 25 Aug. 1966 66 p refs (Contract NAS2-3072)

(NASA-CR-73032) CFSTI: HC $2.50/MF $0.75 CSCL 06A

Equilibrium dialysis experiments of human and bovine albumin with iophenoxic acid revealed an apparent association constant of about 10^7 M^{-1} which is much higher than other small molecules interacting with albumin. Animal experiments have shown that the survival half-time of iophenoxic acid in monkeys, rabbits, and dog was 65–84, 23–32, and 28 days, respectively. This compound was preferentially bound to serum albumin, did not seem to be extensively metabolized, and there was no apparent effect on the metabolism of serum albumin. The biological half-life of serum albumin in monkeys was found to be approximately 20 days and its turnover .15–.18 g/kg/day. Iophenoxic acid seemed to be reassociated with the new albumin molecules synthesized as others were metabolized, and equilibrated with the total exchangeable intra- and extravascular albumin pools. The total body and intravascular albumin mass as well as the intravascular volume for monkeys, rabbits and dog were measured following the injection of IPA and the values obtained were within the range of values reported by other investigators except for the total body albumin pool of rabbits. Author

N66-37042*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EFFECTS OF ACUTE AND CHRONIC HYPOHYDRATION ON TOLERANCE TO $+G_z$ ACCELERATION IN MAN. II: IMPRESSIONS OF SUBJECTS

S. A. Raymond, J. E. Greenleaf, and M. Matter, Jr. Washington, NASA, Sep. 1966 47 p refs

(NASA-TM-X-1255) CFSTI: HC $2.00/MF $0.50 CSCL 06S

The postcentrifugation comments of young male, water depleted subjects following $+G_z$ acceleration was assessed and summarized. Two methods of water depletion were utilized: a sauna bath (acute group) and 48-hour water restriction (chronic group). The acute group lost 3.4 percent of their total body weight and the chronic group, 3.8 percent. Blackout tolerances were measured following the two hypohydration (dehydration) periods and also during normohydration (ad libitum control) at an acceleration buildup of 3.7 G/min. The main conclusions based upon the subjective comments were: (1) Moderate hypohydration, both chronic and acute, is associated with tolerance decrements; (2) the decreased tolerance is traceable to increased fatigue brought about by the water deficit; (3) leg pain and cardiovascular embarrassment during acceleration is increased with hypohydration; (4) the progressive lessening of the leg pain with each succeeding run is partially attributable to muscular effort. Muscular effort increases subjective tolerance to acceleration, often restoring peripheral or central vision; and (5) subjective impressions of changes in tolerance only infrequently correspond to actual performance records. Author

N66-37050# School of Aerospace Medicine, Brooks AFB, Tex.

ASTROSTOMATOLOGY: DENTAL STANDARDS FOR THE SELECTION AND EXAMINATION OF SPACE CREWMEN

Jack L. Hartley and Gaylord L. Hall Jun. 1966 10 p refs (SAM-TR-66-56; AD-635614) CFSTI: HC $1.00/MF $0.50

The report establishes guidelines for the necessary dental standards, examination procedures, and treatment criteria in support of manned space missions and simulated flights. Included are initial and final screening requirements, the establishment of oral hygiene and preventive measures, and treatment recommendations. The preflight examination, in-flight monitoring, and postflight examinations for both chamber and actual flights are presented. A format for reporting the dental protocol of these flights is included. Author (TAB)

N66-37053# Naval Submarine Medical Center, Groton, Conn.

SEALAB I: A PERSONAL DOCUMENTARY ACCOUNT

Robert E. Thompson 30 Mar. 1966 41 p *Its* Memo. Rept.-66-9

(AD-635656) CFSTI: HC $2.00/MF $0.50

The author was the medical officer participant in the group of four men who spent ten days in the underwater habitation designated SEALAB I in July–August 1964. This is a day by day account of the experiences and problems encountered by the author during the preparation for the experiences and problems encountered by the author during the preparation for the experiment, beginning on 28 April, and during the actual time underwater and during the ascent to the surface and the period of decompression, terminating on the first of August. This particular submarine-qualified medical officer was chosen for this assignment in the SEALAB I project because of his previous training in the fields of marine biology and diving medicine. This personal account is published at this time as a part of the record of the SEALAB series of projects, which are part of the larger Man-in-the-Sea Program. He describes what they ate, how they slept, details of their sorties into the ocean around them; problems due to contamination of their atmosphere; the fish and marine life observed through their portholes or encountered in their excursions outside the SEALAB; as well as their psychological states, their relationships with each other, and their communications with both the support personnel topside and their families at home.

Author (TAB)

N66-37065# School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.

ORAL HYGIENE PROCEDURES IN THE PRESENCE OF A "TUBE-TYPE" DIET, MARCH 1964–OCTOBER 1965

Timothy J. O'Leary, Arthur J. Stumph, Jr., and Paul V. Sundberg, Jr. May 1966 14 p refs
(SAM-TR-66-44; AD-635612) CFSTI: HC $1.00/MF $0.50

Three studies were carried out to explore the effects of a liquid 'tube-type' diet on gingival status and plaque accumulation when subjects employed (1) their usual oral hygiene procedures without a dentifrice, and (2) various proposed oral hygiene procedures without a dentifrice. The initial 35-day study evaluated changes in gingival health and plaque status that occurred when subjects employed their usual oral hygiene practices without a dentifrice. There were significant mean increases in the scores for gingival inflammation ($P<.01$) and in plaque accumulation ($P<.05$). A second study evaluated the efficiency of two proposed minimal oral hygiene procedures for 33 days. There was a statistically significant increase ($P<.01$) in gingival inflammation, but no mean increase in plaque scores. A third study evaluated the relative efficiency of three oral hygiene procedures for a 44-day period. There was no significant increase in gingival inflammation or plaque accumulation during the experimental period. Author (TAB)

N66-37067# Applied Psychological Services, Wayne, Pa. Science Center.
STUDIES INTO INFORMATION PRESENTATION THROUGH NOVEL METHODS. III: TWO-WAY INFORMATION TRANSFER THROUGH ELECTROCUTANEOUS TRANSDUCTION
M. A. Fischl, Arthur I. Siegel, and Douglas H. Mac Pherson Jul. 1966 44 p refs
(Contract DA-28-043-AMC-00186(E))
(AD-635693) CFSTI: HC $2.00/MF $0.50

After brief training in a code and orientation to the electrocutaneous transduction equipment, three two-man teams employed the code and the equipment to communicate with one another while jointly performing an experimental task. Two levels of time stress and three levels of attention sharing were imposed. Communication performance was scored as well as performance on a collateral visual monitoring task. The results indicated that: (1) reasonably precise two-way electrocutaneous information transfer had taken place, (2) communication performance was not degraded by the conditions of stress and attention-sharing, but (3) collateral task performance was degraded by stress and possibly by attention-sharing. It was concluded that the feasibility of the cutaneous sensory channel for supporting two-way information transfer in a limited vocabulary setting had been at least partially demonstrated. Some possible applications are discussed. Author (TAB)

N66-37074# Massachusetts Inst. of Tech., Cambridge.
FREEDOM AND CONTROL: THE DILEMMA OF CREATIVITY IN THE ORGANIZATIONAL ENVIRONMENT
Harper Brown Keeler (Ph.D. Thesis) Jun. 1966 271 p refs
(AD-635261) CFSTI: HC $1.50/MF $1.50

The purpose of this study is the analysis of creativity in the context of organizations found in an advanced modern social system. The report deals with a critique of the literature related to the problems of creativity in organizations, with these criticisms in mind, the second part compares different organizations ranked by levels of creativity. Different factors of the environments (especially those relating to organizational control and feelings of individual freedom) which influence creativity levels are analyzed. Eight environments were chosen for study to include industrial labs, government labs, and academic labs. The first case study analyses the severe constraints on creativity which can occur in an organization operated under public health regulation. Four labs that exhibit different levels of creativity are compared. Propositions are generated to explain these differences. These propositions are tested in three academic labs which are assumed to have more creative environments. The conclusions include recommendations for altering the theoretical framework offered by the literature, and recommendations for organizations wishing to foster creativity in their participants. TAB

N66-37087# Institute for Defense Analyses, Arlington, Va. Research and Engineering Support Div.
HUMAN FACTORS PROBLEMS IN COMPUTER-GENERATED GRAPHIC DISPLAYS
Joseph E. Barmack and H. Wallace Sinaiko Apr. 1966 118 p refs
(Contract ARPA SD-50)
(S234; IDA/HQ-66-4820; AD-636170) CFSTI: HC $4.00/MF $0.75

The study is a review of current practices in computer-generated graphic displays from the point of view of engineering psychology. Input devices, which are integral to man-computer systems, are also considered. Theories of cognition are examined with respect to their applicability to computer-graphics. Author (TAB)

N66-37091# Laval Univ. (Quebec).
NEUROHUMORAL CONTROL OF THYROTROPIC ACTIVITY
Final Technical Report, Oct. 1, 1963-Sep. 30, 1965
Claude Fortier [1965] 26 p refs
(Grant AF-AFOSR-511-64)
(AFOSR-66-1476; AD-636083) CFSTI: HC $1.00/MF $0.50

Studies on the levels of interaction between ACTH, TSH, corticosteroid and thyroid hormones are described. Author (TAB)

N66-37106# Naval Radiological Defense Lab., San Francisco, Calif.
RECOVERY FROM RADIATION INJURY IN SWINE AS EVALUATED BY THE SPLIT-DOSE TECHNIQUE
D. S. Nachtney, E. John Ainsworth, and George F. Leong 18 May 1966 27 p refs
(USNRDL-TR-1025; AD-635735) CFSTI: HC $2.00/MF $0.50

With 1 Mvp X-rays, the acute LD50/30 (midline air dose) of 8-9 month old Duroc gilts was determined to be 399 R (95% confidence interval: 371-424 R). The pattern of recovery from the effects of 240 or 265 R of X-rays was studied by means of the split-dose technique, which consists of conditioning the animals with a sublethal exposure and redetermining the LD50 at various times thereafter. By this criterion, the swine had recovered from 51% of the initial injury by three days. By seven days, they appeared to have recovered from about 65% of the initial injury, but the data suggest that part of the population had recovered completely while part was still about as sensitive as at three days. By twenty days, the entire population appeared to be radioresistant: the redetermined LD50 was 164% of the LD50 of unconditioned animals. Radioresistance was also evident at 61 and 107 days: at 61 days, 734 R killed eight out of 15 animals conditioned with 265 R whereas, the same exposure killed 15 of 15 unconditioned animals; at 107 days, none of nine conditioned animals died after 399R. The pattern of systemic recovery and the period of radioresistance are not clearly reflected in the pattern of hematological changes that follow a conditioning exposure. Author (TAB)

N66-37109# Miami Valley Hospital, Dayton, Ohio. Dept. of Research.
EVALUATION OF TECHNIQUES FOR BIOASSAY OF ERYTHROPOIETIN IN SERA OF HUMANS AND ANIMALS IN AMBIENT AND HYPEROXIC ENVIRONMENTS

Bernard J. Katchman and George L. Beemsterboer Wright-Patterson AFB, Ohio, AMRL, Dec. 1965 44 p refs
(Contract AF 33(615)-1169)
(AMRL-TR-65-85; AD-635599) CFSTI: HC $2.00/MF $0.50

The regulation of erythropoiesis by blood pO_2 is of direct consequence to any evaluation of the suitability of higher than ambient O_2 partial pressures in space cabin environments. Alterations in serum erythropoiesis stimulating factor (ESF) of individuals exposed to space cabin environments for long periods of time may have clinical consequences. Four methods for the assay of serum ESF were evaluated, and of these, only the hypoxia-induced polycythemic bioassay rat proved to be sensitive enough to detect ESF in 2 ml of serum. Serum ESF is related to that fraction of a dose of Fe^{59}, injected into the bioassay rat, which appears in the red blood cells after twenty-four hours. Endogenous ESF causes Fe^{59} uptakes of 6.4±3.9%; 2 ml of human serum causes Fe^{59} uptakes of 15.4±6.8%, which are statistically significant from the controls. Variances in duplicates are such that to distinguish between two samples at the 95% confidence interval, the samples must differ from each other by about 50% in ESF content. Although statistically significant changes in blood ESF were found, both in animals and humans exposed to 100% O_2, the physiological significance of these changes is unexplained due to the paucity of data. The unique discovery that neuramin lactose, neuraminic acid, and beta-lactose stimulate Fe^{59} uptake into red blood cells would indicate that the parameters which control incorporation of iron into red blood cells need further definition. Author (TAB)

N66-37121# Joint Publications Research Service, Washington, D. C.
PHASE ANALYSIS OF CARDIAC ACTIVITY
V. A. Karpman 13 Sep. 1966 261 p refs Transl. into ENGLISH of the book "Fazovvy Analiz Serdechnoy Deyatel'nosti" Moscow, 1965 p 1-276
(JPRS-37555; TT-66-33983) CFSTI: $6.00

Dynamics of the human heart functions were studied by standardization of their main phase parameters under static and dynamic conditions; phase changes under the influence of physiological disturbances; general pathophysiological aspects of phase analysis; the syndromic nature of phase changes in physiological and clinical practice; methodology, etc. Detailed phase structures of the cardiac cycle were depicted in a physiological essay and descriptions of the various diagnostic methods and electrical recording devices as well as their particular morphological phase pattern analyses were included. G.G.

N66-37125# Federal Aviation Agency, Washington, D. C. Office of Aviation Medicine.
PHYSICIAN FLIGHT ACCIDENTS
Stanley R. Mohler, Sheldon Freud, Jack Veregge, and Elizabeth Umberger Sep. 1966 10 p
(AM-66-25)

Analysis of physician flight accidents during the period 1964-1965. More than thirty physicians sustained fatal injuries while piloting light aircraft: a fatality record four times the ratio of physician pilots in the general aviation pilot population. Author

N66-37142*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
STUDIES OF MULTI-VARIABLE MANUAL CONTROL SYSTEMS: TWO AXIS COMPENSATORY SYSTEMS WITH COMPATIBLE INTEGRATED DISPLAY AND CONTROL
William H. Levison and Jerome I. Elkind Washington, NASA, Aug. 1966 153 p refs
(Contract NASw-668)
(NASA-CR-554) CFSTI: HC $3.25/MF $1.00 CSCL 05H

Experiments were conducted to determine what modifications to the current models of the human controller of single-variable systems are necessary for them to be good representations of the controller in two-variable situations. These experiments were performed with a single compensatory display and a single two-axis control. Two descriptors of performance were obtained for each axis: (1) the normalized mean squared error, and (2) the describing function. Of prime interest was the extent to which performance on a given axis was modified by the requirement of simultaneously tracking a second axis. Three two-axis control situations were investigated: (1) homogeneous control situation, in which the input power spectra and controlled elements were identical on X and Y, (2) heterogeneous inputs, in which the input bandwidths were different but the controlled elements identical, and (3) heterogeneous dynamics, in which the controlled-element dynamics were different but the input bandwidths identical. Author

N66-37145*# Stanford Research Inst., Menlo Park, Calif.
A THEORETICAL ANALYSIS OF THE VISUAL ACCOMMODATION SYSTEM IN HUMANS
Hewitt D. Crane Washington, NASA, Sep. 1966 79 p refs
(Contract NAS2-2760)
(NASA-CR-606) CFSTI: HC $2.50/MF $0.75 CSCL 06D

This study has attempted to model the human visual-accommodation system, starting directly with the retinal image. The models that are developed are reasonably consistent with existing data and offer a certain degree of understanding of certain features of the data. The modeling is in three stages. Starting at the retina it is asked: (1) What portion of the retinal picture is involved in accommodation control, (2) How that portion of the picture is processed to derive a measure of defocus, and (3) How that signal in turn is used to control the ciliary muscles. It is tentatively concluded that the relevant portion of the retina is a central region of the fovea, having a diameter of some 30 minutes of arc, or 6 mils—the diameter of a coarse human hair. As for processing of the retinal image, it is shown how neural circuits based on lateral inhibition can yield a measure of defocus that is consistent with experimental data over several orders of magnitude of object size and illumination. It is also shown how interaction between three such overlapping receptor regions could account for certain chromatic effects in accommodation control. The case is argued for a control cycle involving a sampling of the accommodation error followed by a ballistic corrective movement. In terms of this control model the elusive lens "vibrations" appear to be no more than normal accommodation correction cycles. Apart from its role in accommodation control it is also noted how these lens vibrations could possibly increase the depth of field for strong accommodation. The models predict significant interaction between accommodation control and eye-movements. A number of experiments are proposed which would help elucidate the nature of this interaction. Author

N66-37186# Institute for Research, State College, Pa. Div. of Psychobiology.
DRUG EFFECTS UPON PERFORMANCE UNDER TASK-INDUCED STRESS
Paul M. Hurst and Marianna F. Weidner Jan. 1966 32 p refs
(Contract Nonr-4423(00))
(ONR-H-66-1; AD-635947) CFSTI: HC $2.00/MF $0.50

An experiment was performed to test the interaction between drug/placebo effects and incentive conditions under task-induced stress. Sixty-three student volunteers served in a

factorially designed experiment varying level of incentive, drug condition, and placebo condition (whether or not the subject was led to believe he had received a drug). All active drugs were given in disguised form. These included *d*-amphetamine sulfate (10 mg), chlordiazepoxide HCl (10 mg), and methylphenidate HCl (10 mg). Neither the incentive nor the placebo condition factor had a significant effect upon performance. *D*-amphetamine showed a significant superiority to other drug conditions early in the session. Most of this superiority derived from the high stress condition. Mood effects were also noted. Results were interpreted as favoring a mood-related component in performance enhancement rather than the psychoanalytic factor. Author (TAB)

N66-37187# School of Aerospace Medicine, Brooks AFB, Tex.

PRELIMINARY OBSERVATIONS ON TESTICULAR FUNCTION IN ROOSTERS AND MICE EXPOSED TO INCREASED PARTIAL PRESSURE OF OXYGEN, MARCH 1964–APRIL 1965

Frode Ulvedal Apr. 1966 17 p refs

(SAM-TR-66-40; AD-635611) CFSTI: HC $1.00/MF $0.50

Adult white leghorn roosters were exposed to 100% oxygen atmospheres at 258 and 380 mm Hg pressure for 31 and 22 days, respectively. A ground-level control experiment was also performed. Ejaculates were obtained twice weekly by the massage technic and the ejaculate volume, total sperm count, and sperm motility were measured. The results show that confinement to the chamber for 58 days (ground-level control experiment) and exposure to 100% oxygen at 258 mm Hg pressure for 31 days had essentially no effect on the three variables studied. The ejaculate volume, sperm motility, and total sperm count decreased significantly, however, in roosters exposed to 100% oxygen at 380 mm Hg; the decrease in the three variables occurred during the first 4 to 7 days. Otherwise, the birds remained apparently healthy throughout the experiments. Histologic examinations were made on the testes after a 30-day recovery period. Size and weight of the testes from the 380 mm Hg oxygen group were also reduced as compared to controls. Previously, the reproductive capabilities of male and female mice investigated at higher partial pressures were found to be adversely affected. Author (TAB)

N66-37190# Naval School of Aviation Medicine, Pensacola, Fla.

THE RELATIONSHIP OF FIVE PERSONALITY SCALES TO SUCCESS IN NAVAL AVIATION TRAINING

Howard L. Fleischman, Rosalie K. Ambler, Floyd E. Peterson, and Norman E. Lane 24 May 1966 13 p refs

(NAMI-968; AD-636268) CFSTI: HC $1.00/MF $0.50

Cattell's Sixteen Personality Factor Questionnaire, the Taylor Manifest Anxiety Scale, the Pensacola Z Scale, and the Adjective Check-List were evaluated as predictors of success/failure in Naval Aviation training. Results showed that certain personality variables contributed significantly to multiple prediction. Author (TAB)

N66-37208*# Illinois Univ., Urbana. Dept. of Physiology and Biophysics.

THE PHYSICAL AND CHEMICAL PROPERTIES OF HUMAN SWEAT AND FACTORS AFFECTING THE WATER BALANCE IN CONFINED SPACES Semiannual Status Report No. 2, 1 Jan.–30 Jun. 1966

Robert E. Johnson and Frederick Sargent [1966] 46 p refs

(Grant NGR-14-005-050)

(NASA-CR-78121) CFSTI: HC $2.00/MF $0.50 CSCL 06P

Efforts during this period were concerned with the chemical composition of sweat compared with its osmotic pressure, the acid-base properties of sweat, and sweat viscosity and density. Sweat constituents were measured and showed the sum of anions about equal to the cations. However, the sum of all constituents did not always account for the osmotic pressure. Experiments on the acid-base properties of sweat showed that neither lactic acid-lactate nor carbonic acid-bicarbonate systems were related to changes in acidity. However, changes in ammonia were closely correlated with acidity changes. Titration curves showed four discontinuities. Fourteen amino acids were detected. Serine, alanine, and glycine were detected in amounts over 0.4 mMole/liter. The viscosity and density of sweat were compared with those of distilled water and sodium chloride solutions. The viscosity of sweat is higher than that of saline solutions of the same density, and increases with temperature while that of saline solutions decreases between 29° and 35°C. A system for measuring the secretory pressure of a single sweat gland and a routine for preparing skin to collect sweat were developed and are described. R.N.A.

N66-37217*# North American Aviation, Inc., Los Angeles, Calif.

PRELIMINARY ANALYSIS OF THE METABOLIC RATE MONITOR SYSTEM

G. W. Campbell, R. K. Breeze, D. Byrnes, and R. Tom 1 Jul. 1965 78 p refs

(Contract NAS4-876)

(NASA-CR-78287; NA-65-513) CFSTI: HC $3.00/MF $0.75 CSCL 06B

A preliminary evaluation was performed on a new concept for measuring oxygen consumption known as a metabolic rate monitor (MRM) along with an error analysis to determine its magnitude of errors for extreme ranges of conditions of R.Q., O_2 consumption, CO_2 production, etc. The mechanical components of the system were evaluated for source of error in measuring ability and a cursory evaluation was made of error magnitudes for both sea level and altitude conditions. The MRM was also evaluated using flow splitting venturies for minimizing diluent gas flow requirements. An error analysis was made for the theoretical operation of a flow meter type respiratory analyzer for comparison with the MRM. Alternate concepts of the MRM are described. The analyses showed that on a basis of error susceptibility and complexity of configuration, the respiratory analyzer using MRM concepts represents a higher development risk than the respiratory analyzer concept using a single flow meter. R.N.A.

N66-37236# Naval Radiological Defense Lab., San Francisco, Calif.

MEASUREMENT OF THE ANTIBODY RESPONSE BY THE ELIMINATION OF I^{131}-LABELED PROTEINS. I: THE ELIMINATION OF I^{131}-LABELED PROTEINS FROM THE BLOOD OF NORMAL MICE

Walter W. H. Weyzen and Myron S. Silverman 19 May 1966 49 p refs

(USNRDL-TR-1020; AD-635754) CFSTI: HC $4.00/MF $0.50

The effect of a number of variables on the elimination of I^{131}-labeled proteins from the blood of normal mice was studied. The purpose of these studies was to arrive at a critical evaluation of the antigen elimination technique which will be used for the measurement of the immune response in studies on the recovery from radiation injury. The method is based on the fact that the biological half-life of a protein is reduced in the presence of specific antibodies in the blood. It was found that the elimination of I^{131}-horse serum albumin in normal LAF_1 mice—under the experimental conditions employed—was not affected by the amount of protein injected or by the time of sampling. Although the degree of labeling

had no effect on the half-life measured, a shift of the elimination curve was observed which was time dependent. This change was attributed to radiation damage of the protein by the radioactive label. The elimination characteristics of a number of different proteins for possible use in the immunization experiments were studied. Considerable differences were observed in the way closely related proteins were eliminated from the blood. The half-life of the albumins ranged from 13.36 hr for I^{131}-porcine serum albumin to 22.03 hr for I^{131}-dog serum albumin. Author (TAB)

N66-37237# School of Aerospace Medicine, Brooks AFB, Tex.
CARDIAC OUTPUT AND REGIONAL BLOOD FLOW IN THE ANESTHETIZED BABOON
William P. Fife May 1966 12 p refs Presented at the Intern. Symp. on the Baboon and Its Use as an Exptl. Animal (2d), San Antonio, 2 Nov. 1965
(SAM-TR-66-50; AD-635613) CFSTI: HC $1.00/MF $0.50

Cardiac output and regional blood flow measurements were made in 9 normal, anesthetized, adult baboons by the use of radioactive tracers. Essentially, the method consists of rapidly introducing a solution of rubidium (Rb^{86}) chloride into a femoral vein while serially sampling blood flow at the femoral artery. Thirty seconds after the injection of the radioactivity, the animal is sacrificed by the rapid injection of 10 cc lethol. This results in the production of a dye dilution curve which, by the employment of a modified Fick equation, provides the measurement of the cardiac output over the sampling period. It also results in the deposition of radioactive rubidium in the capillary beds of all tissues except the brain in direct proportion to the blood flow to that organ over the same time period. From this information, the percent of cardiac output to each tissue bed may be determined and, when calculated on the basis of the cardiac output over the same period of time, actual blood flow in centimeters per minute may be obtained. By this technique, blood flow to the following tissues was obtained: heart, lungs, liver, gut, spleen, stomach, adrenals, kidneys, thyroid, omentum, skin, and skeletal muscle and bone. These data are compared with similar data for the dog and man. Author (TAB)

N66-37244# Melpar, Inc., Falls Church, Va. Research Div.
MECHANISM OF MICROBIOLOGICAL CONTAMINATION OF JET FUEL AND DEVELOPMENT OF TECHNIQUES FOR DETECTION OF MICROBIAL CONTAMINATION Semiannual Progress Report, 1 Jan.–1 Jun. 1965
Gordon C. Blanchard and Charles R. Goucher Jul. 1966 82 p refs
(Contract AF 33(657)-9186)
(AD-635929) CFSTI: HC $3.00/MF $0.75

Two methods for detecting microorganisms were examined in the light of the present understanding of the jet fuel microorganisms. One method was based on a color produced by the enzymes of the organism. This method was found suitable for the detection of organisms in the early part of their growth in fuel systems. However, the sensitivity of the method declined slightly with the age of the culture. Another detection method was devised, tested, and found to be highly sensitive and independent of the age of the culture. This detection method has two simple steps. The first step is the reaction of microbial cells with a specific metal ion; the second step is the reaction of bound metal ions with a colored reagent. The method promises to yield a simple visual readout system capable of field application. The production of compounds by microorganisms associated with aluminum corrosion was dependent on the presence of high concentrations of nitrate ion as well as on jet fuel components. A direct relationship was found between the onset time of respiratory decline and the appearance of corrosive pigments in microbial cultures oxidizing jet fuel. Author (TAB)

N66-37247# Naval Air Development Center, Johnsville, Pa. Aerospace Medical Research Dept.
PULMONARY FUNCTION IN MAN UNDER PROLONGED ACCELERATION. II: CORRELATION OF ARTERIAL BLOOD OXYGEN SATURATION WITH VENTILATION AND GAS BEING BREATHED Final Report
Frederic C. Hoppin, Jr., Raymond J. Sever, and Lloyd Hitchcock Jr., 31 Dec. 1965 23 p refs
(NADC-MR-6519; AD-636723) CFSTI: HC $1.00/MF $0.50

Arterial blood oxygen saturation was studied by ear oximetry in 8 subjects undergoing prolonged forward $+G_x$ acceleration. The effects on saturation of voluntary breathing patterns and the composition of the inspired gas were noted. Under $+4G_x$ saturation levels were stable after two minutes. The degree of unsaturation could be modified to a small extent by voluntary breathing efforts. The level of saturation reached correlated significantly with the minute volume breathed. In contrast, under $+8G_x$ saturation levels were significantly lower and were still falling after two minutes. Saturation levels were not significantly changed by voluntary breathing efforts and there was no significant correlation between level of saturation reached and minute volume breathed. Breathing of oxygen delayed the onset of arterial blood oxygen unsaturation. After two minutes under $+8G_x$, levels were 20% higher when the subjects breathed oxygen than when they breathed air. When subjects changed from air to oxygen or from oxygen to air on attaining peak acceleration, the effects of the 'prebreathed' gas were apparent for as long as two minutes, suggesting that the prebreathed gas was effectively trapped in some parts of the lung. Author (TAB)

N66-37248# School of Aerospace Medicine, Brooks AFB, Tex.
PHYSIOLOGIC EFFECTS OF AN 18-HOUR FLIGHT IN F-4C AIRCRAFT Final Report, 1 Dec. 1964–23 Aug. 1965
Edward F. Kramer, Jr., (Tactical Hosp., Mac Dill AFB, Fla.) Henry B. Hale, and Edgar W. Williams Jun. 1966 15 p refs
(SAM-TR-66-59; AD-636911) CFSTI: HC $1.00/MF $0.50

Physiologic assessment was performed by means of postflight urinalysis for 8 pilots who flew F-4C aircraft for 18 hours. Flight effects were neither numerous nor of large magnitude, nor were the pilots unduly fatigued. The flight-induced, physiologic changes included: (1) increased 17-hydroxycorticosteroid excretion, which implies adrenocortical stimulation, and (2) decreased excretion of uric acid, potassium, and urine, which suggests metabolic depression. Author (TAB)

N66-37259# RAND Corp., Santa Monica, Calif.
THE CLASSICAL STRUCTURE OF BLOOD BIOCHEMISTRY—A MATHEMATICAL MODEL
E. C. De Land Jul. 1966 134 p refs
(Contract AF 49(638)-1700; Proj. RAND)
(RM-4962-PR; AD-635886) CFSTI: HC $4.00/MF $1.00

The mathematical simulation of human blood biochemistry includes the results of detailed chemical analysis of human blood under a variety of chemical stresses. Mathematical simulations of increasing degrees of complexity are developed. A rudimentary-blood model assumes the conventional roles of the fixed proteins, the neutral electrostatic charge constraints, and the active cation pump as the major characteristics of hemostatic blood. The microscopic properties of the proteins, particularly their buffering behavior, are incorporated into the model by a mathematical procedure that assumes that the serum albumin and the various globulins represent all of the important buffering power of the plasma fraction. A model of the respiratory biochemistry of the blood, embodying the results of the previous biochemical structural detail, is tested under various conditions. Properties of the

mathematical model, such as gas exchange, buffering, and response to chemical stress in the steady state, are practically indistinguishable from those properties of real blood within the limits of the present validation program. Author (TAB)

N66-37268*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

DECK MOTION SIMULATOR PROGRAM—HORIZONTAL SINUSOIDAL OSCILLATION EFFECTS UPON PERFORMANCE OF STANDING WORKERS

J. S. Seeman and R. B. Williams Washington, NASA, Oct. 1966 48 p refs

(NASA-TN-D-3594) CFSTI: HC $2.00/MF $0.50 CSCL 05H

Simulation experiments were conducted to determine the effects on maintenance personnel of exposure to wind-induced oscillations of the Saturn V vehicle servicing platforms. It was determined that horizontal, linear, sinusoidal oscillation frequencies of 0.33 cps and 0.80 were satisfactory samples of expected wind conditions; corresponding amplitudes were ±6.3 inches and ±7 inches. A floor-mounted, electrohydraulically controlled deck motion simulator was used to reproduce some of the known motions; however, it did not reproduce the ellipsoidal motion pattern. Six mechanics, designers, and engineers participated in three tasks at each frequency and amplitude: hand assembly accuracy test, hand probe steadiness test, and visual acuity test. The instructions read by the subjects, and to the subjects, are included. Tentative conclusions based on test results indicate no significant differences at 0.33 cps; however, significant performance decrements appeared at 0.80 cps. It was found that at 0.80 cps workers cannot perform tasks requiring tow-hand operations; and increase of time does not result in increased performance accuracy of precision tasks. M.G.J.

N66-37278*# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

TOXICITY STUDIES OF COOLANOL 15 Final Report, Jan.-Sep. 1965

Ralph F. Ziegler, Farrel R. Robinson, and David T. Harper, Jr. Dec. 1965 22 p ref

(NASA Order T-31248-G)

(NASA-CR-78150; AMRL-TR-65-213) CFSTI: HC $1.00/MF $0.50 CSCL 06T

Coolanol® 15, a synthetic heat transfer fluid, is currently being used in the heat transfer systems of manned spacecraft. The current studies were undertaken to confirm or refute previously reported effects on the central nervous system and to acquire additional information on the toxicity of this compound. The effects of single intraperitoneal injections in mice and rats, repeated subcutaneous injections in rabbits, and the repeated cutaneous application on the unabraded skin of rabbits, monkeys, and dogs were investigated. Parenteral injection revealed that Coolanol 15 is relatively nontoxic. The LD_{50} for mice was found to be greater than 20.0 gm (22.2 ml) per kg at 24 hours and 5.9 gm (6.6 ml) per kg at 7 and 14 days. Repeated subcutaneous injections in rabbits resulted primarily in localized reactions at injection sites. The only effects which could be directly attributed to the cutaneous application of 3.6 gm (4.0 ml) per kg per day for 20 days involved the skin. Drying and encrustation and/or desquamation of the superficial layers of the skin were the principal lesions observed clinically, while microscopic examination revealed varying degrees of hyperkeratosis and cellular infiltration. These studies failed to confirm the previously reported lesions in the central nervous system attributed to Coolanol 15. Author

N66-37282*# Naval School of Aviation Medicine, Pensacola, Fla. Naval Aerospace Medical Inst.

INFLUENCE OF CONTACT CUES ON THE PERCEPTION OF THE OCULOGRAVIC ILLUSION

Brant Clark and Ashton Graybiel 5 Aug. 1966 15 p refs Joint Rept. with NASA

(NASA Order R-93)

(NASA-CR-78269; NAMI-976) CFSTI: HC $1.00/MF $0.50 CSCL 06N

Measurements were made on five normal and five labyrinthine-defective men when they stood erect in a room while it was stationary and again when it was rotating. The procedure was designed to produce two situations for the normal men in which otolith and non-otolith information were synergistic and three others in which they were antagonistic. Perception of the visual horizontal during rotation was not systematically related to differences in head and body position, nor were there significant differences between the normal and L-D men. The results show that nonotolith information predominates in this experimental situation. Author

N66-37283*# Naval School of Aviation Medicine, Pensacola, Fla. Naval Aerospace Medical Inst.

HISTOLOGICAL STUDY OF SPONTANEOUS EAR INFECTIONS IN ALBINO RATS

Makoto Igarashi and Albert E. New 20 May 1966 19 p refs Joint Rept. with NASA

(NASA Order R-93)

(NASA-CR-78270; NAMI-967) CFSTI: HC $1.00/MF $0.50 CSCL 06C

When albino rats are used for otological experiments, it is unnecessary to have a large number of experimental animals as there is no precise method for detection of spontaneous ear infection of the rat in the vital status. Post-mortem histological investigation is the only reliable procedure available by which otological infections can be detected. The ears of 16 albino rats originating from three different suppliers were histologically examined. Spontaneous middle ear infection was found in an average of 25% of the ears. Author

N66-37288*# Houdry Process and Chemical Co., Philadelphia, Pa. Research and Development Dept.

FEASIBILITY STUDY OF A LOW TEMPERATURE CARBON DIOXIDE REMOVAL SUBSYSTEM, PART II Final Report

E. G. Bauer Jan. 1964 52 p refs *Its* Tech. Rept.-70

(Contract NAS9-1782)

(NASA-CR-65505; WO-87-0486) CFSTI: HC $2.50/MF $0.50 CSCL 06K

This study was conducted to determine the feasibility of removing metabolic carbon dioxide (CO_2) and water from the atmosphere of a four-man space cabin by means of a low-temperature freezeout process. The system is to run continuously for one year. The recovered carbon dioxide is passed to a reduction system where it is reduced to breathable oxygen and waste hydrocarbons. A portion of the recovered water is passed to an electrolytic cell and the remainder is used as drinking water. The results of this study indicated that the CO_2 removal system is feasible for systems having a compressor discharge pressure equal to or greater than 70 psia. Power requirement was minimum for the 70 psia system and was 550 watts. The equipment will require a volume of 7 ft^3 and will weigh 200 lbs. Author

N66-37289*# Houdry Process and Chemical Co., Philadelphia, Pa.

INTEGRATED CARBON DIOXIDE REDUCTION SYSTEM FEASIBILITY STUDY, PART I Final Report

J. D. Potts and J. J. Donovan 16 Apr. 1964 74 p refs
(Contract NAS9-1782)
(NASA-CR-65504) CFSTI: HC $2.50/MF $0.75 CSCL 06K

Results are presented from a design study and experimental program conducted to define a method for the physical recovery of carbon dioxide from the atmosphere of a space cabin and the chemical recovery of metabolic oxygen from carbon dioxide and metabolic water. The design study confirmed the original estimates for the carbon dioxide recovery system. It was found that the critical mechanical components were not state-of-the-art. The chemical efficiency of the carbon dioxide reduction process is about one-fourth that necessary to make good the postulated sizes and power demands of the proposal flow sheet. The mechanical design studies indicated the need for developing small, high temperature control valves for the chemical process. It is recommended that a program of study be initiated to advance the state-of-the-art to a position where the proposed system can demonstrate its superiority to present systems. H.S.W.

N66-37309*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.

MAN SYSTEM CRITERIA FOR EXTRATERRESTRIAL ROVING VEHICLES. PHASE IB: THE LUNEX II SIMULATION Interim Technical Report

J. E. Haaland 15 Jun. 1966 272 p refs *Its* Rept.-12504-ITR2
(Contract NAS8-20006)
(NASA-CR-78245) CFSTI: HC $6.00/MF $1.50 CSCL 06K

An 18-day lunar surface mission was simulated under laboratory conditions with two subjects to validate a minimum volume cabin design for a lunar roving vehicle. The cabin was evaluated with subjects performing representative scientific and mission orientated tasks using a 16-hour on and 8-hour off work-rest schedule. A 3000 calorie/day diet was provided. Driving, monitoring, navigation, sample measurement, and audio balancing tasks were evaluated. Subject's maximum oxygen capacity and heart and respiratory rates were obtained by measuring oxygen consumption during graded treadmill runs. Heart and respiratory rates were also taken continuously via a biotelemetry system. Water balance and urine analyses were performed. Subject's interaction in pressure suits with the vehicle interior volumes and workspace layout was evaluated during simulated emergencies. Daily extravehicular activities were performed while wearing inflated pressure suits, and the physiological stresses measured. No adverse trends or irregularities were noted and the subjects maintained satisfactory performance levels and physical condition throughout the simulation. R.N.A.

N66-37321*# Naval School of Aviation Medicine, Pensacola, Fla. Aerospace Medical Inst.

THE INVERSION ILLUSION IN PARABOLIC FLIGHT: ITS PROBABLE DEPENDENCE ON OTOLITH FUNCTION

Ashton Graybiel and Robert S. Kellogg 20 Jul. 1966 15 p refs Joint rept. with NASA *Its* rept.-134
(NASA Order R-93)
(NASA-CR-78067; NAMI-974) CFSTI: HC $1.00/MF $0.50 CSCL 06S

Observations were made on normal subjects and deaf persons with bilateral labyrinthine defects (L-D subjects) under three different conditions in parabolic flight: (1) free-floating, (2) restrained in a Fiberglass mold, and (3) standing on the overhead during a modified parabola generating about −0.05 G unit. There were interindividual differences in the reactions among the normal but not among the L-D subjects. Some normal but none of the L-D subjects experienced a reversal of their personal orientation with regard to up-down under all three conditions. This reversal was considered to have its genesis in the vestibular organs, probably the otolith apparatus. Findings are in accord with Russian reports describing feelings of inversion among cosmonauts in orbital flight. Attention is called to the necessity of distinguishing between information furnished by touch-pressure, kinesthesis, and stereognosis under ordinary conditions and agravic touch-pressure, agravic kinesthesis, and agravic steragnosis. Author

N66-37341# Pacific Northwest Research Foundation, Seattle, Wash.

EFFECTS OF IONIZING RADIATION RADIATION ON TESTICULAR FUNCTION OF MAN Second Yearly Progress Report, 1 Jun. 1964–31 May 1965

Carl G. Heller 15 Mar. 1965 35 p refs
(Contract AT(45-1)-1780)
(RLO-1780-8) CFSTI: HC $2.00/MF$ 0.50

Progress is reported on: design and use of X-ray apparatus for uniform irradiation of human testes; hormonal evaluations; seminal fluid counts; quantitation of the germinal epithelium; assessing Leydig cell function; chromosomal studies; and tritium labeling in X-ray studies. Hormonal evaluations were made on subjects that received 5, 15, 20, 25, 50, 100, 300, 400, or 600 R. Estrogen, ICSH, and 17 ketosteroid data revealed no apparent changes after radiation compared to that of the control period. There was, however, a highly significant rise in gonadotropins following irradiation for every dose level and every subject. Of the subjects undergoing testicular biopsy, only 39% experienced a drop in sperm count, and this decrease always occurred within the first ten weeks. A technique was devised for evaluating the structural changes in Leydig cells and relating these to observed hormonal changes, or lack of changes. Problems inherent in the study of pachytene bivalents are discussed. Preliminary studies were conducted on two individuals to determine if labeled sperm could be detected through the depletion period following irradiation, and therefore, to prove that the preleptotene spermatocyte is not as radiosensitive as the spermatogonia. The two individuals were injected with ^{3}H-thymidine just prior to irradiation, and smears of their seminal fluid were followed by radioautography. Labeled sperm appeared after 46 days and continued until the tubules were empty and the subjects zoospermic as determined by routine seminal fluid counts. NSA

N66-37342# Brookhaven National Lab., Upton, N. Y.

HEMATOLOGICAL EFFECTS OF SPACE RADIATION

Robert A. Conard [1965] 31 p refs
(Contract AT(30-2)-GEN-16)
(BNL-10221) CFSTI: HC $2.00/MF $0.50

Available data on the hematological effects of space radiation on man are reviewed. The data indicate that the bone marrow is, under most circumstances, the most critical organ for damage from radiation. The blood forming tissues possibly do not have the regenerative or renewal capacity that the gastrointestinal epithelium has, and will, in most cases, be the limiting factor for survival. Neutrophil and platelet levels will be of primary importance in regard to the fitness and survival of the astronaut from the hematological point of view. Peripheral blood counts, both preflight and in-flight, for total white cell count (with neutrophil and lymphocyte levels) offer the best index of prognosis from the point of view of hematopoietic damage. Lymphopenia must be interpreted with caution, since dose distribution patterns and abscopal effects from partial body irradiation may give lower values than indicative of general bone marrow damage. The development of fever, infection, bleeding are signs of severe bone marrow damage. Abortion of a mission is indicated if any accumulated whole body dose of radiation of greater than 150 rads in a 48 hour period occurs; white blood counts drop below 2000 cells

per cubic mm and neutrophils below 1000 cells per cubic mm; or if associated fever, infections, or bleeding occur. Very large doses of partial body radiation may be tolerated without lethal depression of circulating blood cells. Shielding part of the bone marrow may be an important factor in preventing serious hematological depression. It is recommended that serious consideration be given to providing shielding of part of the bone marrow of the astronaut. A lead apron over the pelvic region would shield about 40% of his bone marrow, and he could then withstand considerably larger doses of radiation to the remainder of his body. The dose rate and depth-dose distribution patterns of space radiation are the most important physical considerations in determining total bone marrow damage. High proton flux irradiation associated with solar flares presents the most serious radiation hazard. Based on limited data, the quality of radiation delivered to the bone marrow does not appear to present any special hazards, since the RBE appears to be about 1 or only slightly above for most space radiations that penetrate to the depth of the bone marrow. Author (NSA)

N66-37360*# Naval School of Aviation Medicine, Pensacola, Fla. Naval Aerospace Medical Inst.

LACK OF RESPONSE TO THERMAL STIMULATION OF THE SEMICIRCULAR CANALS IN THE WEIGHTLESSNESS PHASE OF PARABOLIC FLIGHT

Robert S. Kellogg and Ashton Graybiel 9 Aug. 1966 16 p refs

(NASA Order R-93)

(NASA-CR-78224; NAMI-977) CFSTI: HC $1.00/MF $0.50 CSCL 06S

The objective of this study was to clarify the mechanism of caloric nystagmus in man by conducting the test in weightlessness. Eight subjects were selected on the basis of a strong nystagmus response to irrigation with ice water. Nystagmus was determined by oscillograph tracings and direct observation, and, in addition, subjective responses of the subject were obtained. The experimental evidence indicated that, under the conditions of this experiment, zero gravity completely suppressed caloric nystagmus. This supported Barany's original hypothesis that caloric nystagmus was dependent on difference in specific weight of the endolymph in the horizontal canal. Author

N66-37388# Royal Inst. of Tech., Stockholm (Sweden). Speech Transmission Lab.

ACOUSTIC SPECIFICATION OF SPEECH Final Scientific Report, 1 Jan.-31 Dec. 1965

C. G. M. Fant 31 Jan. 1966 15 p refs

(Grant AF-EOAR-65-51)

(AFCRL-66-294; AD-635633) CFSTI: HC $1.00/MF $0.50

This report summarizes results from speech research during the calendar year of 1965 at the speech transmission laboratory mainly in the field of speech production and speech analysis. Author (TAB)

N66-37399# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON COGNITION OF SPEECH SOUNDS WITH THE AID OF SELF-ORGANIZING SYSTEMS WITH TWO POSITIVE FEEDBACKS

G. L. Otkhmezuri 25 May 1966 24 p refs Transl. into ENGLISH from Avtomatyka (Kiev), v. 9, no. 2, 1964 p 59-70

(FTD-TT-65-1851; TT-66-61798; AD-635849) CFSTI: HC $1.00/MF $0.50

The use of self-organizing systems in the role of cognitive devices of second-degree speech is discussed. Advantages of such systems in comparison with determinative systems are shown. Block diagrams are proposed for the cognizance of sounds with the use of self-organizing systems. Methods of improving the cognizance part by the introduction of additional bonds are given. Certain experimental results obtained with the use of self-organizing systems with one (basic) positive feedback are presented. TAB

N66-37425# Joint Publications Research Service, Washington, D. C.

SOVIET GOALS AND SOME ACHIEVEMENTS IN PSYCHOLOGY

P. K. Anokhin et al 2 Sep. 1966 59 p Transl. into ENGLISH from Vopr. Psikhologii (Moscow), v. 12, no. 3, May-Jun. 1966 p 3-9, 10-32, 39-43, 44-48, 184-188

(JPRS-37416; TT-66-33844) CFSTI: $3.00

Translations of five articles covering the problems of psychology in the following areas are presented: the objects of psychology; cybernetics and integrative brain activity; heredity, environment, brain, and problem solving; electrical activity of the deep structures of the brain when studying the immediate memory; and a discussion of the book "Problems of Social Psychology". C.T.C.

N66-37426# Rochester Univ., N. Y. Dept. of Electrical Engineering.

ELECTRICAL RESISTIVITY OF LUNG AT 100 kc/sec

Edwin Kinnen and D. Witsoe Brooks AFB, Tex., School of Aerospace Med., Jun. 1966 16 p refs

(Contract AF 41(609)-2278)

(SAM-TR-66-51; AD-636912) CFSTI: HC $1.00/MF $0.50

Average resistivity values of the lung were determined from measuremnts made on the surface of canine lung in vivo at 100 kc./sec. Data were taken at various levels of expiration with several different electrode configurations on each of 7 dogs. Theoretical considerations assumed the lung to be a homogeneous, isotropic, and primarily resistive medium at this frequency. The linear regression equation for resistivity as a function of lung air volume representing all data was calculated. The variation of resistivity values is characterized by a standard deviation of 180 ohm cm. for the distribution of individual experiment averages about the average of all data, at one-half expiration level. On the basis of assumptions relating normal and collapsed lung air volume, the resistivity of canine lung in situ can be expected to be around 1,800 ohm cm. at normal expiration. With inspiration, this value increases linearly by approximately 230 ohm cm. per 100 cc. Both of these values are expected to vary within 30% for an individual experiment, however. Comparison of the data taken with the various measurement technics on an individual animal indicated no discrepancy. Author (TAB)

N66-37436# Armed Forces Radiobiology Research Inst., Bethesda, Md.

A PROCEDURE FOR MINIMIZING PERSONNEL HAZARDS WHILE CHANGING TRITIUM TARGETS IN ACCELERATORS

J. A. Aberle, A. R. Macdonald, and S. W. Porter, Jr. May 1966 23 p refs

(AFRRI-TN66-5; AD-636185) CFSTI: HC $1.00/MF $0.50

A detailed procedure for minimizing personnel hazards while changing tritium targets in accelerators is given. The step-by-step process utilizes an airtight stainless steel glove box. The use of a plastic containment area is also described. Author (TAB)

N66-37437# School of Aerospace Medicine, Brooks AFB, Tex.

ECLIPSE BURNS IN HUMANS AND LABORATORY THRESHOLD MEASUREMENTS IN RABBITS

Ralph G. Allen, Jr. and Everett O. Richey May 1966 11 p refs
(SAM-TR-66-45; AD-635736) CFSTI: HC $1.00/MF $0.50

The radiant energy incident on the retina of a human viewing the noon-day sun is calculated as 4.25 cal./cm. sq.-sec. with an image diameter of 0.16 mm., assuming an atmospheric transmission of 85% and a pupil diameter of 2.5 mm. The retinal irradiance under the limiting conditions of 100% atmospheric transmission and 6 mm. pupil diameter is shown to be only 29 cal./cm. sq.-sec. This retinal irradiance is compared to experimentally determined retinal burn thresholds in rabbits. It is concluded that eclipse burns, which are known to occur, would not be predicted on the basis of extrapolated animal data, and that care must be exercised in using existing animal threshold data in predicting chorioretinal damage in humans.

Author (TAB)

N66-37439# Army Medical Research Lab., Fort Knox, Ky.
ANNUAL PROGRESS REPORT, FY-1966
30 Jun. 1966 82 p refs
(RCS-MEDDH-288(R1); AD-636281) CFSTI: HC $3.00/MF $0.75

The investigations reported are related to: human vision, hearing, equilibrium, strength and endurance; effects of laser on ocular structures, immune mechanisms and other biologic models; effects of irradiation on behavior of rats and mice; extending human red blood cell survival, clarifying safety limits for use of group O blood donors and supplying blood to military units; infectious diseases of laboratory animals; dissolution of blood clots; corticosteroids; analysis and detoxification of snake venom. In addition, there is a report of a Costan Rican effort related to antivenin production in that country and uncontrolled observations of treatment of human envenomation.

Author (TAB)

N66-37442# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF LIGHT ON THE KETOSTEROID EXCRETION
Emil Wallner, Maria Kerepesi, and Magna Radnot 26 May 1966 14 p refs Transl. into ENGLISH from Acta Chir. (Hungary), v. 4, no. 3, 1963 p 181–188
(FTD-TT-65-1867; TT-66-61801; AD-635854) CFSTI: HC $1.00/MF $0.50

The day–night rhythmicity of ketosteroid excretion was studied in hospitalized patients, as well as the effect of light or the influence of the temporary elimination of light on the extent and the rhythm of the ketosteroid excretion. The 12 hour night fraction proved to be 30.5% less than the same fraction taken during the day. Complete darkness lasting from 7 to 10 days reduced the mean value of the excreted ketosteroids, although the day–night rhythm persisted.

Author (TAB)

N66-37446# Cambridge Univ. (England). Zoological Lab.
BIOLOGICAL CLOCKS AND THEIR INTERACTIONS IN INSECTS Final Scientific Report
Janet Harker 1 Nov. 1965 42 p refs
(Grant AF-EOAR-64-14)
(AFOSR-66-1478; AD-635770) CFSTI: HC $6.00/MF $0.50

The research described falls into four sections: (a) Histological investigations into the activity of the neurosecretory cells in the cockroach suboesophageal ganglion show that no clear changes occur in the stainable secretory material in these cells to parallel the animal's circadian locomotor activity cycle. The nuclei of some of these cells showed a possible circadian cycle of change in volume. (b) A method of bioassaying pharmacologically active extracts of cockroach tissues was set up. After initial trials it was considered that the necessary further development of the apparatus was not warranted. (c) Operations on the nervous system of cockroaches confirmed that the clock mechanism controlling the activity cycle could function without direct nervous connection between the suboesophageal ganglion and the corpora cardiaca. (d) The rate of development of Drosophila pupae is affected by factors following a circadian rhythm. The form of the rhythm is determined by both light-on and light-off signals, but the timing of the rhythm is determined by the two signals acting independently of each other. The circadian rhythm of eclosion of Drosophila cultures is shown to be the result of the summation of different individual rhythms of development at earlier stages.

Author (TAB)

N66-37449# Naval School of Aviation Medicine, Pensacola, Fla.
TECHNIC FOR REMOVAL OF WHOLE RETINAS
Jesse Vasys Jul. 1966 13 p refs
(SAM-TR-66-67; AD-636725) CFSTI: HC $1.00/MF $0.50

A method of dissection that provides undamaged, intact retinas is described. Whole eyes are soaked successively in 10% buffered formaldehyde, distilled water, 60% alcohol, and distilled water. The eye globe is divided into two sections and the whole retina is removed by a gravity flow technic. The retina is then clover-leafed, stained, and mounted on a glass slide.

Author (TAB)

N66-37450# Army Biological Labs., Fort Detrick, Md.
STERILIZATION WITH METHYL BROMIDE VAPOR
Daniel L. Jones and Charles R. Phillips Jul. 1966 22 p refs *Its* Tech. Manuscript-304
(AD-636846) CFSTI: HC $1.00/MF $0.50

Methyl bromide vapor was shown to be bactericidal for the spores of Bacillus subtilis, and the vegetative cells of Staphylococcus aureus and Escherichia coli. The disinfection rate of B. subtilis spores has been determined for five different temperatures. Bacteria dried on cloth patches are sterilized more rapidly by methyl bromide vapor in atmospheres of low relative humidity than in atmospheres of higher relative humidity. Organisms in aqueous suspension can be sterilized by the admission of methyl bromide vapor to the atmosphere above the suspension in spite of the low solubility of methyl bromide in water. Such sterilization is not greatly influenced by changes in pH of the aqueous suspension, nor by the presence of organic matter of salt dissolved in the water. Methyl bromide has only about one-tenth the activity of ethylene oxide as a gaseous disinfectant, but since it is nonflammable it can be used in large-scale operations where safety precautions prohibit the use of ethylene oxide. It is believed that the mechanism is one of direct alkylation of protein material within the bacterial cell by methyl bromide.

Author (TAB)

N66-37454# Naval School of Aviation Medicine, Pensacola, Fla.
PERCEPTIONS AND ATTITUDES OF AVIATORS TOWARD VOLUNTARY WITHDRAWAL FROM FLIGHT TRAINING
Richard S. Pomarolli 8 Jun. 1966 17 p refs
(SR-66-4; AD-635602) CFSTI: HC $1.00/MF $0.50

The study used a questionnaire approach to investigate perceptions and attitudes of winged aviators toward voluntary withdrawl (DOR) from flight training. Results reveal widespread disagreement between DOR students and the aviators regarding what factors are of primary importance in the DOR process. In the assessment of pilot attitudes toward DOR'ing, the great majority of the group sampled expressed realistic and accepting attitudes toward this phenomenon. It is recommended that pilots assigned to instruction duty received thorough instruction regarding the factors in the DOR process.

Author (TAB)

N66-37465# Naval Air Development Center, Johnsville, Pa.
DECREASE OF METABOLIC RATE BY PREOPTIC LESIONS AS CAUSE OF HYPOTHERMIA IN CATS
F. H. Jacobson and R. D. Squires 7 Jul. 1966 20 p refs
(NADC-MR-6605; AD-636724) CFSTI: HC $1.00/MF $0.50

The persistence of hypothermia in eight cats with lesions in the medial preoptic region of the forebrain was due in large part to their lower oxygen consumption per unit body weight after operation. Vasodilation inappropriate to the low body temperature occurred sometimes, as did vasoconstriction inappropriate to the rare high body temperature. Usually the cats were appropriately vasoconstricted. There was no decrease of the oxygen consumption per kilogram by five unoperated cats fasted until they lost 16.3% (mean) of their body weight. (The operated cats had lost 14.1% of their body weight). The lower metabolic rate of the lesioned cats, therefore, did not result from weight loss or reduced food intake, but from loss of preoptic tissue which normally, when its temperature falls, stimulated metabolism. Author (TAB)

N66-37547# Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine.
THE AEROMEDICAL ASSESSMENT OF HUMAN SYSTOLIC AND DIASTOLIC BLOOD-PRESSURE TRANSIENTS WITHOUT DIRECT ARTERIAL PUNCTURE
Michael T. Lategola May 1966 21 p refs
(AM-66-16)

A system for vitually continuous measurement of both systolic and diatolic blood pressures without recourse to direct arterial puncture has been effected by the modification of already existing standard equipment. This sytem entails the measurement of systolic blood pressure with a digital pressure cuff on one arm simultaneously with the measurement of diastolic blood pressure from a bracial cuff mounted on the other arm. The systolic-pressure device was used virtually unmodified. The diastolic-pressure device was originally designed to measure both systolic and diastolic pressures automatically. The modification consisted mainly in the elimination of the systolic portion of the automatic cycle. The combined system is capable of routinely obtaining measurement frequencies in the order of 20 per minute for protracted time periods. The system functions well under all resting-subject conditions and under some "body-movement" conditions. This system is currently in routine use in all of our aeromedically oriented research involving the assessment of cardiopulmonary function. Author

N66-37564*# Neuroscience Research Program, Brookline, Mass.
SLEEP, WAKEFULNESS, DREAMS AND MEMORY
Walle J. H. Nauta and Werner P. Koella 31 May 1966 107 p refs *Its* Bull. V. 4, No. 1
(Grants NsG-462; NIH GM-10211-04; Nonr(G)-00067-65)
(NASA-CR-78365) CFSTI: HC $4.00/MF $0.75 CSCL 05J

Mechanisms of the sleep–wakefulness cycle are studied, especially as manifestations in changes of central neural activity and attendant perceptual, ideational, and behavioral states. The physiological phenomenology of sleep is analyzed, and mechanisms of sleep induction, maintenance, and termination are discussed. The psychological phenomenology of normal sleep and of abnormal states of sleep and wakefulness are also considered. An extensive bibliography of relevant publications is included. A.G.O.

N66-37566*# Colorado State Univ., Fort Collins.
THE USE OF PATHOGEN-FREE PLANTS IN A MICROCOSM, PART II Final Report, Jan. 1–Jun. 30, 1966
Ralph Baker [1966] 11 p Submitted for Publication
(Grant NsG-78-60)
(NASA-CR-78354) CFSTI: HC $1.00/MF $0.50 CSCL 06F

A prototype germfree controlled environment plant growth chamber was developed. The main physical characteristics of the unit are diagrammed, its various subsystems are described, and its theory of operation is discussed. Initial tests of the chamber established the feasibility of the design, however modifications were necessary. Completed modifications of the unit are outlined along with improvements still in progress. Drawings of the modified prototype are also shown. The initial evaluation was interrupted because of icing problems. Modifications to eliminate this and other design deficiencies are being completed. The evaluation did show that the unit would meet the original temperature specification of 10° to 35° C. However, it consistently delivered a low relative humidity of 52% as compared to the desired low of 10%. This figure could be improved with a more complicated and expensive dehumidifying system. The chamber does represent a considerable advancement over modified animal tents which have been used as plant growth chambers and is better in all respects than any other previously developed germfree plant growth chamber. R.N.A.

N66-37585*# Sandia Corp., Albuquerque, N. Mex.
EVALUATION OF THE EFFICIENCY OF A CLASS 100 LAMINAR-FLOW CLEAN ROOM FOR VIABLE CONTAMINATION CLEANUP. PART I: MICROBIOLOGICAL STUDIES RELATING TO CLEAN ENVIRONMENTS
John William Beakley, W. J. Whitfield, and J. C. Mashburn Sep. 1966 10 p refs
(NASA Order R-09-019-040)
(NASA-CR-78342; SC-RR-66-385) CFSTI: HC $1.00/MF $0.50 CSCL 06F

A laminar-flow wall-to-floor clean room was challenged with *Bacillus subtilis* spores and then tested for efficiency of cleanup using both electronic and viable particle detection systems. The results confirmed the extreme efficiency of laminar-flow systems in reducing airborne viable particles to an absolute minimum. Author

IAA ENTRIES

A66-38447
OXYGENATION OF BLOOD DURING INHALATION OF A LIQUID MEDIUM.
L. Lukin (California, University, Medical Center, Biomechanics Laboratory, San Francisco, Calif.).
Society for Experimental Biology and Medicine, Proceedings, vol. 121, 1966, p. 703-707.
Contract No. NASw-674; Grant No. NsG-722.

Experimental study of liquid-breathing. Seven dogs were submerged in a hyperbaric chamber containing Ringer's solution equilibrated with oxygen at 8 atm. All seven animals breathed the liquid for at least 8 min. Five of the animals died, but the two that survived maintained liquid-breathing for 1 hr. As long as the animals breathed the solution, their arterial O_2 concentration was adequate or above normal; however, CO_2 was gradually accumulating in the blood. Four of the dogs died in the chamber as a result of sudden apnea or irregularity and bronchiospasm followed by apnea. Histopathological examinations revealed excessive blood, vascular lesions, and infiltration of neutrophilic cells into the lungs, but no atelectasis (inadequate expansion of the lungs). Vascular lesions were also found in the central nervous system, including the medulla, which may have caused the sudden apnea. M. L.

A66-38454 #
PRINCIPLES AND APPLICATIONS OF PREDICTION DISPLAY.
R. Bernotat and H. Widlok (Berlin, Technical University, Institute for Guidance and Control, Berlin, West Germany).
Institute of Navigation, Journal, vol. 19, July 1966, p. 361-370. 7 refs.

Analysis of the improvement that mechanical prediction might effect in the performance of a human operator in a control system. The principles of prediction display are described, and two methods for mechanically calculated prediction - the model method and the extrapolation method - are discussed. The input-output behavior of a human operator in a control system is characterized by his ability to predict the course of a target based on past performance. With a stochastic signal or a more complicated system, however, prediction is necessarily imperfect, and the operator's response lags behind the input. Four types of knowledge are needed for prediction: actual value of the controlled variable, derivative information for the variable, system-response, and future disturbing inputs. M. L.

A66-38481 #
HUMAN ENGINEERING AND ACOUSTICAL FATIGUE.
Gilbert C. Tolhurst (U.S. Navy, Office of Naval Research, Washington, D.C.).
American Society of Mechanical Engineers, Design Engineering Conference and Show, Chicago, Ill., May 9-12, 1966, Paper 66-MD-25. 10 p. 23 refs.
Members, $0.75; nonmembers, $1.50.

Study of a few of the many ways acoustic fatigue can be made less stressful. For purposes of discussion, system parameters and methods of alleviating fatigue are dichotomized into physiological and psychological factors. It would be preferable if all approaches to acoustic stress problem solutions could be resolved by a psychophysiological integral. The theories and techniques so derived would then only need to be applied by the human engineer. The human engineer must become aware of and know how to utilize the acoustic signal and to manipulate the environmental noise background in order to (1) enhance message transmission and reception, (2) maintain the man-machine system at an expedient level of performance, and (3) protect from overload and/or trauma. M. F.

A66-38483 #
BIOLOGICAL TELECOMMUNICATIONS.
R. M. Goodman (Franklin Institute, Research Laboratories, Electrical Engineering Div., Bio-Instrumentation Laboratory, Philadelphia, Pa.).
American Society of Mechanical Engineers, Design Engineering Conference and Show, Chicago, Ill., May 9-12, 1966, Paper 66-MD-27. 8 p. 17 refs.
Members, $0.75; nonmembers, $1.50.

Study of the specific area of telecommunications in biology which represent a means by which the observation senses of the biological and medical researcher are extended and enhanced. Progress and problems are discussed. Applications for such devices range from tiny ingestible devices to long-distance ranging equipment for animal ecological studies to surveillance and research equipment for human subjects. Problem areas embrace the application and development of nontoxic electrical contacts as well as higher capacity, smaller volume, electrical storage cells and further miniaturized electrical and electronic circuitry. M. F.

A66-38530
ON THE MELTING OF COPOLYMERIC DNA.
H. Reiss, D. A. McQuarrie, J. P. McTague, and E. R. Cohen (North American Aviation, Inc., Science Center, Thousand Oaks, Calif.).
(Biophysical Society, Annual Meeting, 9th, San Francisco, Calif., Feb. 24-26, 1965, Paper.)
Journal of Chemical Physics, vol. 44, June 15, 1966, p. 4567-4581. 30 refs.

A model for DNA molecules is introduced and treated by the methods of statistical mechanics. This model takes into account the difference in bonding free energy between adenine-thymine and guanine-cytosine base pairs. The model used is an extension of the Zimm-Bragg model for polypeptides. The partition function for a certain class (which probably corresponds to most DNA sequences) of molecules is evaluated numerically and the linear dependence of the temperature of half-denaturation on base composition is obtained, in agreement with the experimental work of Marmur and Doty. A further, previously unnoted, result is that the breadth of the transition is a function of the base composition. Comparison of the predicted broadening with available experimental data is excellent for DNA from simple organisms which probably possess only one kind of DNA molecule each. However, for complex organisms, which are known to have compositionally heterogeneous DNA, the relationship is not obeyed. This suggests the possibility of using transition breadth as a simple and rapid test for compositional heterogeneity of DNA's. (Author)

A66-38634
TRAINING THE VESTIBULE FOR AEROSPACE OPERATIONS - CENTRAL CONTROL OF VESTIBULAR FUNCTION.
Kent K. Gillingham (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Vestibular Research Section, Brooks AFB, Tex.).
Military Medicine, vol. 131, Aug. 1966, p. 696-704. 17 refs.

Study of one way of training the vestibular system for aerospace operations. The function of the semicircular canals and of the otolith organs is discussed. Other topics treated include vestibular suppression, the efferent sensory-control theory, spatial disorientation, and motion sickness. It remains to be determined whether the most effective and economical approach to vestibular training lies in more effective didactics, more sophisticated utilization of the suppression mechanism, the actual changing of erroneous vestibular responses into correct responses, or any combination thereof. M. F.

A66-38932 #
TRANSFER FUNCTION OF A PILOT DURING A CONTINUOUS, ONE-DIRECTIONAL PERTURBATION OF THE LATERAL MOTION OF AN AIRCRAFT [ZUR FRAGE DER ÜBERTRAGUNGSFUNKTION DES PILOTEN BEI EINER FORTWÄHREND IN EINE RICHTUNG WIRKENDEN STÖRUNG DER QUERBEWEGUNG VON FLUGZEUGEN].
Hubertus Schmidtlein (Darmstadt, Technische Hochschule, Institut für Flugtechnik, Darmstadt, West Germany).
Darmstadt, Technische Hochschule, Fakultät für Maschinenbau, Dr.-Ing. Dissertation, 1965. 143 p. In German.
Research supported by the Deutsche Forschungsgemeinschaft.

Study of the transfer response of a pilot to a steady, lateral, perturbing force on his aircraft. Measurements were conducted in a Boeing 707 flight simulator, and the effects of variations in the perturbation on the pilot's response were observed. R. A. F.

A66-39129
OBSERVED REGULARITIES OF CONTRAST VISION IN THE PHOTOPIC REGION - RESPONSE/STIMULUS PEAK-TO-PEAK MEASUREMENTS OF SPATIAL SINE-WAVE PATTERNS.
Olof Bryngdahl (Xerox Corp., Research and Engineering Div., Webster, N.Y.).
Optica Acta, vol. 13, Jan. 1966, p. 55-68. 13 refs.

Contrast characteristics of the human visual system are examined in the photopic luminance region by psychophysical examination of response/stimulus relationships using suprathreshold measurements. Results, for the transfer of the extreme values in spatially sinusoidal light distributions, show the dependence of perceived contrast on variation in the average luminance, modulation, and spatial frequency of a viewed sine-wave pattern. Certain regularities are discernible: (1) the peak-to-peak value of the apprehended brightness variation can be described as a power function of the peak-to-peak value in the stimulus; and (2) the relative change in the average brightness response with increasing object modulation retains its characteristics at the examined levels of average stimulus luminance. The sensitivity of the visual system to changes in contrast is found to be higher for object modulations below 0.30 than it is for higher modulation values. (Author)

A66-39211
EFFECTS OF ULTRA-VIOLET ALONE AND SIMULATED SOLAR ULTRA-VIOLET RADIATION ON THE LEAVES OF HIGHER PLANTS.
Morris G. Cline (California Institute of Technology, Div. of Biology, Pasadena, Calif.) and Frank B. Salisbury (Utah State University, Plant Science Dept., Logan, Utah).
Nature, vol. 211, July 30, 1966, p. 484-486. 12 refs.
NASA-supported research.

Investigation of the relative resistances of a wide variety of plants to relative UV intensities corresponding to those incident upon the surfaces of Mars, earth, and Venus. Two leaf-survival experiments are described involving a total of 67 species of plants, with special emphasis on Xanthium pennsylvanicum, Zea mays, and Pinus nigra. In the first experiment, a 15-watt, low-pressure mercury germicidal lamp was used (90% of energy at 2537 Å), and in the second, a complete solar spectrum was simulated by means of a 2500-watt, high-pressure xenon arc lamp. A plot of the leaf survival times under different intensities of extraterrestrial solar radiation in the second experiment is presented. Plants were usually irradiated for 13-16 hr each consecutive day. No attempt was made to simulate precise photoperiods, gravity effects, or gas composition or pressure of the Martian or other environments. Some plants were killed after only 1.8 hr of exposure to Venusian-level radiation while others survived 100 hr of such exposure, and the Austrian Pine (Pinus) showed almost complete absence of damage after 635 hr (44 days) of Martian-level radiation. It is concluded that, at least as far as UV resistance is concerned, even some terrestrial plants could survive the UV bombardment on Mars during a blue clearing. M. L.

A66-39315 #
RESULTS OF THE STUDY OF THE EFFECT OF COSMIC RADIATION AND OTHER SPACE FLIGHT FACTORS ON LYSOGENIC BACTERIA AND HUMAN CELLS IN CULTURE [ITOGI ISSLEDOVANIIA VLIIANIIA KOSMICHESKOI RADIATSII I DRUGIKH FAKTOROV KOSMICHESKOGO POLETA NA LIZOGENNYE BAKTERII I KLETKI CHELOVEKA V KUL'TURE].
N. N. Zhukov-Verezhnikov, I. N. Maiskii, A. P. Pekhov, N. I. Rybakov, N. N. Dobrov, V. V. Antipov, V. A. Kozlov, P. P. Saksonov, and I. I. Fedoplelov.
(Chekhoslovatskaia Akademiia Nauk, Institut Biologicheskoi Fiziki, Iubileinyi Simpozium, Brno, Czechoslovakia, May 1965.)
Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, vol. 31, July-Aug. 1966, p. 592, 593. In Russian.

Space flight factors exert a definite effect on the hereditary reactions of lysogenic bacteria which finds expression in a small but statistically significant increase of the induced phage production of the objects studied. The inducing effect proved to be more pronounced in the lysogenic bacteria exposed to space flight factors aboard the Vostok-3 spacecraft. The Vostok spacecraft traveled in orbits where no factors occurred that were capable of producing genetic anomalies which could produce malignant tumors or hereditary diseases.

(Author)

A66-39337 #
ORIENTATION AND ACTIVITY IN OPEN SPACE - FIRST PUBLICATION OF MOTION-PICTURE FRAMES FROM THE FLIGHT OF THE "VOSKHOD 2" [ORIENTATSIIA I DEIATEL'NOST' V BEZOPORNOM PROSTRANSTVE - VPERVYE PUBLIKUIUTSIA KINOGRAMMY POLETA "VOSKHODA-2"].
E. Ivanov, V. Popov, and L. Khachatur'iants.
Aviatsiia i Kosmonavtika, July 1966, p. 20-24. In Russian.

Analysis of data from the EVA of the Soviet cosmonaut Leonov during the flight of Voskhod 2. Data are concerned with Leonov's motion and orientation while in space. Black-and-white reproductions of some motion-picture frames are included. R. A. F.

A66-39420
BRIGHTNESS CONTRAST, COLOR CONTRAST, AND LEGIBILITY.
Michael V. McLean (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).
Human Factors, vol. 7, Dec. 1965, p. 521-526. 16 refs.

An experimental study was conducted investigating the effects of color and brightness contrast, direction of contrast, and six contrast values upon the legibility of a circular dial. The brightness of four chromatic hues was matched with four achromatic hues. Hues were combined in all possible combinations excluding chromatic with achromatic, resulting in six contrast values. For both dark on light and light on dark contrast directions, the contrast values were equal. Half of the twenty-four subjects had pilot training and half did not. A Dodge-type tachistoscope was used to present the stimulus conditions. Reading time results indicated that the addition of color contrast to a dial of a given achromatic brightness contrast value, with a light on dark contrast direction, will not degrade and may improve the legibility of that dial. Legibility was also found to increase as contrast value increased. The study indicates that the use of color should be reconsidered in its application as a coding technique in complex system displays. (Author)

A66-39421
SEARCH PERFORMANCE AS A FUNCTION OF PERIPHERAL ACUITY.
Dorothy M. Johnston (Boeing Co., Seattle, Wash.).
Human Factors, vol. 7, Dec. 1965, p. 527-535. 14 refs.

This study was made to investigate the relationship between the size of visual fields of observers and time required to locate targets on static displays. The findings, which indicate that people with large visual fields can find targets more rapidly than observers with small fields, have practical selection and training application. Equations are presented which can be used to determine search time that can be expected as a function of the size of the visual field of the observer and the apparent size of the area being searched. (Author)

A66-39422 #
LEGIBILITY STUDY OF SELECTED SCALE CHARACTERISTICS FOR MOVING-TAPE INSTRUMENTS.
Barbara J. Kelso (Bunker-Ramo Corp., Canoga Park, Calif.).
Human Factors, vol. 7, Dec. 1965, p. 545-554. 20 refs.
Contracts No. AF 33(657)-8600; No. AF 33(657)-8021.

A legibility study was performed to investigate the effects of scale factors, graduation marks, orientation of scales, and reading conditions on the speed and accuracy of reading moving-tape instruments. Each of 150 Air Force officers made 150 self-paced readings from slides of hand-drawn tape instruments. Error was expressed as the magnitude of deviation of a subject's verbal response from the set scale value. An analysis of variance was performed on the mean

error scores, standard deviations of error, mean reaction times, and standard deviations of reaction times. The results clearly favored the 1-7/8-in. scale factor over the 1-3/8-in. and the 2-3/8-in. scale factor. The use of 9 graduation marks was superior to either 0, 1, 3, or 4 graduation marks. Reading conditions had little effect on performance. Horizontal scales were read more rapidly but no more accurately than vertical scales. (Author)

A66-39423

DYNAMIC VISION - THE LEGIBILITY OF MODERATELY SPACED ALPHANUMERIC SYMBOLS.

S. Lippert and D. M. Lee (Douglas Aircraft Co., Inc., Biotechnology Section, Long Beach, Calif.).

Human Factors, vol. 7, Dec. 1965, p. 555-560.

Two experiments were conducted to investigate subject performance on the basis of two criteria: 0 and 100% legibility of moving targets. A modified method of limits was employed. The targets consisted of black alphanumeric symbols regularly spaced 7.5° apart on a brightly illuminated white background. Each target subtended an angle of 39'. Legibility of the symbols was determined as they moved vertically from top to bottom in a frontal plane. The mean angular velocities for both the 0 and 100% legibility performance levels were found to be approximately three times higher for the 7.5° symbol spacing than their respective velocities for a previously determined 1.5° symbol spacing. Performance was approximately twice as good with a 30° aperture as with a 3° aperture. (Author)

A66-39424

EFFECTS OF MAGNIFICATION AND OBSERVATION TIME ON TARGET IDENTIFICATION IN SIMULATED ORBITAL RECONNAISSANCE.

Charles W. Simon and David W. Craig (Hughes Aircraft Co., Culver City, Calif.).

Human Factors, vol. 7, Dec. 1965, p. 569-583. 8 refs.

When deciding what telescopic power is required to find objects of interest on the ground while flying over the earth at relatively high speeds, the positive value of an increased magnification must be balanced against the negative effects of a decreased observation time and an increased movement rate. The relative trade-off between these two factors - magnification and time - was compared in a series of three studies in which photographic imagery was used to simulate a telescopic view of the earth from a spacecraft orbiting at 175 nautical miles. Target acquisition decreased as image scale factor decreased and as image movement rate increased. When a change in scale factor was inversely proportional to a change in observation time, the positive effects of an increased image scale factor tended to exceed the negative effects of a decreased observation time and increased image movement rate within the limits of this study. The theoretical and practical implications of these and other results are discussed. (Author)

A66-39425

A SYSTEMS TASK USED IN THE STRESS TESTING OF SPECIAL MISSION PERSONNEL.

Richard E. McKenzie (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).

Human Factors, vol. 7, Dec. 1965, p. 585-590.

One aspect of a psychologic evaluation program for special mission personnel was structured within a concept of competing tasks, requiring two operator signal-display sources. One source produced an array of discrete, discontinuous signals. The other produced a continuous input for the operator to monitor and process. The evaluation was made with reference to the performance of an "ideal" subject. The results indicate that a criterion group of those finally selected for the special mission was better able to adapt to the two competing tasks and was less susceptible to the signal/noise ambiguity and the induced task stress than the special mission personnel group as a whole. (Author)

A66-39494

BLOOD GASES - CONTINUOUS IN VIVO RECORDING OF PARTIAL PRESSURES BY MASS SPECTROGRAPHY.

Sabbo Woldring, Guy Owens, and Donald C. Woolford (Roswell Park Memorial Institute, Dept. of Neurosurgery, Buffalo, N.Y.).

Science, vol. 153, Aug. 19, 1966, p. 885-887. 6 refs.
National Institutes of Health Grant No. GM-09034.

Gases were sampled directly from circulating blood through a membrane at the tip of an intravascular cannula that was connected to the analyzing section of a mass spectrometer. Partial gas pressures and membrane permeability determine gas flow into the spectrometer. Arterial carbon dioxide and oxygen pressures were simultaneously recorded in an anesthetized animal subjected to various respiratory maneuvers. (Author)

A66-39785

TILT TABLE RESPONSE AND BLOOD VOLUME CHANGES ASSOCIATED WITH THIRTY DAYS OF RECUMBENCY.

Fred B. Vogt (Texas Woman's University, Denton; Baylor University, College of Medicine, Dept. of Rehabilitation and Texas Institute for Rehabilitation and Research, Houston, Tex.), Pauline Beery Mack (Texas Woman's University, Nelda Childers Stark Laboratory for Human Nutrition Research, Denton, Tex.), and Philip C. Johnson (Baylor University, College of Medicine, Dept. of Medicine; Methodist Hospital, Houston, Tex.).

Aerospace Medicine, vol. 37, Aug. 1966, p. 771-777. 13 refs.
Grant No. NsG-440; Contract No. NAS 9-1461.

Five healthy adult males were studied during a 30-day bed rest experiment. Repeated tilt table tests, using an English-saddle type of support, were conducted before and after the period of recumbency to determine the response of the subjects. Radioisotope blood volume determinations were made prior to the study, during the study, and during the recovery phase. These tests were performed in conjunction with a study designed primarily to evaluate the musculoskeletal changes that occur as a consequence of prolonged bed rest. The results indicate that definite cardiovascular deconditioning occurs after 30 days of bed rest and that almost complete recovery is achieved after two weeks of ambulatory activity. The study also demonstrates that blood volume decreases in the first few days of bed rest and returns toward normal at the end of the 30-day bed rest period. (Author)

A66-39786

ADAPTATION TO PROLONGED EXPOSURES IN THE REVOLVING SPACE STATION SIMULATOR.

B. D. Newsom, J. F. Brady, W. A. Shafer, and R. S. French (General Dynamics Corp., General Dynamics/Convair, Life Sciences Laboratory, San Diego, Calif.).

Aerospace Medicine, vol. 37, Aug. 1966, p. 778-783. 16 refs.

Prior to design of a space vehicle that is to employ an artificial gravity, it is necessary to establish guidelines based not only on vestibular physiology but also on a measure of crew performance in a simulator that imposes realistic changes in the inertial environments. The Manned Revolving Space Station Simulator has been constructed according to this concept and allows adjustments of radius, rpm, and stability. Four subjects have been exposed for five days of continuous rotation at 6 rpm on a stable platform to establish a baseline to define stability requirements for a space vehicle with a "rotogravic" system. The four subjects all adjusted well to the environment and required little post spin readaptation. It is concluded that 6 rpm at a 20-ft radius is a satisfactory environment to use as a base line. (Author)

A66-39787

HEARING IN HYPERBARIC AIR.

Erik Fluur and John Adolfson (Karolinska Institute, Dept. of Otolaryngology, Stockholm; Göteborg, University, Psychological Laboratory, Göteborg, Sweden).

Aerospace Medicine, vol. 37, Aug. 1966, p. 783-785. 9 refs.
Research supported by the Ministry of Defence.

The effect of increased ambient air pressure on the hearing function in 26 experienced divers was investigated. Air and bone conduction audiograms were made in normal air (1 atm absolute) and in hyperbaric air (4, and 7, and 10, and 11 atm absolute). After

correcting for the transmission changes in the earphone (5 to 10 db), the maximum elevation of the hearing threshold was found to be about 30 to 40 db in the middle frequency range of hearing. The bone conduction was unaffected. (Author)

A66-39788 #
REVERSAL OF DECABORANE-MEDIATED NOREPINEPHRINE DEPLETION BY METHYLENE BLUE.
James H. Merritt and John A. Merritt (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Physiological Chemistry Section, Brooks AFB, Tex.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 786, 787. 11 refs.

Decaborane ($B_{10}H_{14}$) was found to deplete rabbit brain-stem and heart tissue of norepinephrine content. Six hours after 15 mg of decaborane/kg, the norepinephrine content was 33% and 57% of control values for brain and heart, respectively. Administration of methylene blue in a continuous drip over a 6-hr period (an initial dose of 7 mg/kg in 5% glucose, and then 0.13 mg/kg/hr in 5% glucose) prevented the fall in norepinephrine level. Mechanisms of action of methylene blue in reversing decaborane-mediated norepinephrine depletion are discussed. Treatment with methylene blue of individuals intoxicated with boron hydride seems more rational than the present empirical therapy. (Author)

A66-39789 #
RAPID DECOMPRESSION AND EXPOSURE OF FRESH FOODS TO NEAR VACUUM CONDITIONS.
Julian P. Cooke and Norman D. Heidelbaugh (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 788-790.
USAF-sponsored research.

Representative samples of eight unpackaged fresh foods (apples, bananas, carrots, eggs, grapes, oranges, plums, tomatoes) were decompressed in 1 sec from 259 mm Hg to 1 mm Hg absolute pressure and then held at about 1 mm Hg absolute for 30 min. Food samples with internal temperatures at the start of decompression of 24, 37, and 55°C were observed. The only significant differences detected in these decompressed foods when compared to non-decompressed controls occurred in the 55°C bananas, plums, and tomatoes which exploded. The pressure differential experienced by these foods was calculated by measuring the vapor pressure of their juices. These observations should be of value in understanding the reactions of foods exposed to rapid decompression and also to the selection of foods for use in altitude chambers and spacecraft. (Author)

A66-39790
FLIGHT RESEARCH PROGRAM. III - HIGH IMPEDANCE ELECTRODE TECHNIQUES.
James Roman (NASA, Flight Research Center, Edwards AFB, Calif.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 790-795.

This paper describes electrode techniques designed for large-scale flight physiological data collection on a routine basis. Large-scale data collection requires both smaller demands on crew time and less interference with crew comfort than could be achieved by former methods. The resistive components of electrode impedance appears to be related primarily to the extent of skin preparation. For any one method of skin preparation, both resistance and capacitance appear to be primarily a function of electrode area. Motion artifacts are not caused by changes in electrode impedance. Dry electrodes showing a resistive component in excess of 50,000 ohms can be used to obtain tracings of quality comparable, and in some cases superior to those obtained with larger wet electrodes. (Author)

A66-39791
DETERMINATION OF INFLIGHT BIOCHEMICAL RESPONSES UTILIZING THE PAROTID FLUID COLLECTION TECHNIC.
Bruce H. Warren, Ray W. Ware, Ira L. Shannon, and Sidney D. Leverett, Jr. (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).
(Aerospace Medical Association, Annual Meeting, 36th, New York, N.Y., Apr. 26-29, 1965, Paper.)
Aerospace Medicine, vol. 37, Aug. 1966, p. 796-799. 21 refs.

Parotid fluid samples were collected from 11 volunteer subjects during 57 clear weather, daytime, cross-country flights in the back cockpit of NF-100F aircraft. Subjects consisted of pilots and non-pilots all of whom were in a nonpiloting capacity during the experiments. Parotid fluid samples were also collected on subjects during a normal nonflying duty day. The plastic collecting device utilized in these experiments is described. All parotid fluid samples were analyzed for free 17-hydroxycorticosteroid (17-OHCS) levels. The nonflying day mean values for free 17-OHCS levels were essentially the same for F-100 pilots and nonpilots. F-100 pilots evidenced rises of free 17-OHCS during preflight, takeoff, and landing portions of flight which were considerably above the nonflying day mean value as well as above the mean values of nonpilots during corresponding portions of flight. (Author)

A66-39792
TELEMETRY SYSTEM FOR THE ACQUISITION OF CIRCADIAN RHYTHM DATA.
C. M. Winget and T. B. Fryer (NASA, Ames Research Center, Moffett Field, Calif.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 800-803. 19 refs.

A module assembly was designed to maintain an ambulatory animal for relatively long periods of time and to collect data on four circadian rhythms. Heart rate and deep body temperature data were collected by radio telemetry. The measurement of locomotor activity and oviposition was accomplished by direct data transmission. The data were evaluated by the correlogram, periodogram, power spectral analysis, and periodic regression techniques. Analysis of the data indicated circadian cycles as well as infradian and ultradian cycles. There was a high degree of correlation between the various parameters studied along with approximate equal period lengths in three of the cycles (deep body temperature, heart rate, and locomotor activity). (Author)

A66-39793
VOLUNTARY WITHDRAWAL FROM PRIMARY FLIGHT TRAINING AS A FUNCTION OF THE INDIVIDUAL FLIGHT INSTRUCTOR.
Richard S. Pomarolli and Rosalie Ambler (U.S. Naval School of Aviation Medicine, Pensacola, Fla.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 810-812.

The present study sought to determine if some flight instructors had significantly higher voluntary withdrawal (DOR) rates among their students than did other instructors. An overall statistical approach to the problem was used. This was followed by three ancillary approaches that examined the extreme cases in some detail. Chi-square test results indicated that the distribution of DOR's among instructors for the two-year period studied was not significantly different from a chance distribution. The three ancillary approaches supported this finding. Based on these findings, it was recommended that indices other than number of DOR's be used to explore the quality of the flight instructor-student relationship. This would be especially true in any attempt to establish a criterion of instructional effectiveness. (Author)

A66-39794
FLASHBLINDNESS PROTECTION - THE EYE PATCH.
J. H. Hill and Gloria T. Chisum (U.S. Naval Air Development Center, Aerospace Medical Research Dept., Johnsville, Pa.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 813-817.

Two experiments were conducted to evaluate the effectiveness of a simple eye patch as a flashblindness protective device and to provide an indication of the desirability of using large numbers of observers in flashblindness research. The results indicate that a simple eye patch does provide some protection from flashblindness and that a completely light-tight seal is not necessary for this device to be effective. Because of the noxious nature of the stimulus, the general applicability and significance of data collected from large numbers of observers are questionable. The results of unsophisticated and, presumably, relatively unmotivated observers are at variance with those of more sophisticated observers. (Author)

A66-39795
EFFECT OF SODIUM ACETATE ON Tm_{PAH} DEPRESSED BY EXPOSURE TO HYDRAZINE.
Ethard W. Van Stee (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 817-819. 6 refs.

Dogs were exposed to 0.63 mM/kg of hydrazine. They were treated 2 hr later with sodium acetate, alpha-lipoic acid, or alpha-lipoamide. Exposure to hydrazine produced an expected sharp decrease in the tubular maximum for para-aminohippurate (Tm_{PAH}). The infusion of the hydrazine-treated dogs with sodium acetate resulted in a transient increase in Tm_{PAH}. Some sparing effect of alpha-lipoamide on the PAH transport mechanism inhibited by hydrazine was suggested, although the magnitude of the sparing effect was not statistically significant. (Author)

A66-39796
EFFECTS REAL AND RELATIVE OF A SPACE-TYPE DIET ON THE AEROBIC AND ANAEROBIC MICROFLORA OF HUMAN FECES.
P. E. Riely, D. B. Beard, and James Gatts (Fairchild Hiller Corp., Republic Aviation Div., Space Environment and Life Sciences Laboratory, Farmingdale, N.Y.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 820-824. 8 refs.
Contract No. AF 33(615)-1748.

The effects of a space-type diet on the aerobic and anaerobic microflora of human feces were determined. Fecal specimens from four young men confined at the Aerospace Medical Research Laboratories were cultured both aerobically and anaerobically thirteen times during a six-week period. Two of the men were on an experimental space-type diet which was freeze-dehydrated. The other two subjects were on a "control" diet which contained identical foods, fresh and canned, to duplicate the dehydrated diet nutritionally as closely as possible. Although the obligately anaerobic character of the flora remained constant, a shift was found in the types of anaerobic organisms isolated. This change in the biochemically distinct flora occurred after a period on the diet sufficiently long to suggest that the diet was a contributing factor. The aerobic flora differed from that cited in the literature by the frequent presence of Shigella and enteropathogenic types of E. coli. (Author)

A66-39797
IN VIVO EXPERIMENTS WITH THE BIOELECTRIC POTENTIALS.
J. J. Konikoff (General Electric Co., Missile and Space Div., Re-Entry Systems Dept., King of Prussia, Pa.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 824-828. 5 refs.
Contract No. NAS 2-1420.

Empirical studies were conducted on rats, rabbits, and dogs to define the quantity of electricity obtainable by the direct implantation of dissimilar metallic electrodes. Optimization studies resulted in the selection of the best apparent anatomic site, electrode materials, electrode geometric configuration and area for maximum output. Results demonstrated that a power output of 308 μw under a load of 1000 ohms at 0.555 v was attainable using a pair of electrodes made of high speed steel and platinum-platinum black. Long term experiments (up to 128 days) have shown the feasibility of the utilization of biolectric potentials under a continuous 10-KΩ impedance. No tissue damage or other anomalies have been found in the subject (a rabbit). Preliminary application studies have resulted in the operation of tunnel diode and/or transistorized radio transmitters. Using a modulated circuit, a heart beat signal has been transmitted a distance of over 30 ft. (Author)

A66-39798
A CRITIQUE OF THE BIOLOGICAL SIGNIFICANCE OF THE SUPERSONIC TRANSPORT RADIATION ENVIRONMENT.
Max M. Nold, Duane A. Adams, and Peter R. Supko (USAF, Systems Command, Research and Technology Div., Weapons Laboratory, Kirtland AFB, N. Mex.).
Aerospace Medicine, vol. 37, Aug. 1966, p. 829-834. 21 refs.

This paper compares the approaches taken by several authors to delineate the radiation problem at 70,000 ft and comments on the assumptions used for lack of measured parameters. The problems of physiological aging and increased genetic burden are considered, and the status of the fractional cell lethality concept is discussed. Finally, an experimental program is discussed in which the FAA, USAF Weapons Laboratory, and NASA will cooperate to better define the environment at 70,000 ft. The FAA-AFWL experiment will use tissue-equivalent sensors to measure absorbed dose and LET spectra while NASA will measure neutron and charged particle fluxes and spectra. Measurements will be made in high flying aircraft stationed throughout the world. (Author)

A66-39799
INTERMEDIATE VISION TESTING OF AIRLINE PILOTS.
C. R. Harper, J. E. Keehan, and G. J. Kidera.
Aerospace Medicine, vol. 37, Aug. 1966, p. 841-843.

The intermediate visual acuity of 50 senior airline pilots was tested. All subjects had minimal or no accommodative ability as measured by the Prince Rule. Objectively, two methods were used: (1) the visual acuity in each eye at 30 in. was tested using the trifocal chart of American Optical; and (2) the amount of artificial accommodation or plus sphere required for 30 in. was measured by use of the dynamic cross cylinder test. Subjectively, the pilot in a dark room was shown a simulated DC-8 instrument panel at 30 in. With red and white illumination at the intensity he desired, the comparative acuity was demonstrated with and without correction of plus sphere. At 30 in., which is a mean distance taken from various aircraft utilized by United Air Lines, all subjects related significantly blurring of vision without sphere correction. With proper correction, all subjects appreciated significant improvement in the clarity of the instrument panel and printed testing material. Recommendations are made for pilot education concerning intermediate vision. (Author)

A66-40007
VERTICAL SINUSOIDAL VIBRATION AS A PSYCHOLOGICAL STRESS.
H. F. Huddleston (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
Nature, vol. 211, July 16, 1966, p. 324, 325. 8 refs.

Comparison of results of two experiments to test the thesis that man has a finite capacity for handling information. If some of this capacity is devoted to persistent anxiety about his organic integrity it was believed possible to show that a limited capacity remains for carrying out tasks. Five adult male subjects were exposed to vertical sinusoidal vibration at 4.8 and 6.7 cps, at an acceleration amplitude of 0.5 g applied to the seat for two 15-min exposures at each frequency. Eight military jet pilots were also exposed for two 10-min periods at each frequency, and in all cases simple number problems were assigned. Results compared with performance under stationary conditions confirm that stress level and task difficulty operate synergistically to diminish human information processing ability. M.L.

A66-40022
KEEPING ASTRONAUTS ALIVE.
Howard W. Mattson.
International Science and Technology, June 1966, p. 28-37.

Consideration of the methods by which a designer can make a spacecraft self-sufficient, thus making it unnecessary to carry packaged water, air, and food, or to absorb CO_2 chemically and dispose of waste in containers. Such methods are essential for longer space missions because of the large cumulative weights involved. Exhaled CO_2 must be reconverted to oxygen by any of several ways, the most practical one apparently being a molecular sieve composed of synthetic zeolite. Catalytic toxin burners are available to remove contaminants. Water or moist air can be electrolyzed to produce oxygen. Methods of handling and reclaiming urine and solid wastes are discussed. Food could be produced aboard a spacecraft from algae or, more probably, by chemosynthetic means. F.R.L.

A66-40044 #
BIOLOGICAL DECONTAMINATION OF A SPACECRAFT SYSTEM.
Francis Noel Le Doux (NASA, Goddard Space Flight Center, Structural and Mechanical Applications Section, Greenbelt, Md.).
American Association for Contamination Control, Annual Technical Meeting and Exhibit, 5th, Houston, Tex., Mar. 29-Apr. 1, 1966, Paper. 8 p.

Report on an attempt at microbiological decontamination of a spacecraft system during mechanical integration and assembly, as required by the NASA Office of Planetary Quarantine for spacecraft for lunar missions. Complete sterilization was not required, only biological decontamination to a low level of viable organisms at time of launch. Xylene and 90% isopropyl alcohol, both of which proved to be compatible with the electronic circuits and spacecraft materials, were used as decontaminants. A detailed description of procedures used in decontamination and recovery of viable organisms from treated surfaces for checking decontamination efficiency is given. Tables of test results, photographs of equipment and procedures used, and diagrams of spacecraft areas treated are included.
W.A.E.

A66-40112
MAN AND ALTITUDE.
Alberto Hurtado (Peruvian University of Medical and Biological Sciences, High Altitudes Research Institute, Lima, Peru).
American Industrial Hygiene Association, Journal, vol. 27, July-Aug. 1966, p. 313-320.

Study of the influence of a lifetime high-altitude environment on man, of the adaptive processes found in men taken from sea level to high altitude, and of the adaptation of native high-altitude residents taken down to sea level. Natives of a high altitude area (4540 m, or 446 mm Hg) exhibit a high degree of adaptation to the condition of constant hypoxia and show great tolerance to the increased physiological demands of physical activity. At simulated altitudes of 9840 m, about half of the exposed native subjects remained conscious for an indefinite time and were able to solve simple mental problems. Adaptive mechanisms are discussed. Various physiological modifications were observed in circulating blood. The main compensatory process in the vascular system consists of a greater number of dilated capillaries.
F.R.L.

A66-40129
LIFE SUPPORT.
Patrick Byrne and James O'Reilly (Garrett Corp., AiResearch Manufacturing Co., Los Angeles, Calif.).
Space/Aeronautics (Research and Development Issue), vol. 46, Mid-July 1966, p. 132-136, 184, 186.

Review of design advances in life support systems which emphasize problems of crew comfort, safety, and use of consumables on flights of 30 to 90 days. In addition to use of existing equipment in solving these problems, a number of new design approaches will be required. Perhaps most important among these is the "designed for maintenance" concept. For thermal control, the big problem of radiator design is how to accommodate the wide range of thermal loads and radiation environments of space at minimum weight and power drain while preventing freezing in the radiator tubes under low-load conditions. To achieve a shirtsleeve environment, the phenomenon of thermal interchange between man and the spacecraft cabin environment at zero g has been studied. Attention is given to CO_2 removal by molecular sieve. Problems of cryogenic gas storage, water and waste management, and extravehicular equipment are discussed.
F.R.L.

A66-40166
ON THE SOUND PRESSURE TRANSFORMATION BY THE HEAD AND AUDITORY MEATUS OF THE CAT.
Francis M. Wiener, Russell R. Pfeiffer, and Ann S. N. Backus (Massachusetts Eye and Ear Infirmary, Eaton-Peabody Laboratory of Auditory Physiology, Boston; Massachusetts Institute of Technology, Research Laboratory of Electronics, Center for Communications Sciences, Cambridge, Mass.).
Acta Oto-Laryngologica, vol. 61, Mar. 1966, p. 255-269. 10 refs.
National Institutes of Health Grants No. MH-04737-05; No. NB-01344; NSF Grant No. GP-2495; Contract No. DA-36-039-AMC-03200(E); Grant No. NsG-496.

Comparison of the sound pressure in the vicinity of a cat's eardrum, as measured by a flexible probe microphone implanted in the external auditory meatus, and the sound pressure at a point near the center of the cat's head in the absence of the animal, as measured with a duplicate probe. The magnitude of the ratio of the sound pressure near the eardrum to that in the free field is determined as a function of frequency. When the ear under study was turned toward the sound source, the sound pressure near the eardrum exceeded the free-field pressure appreciably, except at very low frequencies; the reverse was true for the ear turned away from the sound source.
M.L.

A66-40240 #
RESCUE TEAMS FOR MANNED TESTING OF GEMINI SPACECRAFT.
Frederick C. Wear (McDonnell Aircraft Corp., St. Louis, Mo.).
IN: AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, INSTITUTE OF ENVIRONMENTAL SCIENCES, AND AMERICAN SOCIETY FOR TESTING AND MATERIALS, SPACE SIMULATION CONFERENCE, HOUSTON, TEX., SEPTEMBER 7-9, 1966. TECHNICAL PAPERS. [A66-40204 22-11]
New York, American Institute of Aeronautics and Astronautics, 1966, p. 253-258.

Outline of a technique for safeguarding of astronauts while they undergo preflight tests in an environmental chamber for Gemini space missions. Selection, screening, and training of personnel are described. Personal and chamber equipment are described, and test operations and the rescue function are outlined. Finally, the rescue drill and developments in equipment and procedures are evaluated.
B.B.

A66-40250 #
HELICOPTER TRAINEE PERFORMANCE FOLLOWING SYNTHETIC FLIGHT TRAINING.
Paul W. Caro, Jr. and Robert N. Isley (U.S. Army, Human Resources Research Office, Div. no. 6 /Aviation/, Fort Rucker, Ala.).
(Southeastern Psychological Association, Meeting, New Orleans, La., 1966, Paper.)
American Helicopter Society, Journal, vol. 11, July 1966, p. 38-44.
Army-supported research.

In a study to determine whether the use of a synthetic helicopter flight training device would improve the subsequent primary flight performance of trainees at the U.S. Army Primary Helicopter School, two groups were trained to "fly" a captive helicopter mounted on a ground effects machine. The device had the approximate handling characteristics of a free-flying vehicle, yet it allowed the trainees to obtain "aeronautical experience" not otherwise possible at their level of training. It was found that the device-trained subjects, when compared with nondevice-trained controls, were significantly less likely to be eliminated from subsequent primary helicopter training for reasons of flight skills deficiency. Further, measures of relative performance during primary flight training indicated the device-trained group soloed the helicopter earlier and made better flight grades during the presolo phase of training than did the controls. Implications of the device concepts investigated in this study are illustrated.
(Author)

A66-40252
STABILITY AND PERFORMANCE OF MANNED CONTROL SYSTEMS.
Alfred Skolnick (U.S. Navy, Washington, D.C.).
IEEE Transactions on Human Factors in Electronics, vol. HFE-7, Sept. 1966, p. 115-124. 21 refs.

This study demonstrates that the human-operator transfer function approach may be generalized; from a variety of published experimental data, "capability bounds" upon the transfer function parameters are formed. With such ranges defined, these parameters, forming a type of variable structure, can be used as a mapping function to display in the complex plane the boundaries of human adaptive capacity. These boundaries contain a collection of "critical points" which, used in conjunction with the plant Nyquist contour, permit interpretation of system stability characteristics. Control of varying-parameter plants is studied and a solution to the "best" performance problem proposed. The notion of a "vector" performance index is introduced and the design for a "best-overall"

compensator to meet specifications upon a varying-parameter plant is obtained by using a "direct search" method (especially suited to the electronic computer). This method incorporates a "pattern strategy" to aid in finding the next set of trial values for the compensator; the strategy affords rapid convergence to a solution, as is demonstrated by an example. (Author)

A66-40253
A PRELIMINARY STUDY OF HUMAN OPERATOR BEHAVIOR FOLLOWING A STEP CHANGE IN THE CONTROLLED ELEMENT.
J. D. McDonnell (Systems Technology, Inc., Hawthorne, Calif.).
IEEE Transactions on Human Factors in Electronics, vol. HFE-7, Sept. 1966, p. 125-128. 7 refs.
Contract No. AF 33(657)-10407.

Description of an experimental investigation aimed at understanding human operator behavior following a step change in the controlled element and the determination of limitations on operator descriptions and measurement methods which might be employed. A fixed-base simulator was used in which the subject was presented with a 2-in.-long "horizon bar" on a cathode ray tube displaying the system error as a role angle. The system motion quantities and the time of the change introduction were recorded. The resulting time histories serve as the data source for subsequent analyses, where an attempt is made to uncover clues to human operator transitional behavior. An evaluation of the conventional quasi-stationary model of an operator for transitional behavior description is made via data from the time histories. The model proves unsatisfactory, in general, although interesting observations on operator stationarity are noted. S. Z.

A66-40254
REMARKS ON SOME NEUROMUSCULAR SUBSYSTEM DYNAMICS.
Duane McRuer (Systems Technology, Inc., Hawthorne, Calif.).
IEEE Transactions on Human Factors in Electronics, vol. HFE-7, Sept. 1966, p. 129, 130.
Contracts No. AF 33(657)-10835; No. NAS 2-2824.

Brief discussion of the need for more refined neuromuscular system data and descriptions because of: (1) practical ramifications of neuromuscular dynamics in manual control systems and (2) implications of these data on the structural organization of the neurological apparatus. Use of several levels of approximation as "describing function models" is described, and the nature of typical pilot describing function data and models is illustrated. The connection between equivalent time-delay and low-frequency phase lag is graphed. The phenomenon illustrated has some impact on manual control operations. A decrease in equivalent time delay is used by the operator in one or a combination of two ways: (1) to increase the phase margin while the crossover frequency is held constant, or (2) to permit an extension in the crossover frequency, thus increasing the bandwidth of available control. Both the time-delay decrease and the low-frequency phase increase can have important effects for conditionally stable systems, particularly for higher-order controlled elements. S. Z.

A66-40375
CLASSIFICATION OF RESPONSE PATTERNS OF SPIKE DISCHARGES FOR UNITS IN THE COCHLEAR NUCLEUS - TONE-BURST STIMULATION.
Russell R. Pfeiffer (Massachusetts Institute of Technology, Research Laboratory of Electronics, Center for Communications Sciences, Cambridge; Massachusetts Eye and Ear Infirmary, Eaton-Peabody Laboratory of Auditory Physiology, Boston, Mass.).
Experimental Brain Research, vol. 1, no. 1, 1966, p. 220-235. 26 refs.
National Institutes of Health Grants No. MH-04737-05; No. NB-01344; NSF Grant No. GP-2495; Contract No. DA-36-039-AMC-03200(E); Grant No. NsG-496.

Computation of poststimulus time histograms for tone-burst stimulation of the cochlear nuclei of 40 cats. Certain shapes of histograms, or response patterns, were observed more often than others for units in the cochlear nucleus. The shapes of patterns observed are found to depend on the stimulus parameters. These response patterns of units in the cochlear nucleus lend themselves to classifications into categories; a given group of units has not only response patterns in common, but often other properties also. B. B.

A66-40378
THE INFLUENCE OF SEED WATER CONTENT ON THE OXYGEN EFFECT IN IRRADIATED BARLEY SEEDS.
R. A. Nilan, C. F. Konzak, S. Metter (Washington State University, Dept. of Agronomy, Pullman, Wash.), and B. V. Conger.
Radiation Botany, vol. 6, 1966, p. 129-144. 35 refs.
Research supported by Washington State; U.S. Public Health Service Grant No. GM-10838-06; AEC Contract No. AT(45-1)-353; Grant No. NsG(T)-100.

Measurement of the magnitude of the oxygen effect on Himalaya barley seeds at different seed water contents in terms of oxygen-effect factors. These factors are the ratios of radiation doses that are required to produce the same amount of biological effect in seeds hydrated in nitrogen-saturated water but otherwise treated identically. The response to oxygen rehydration of irradiated seeds with a low or high water content showed little or no change during a two-week storage period in sealed, evacuated vials. B. B.

A66-40403
SYNAPTIC DELAY AND CONDUCTION TIME IN BRAIN DURING EXPOSURE TO SIMULATED HIGH ALTITUDES.
Beatriz Williams, Dorothy E. Woolley, and Paola S. Timiras (California, University, Dept. of Physiology, Berkeley, Calif.).
Nature, vol. 211, Aug. 20, 1966, p. 889, 890.
Research supported by the U.S. Public Health Service.

Investigation in 12 rats chronically implanted with electrodes of the effect of exposure for three days to simulated altitudes of 3,800 and 5,490 m on conduction time along the lateral olfactory tract (LOT) and synaptic delay between tract and cortex. The results obtained showed that the hypoxia of high-altitude exposure prolongs synaptic delay and conduction time in a brain system, even at the relatively moderate altitude of 3,800 m. Moreover, synaptic delay is altered to a greater degree than is conduction time at both altitudes, in agreement with previous observations on the effects of 2-h altitude exposure. An important finding is that the prolongation in synaptic delay and in conduction time did not improve during the three-day exposure to either altitude, but in fact tended to become even greater with time at altitude. M. M.

A66-40473 #
MEASURES AGAINST RADIATION HAZARD DURING THE FLIGHTS OF VOSKHOD AND VOSKHOD 2 [OBESPECHENIE RADIATSIONNOI BEZOPASNOSTI PRI POLETAKH KORABLEI "VOSKHOD" I "VOSKHOD-2"].
Iu. M. Volynkin, V. V. Antipov, B. I. Davydov, N. N. Dobrov, M. D. Nikitin, N. F. Pisarenko, and P. P. Saksonov.
Kosmicheskie Issledovaniia, vol. 4, July-Aug. 1966, p. 630-633. 6 refs. In Russian.

Comparison of the radiation doses measured by onboard dosimeters and those fastened to the spacesuits for the crews of Voskhod 1 and 2. The mean radiation dose for the entire flight was 30 ± 5 mrad for Voskhod 1 and 70 ± 5 for Voskhod 2. The radiation dose experienced by Leonov, who left the spaceship to "walk in space," was the same as that experienced by Beliaev. An analysis of the radiation composition by means of nuclear emulsions revealed the presence of charged particle fluxes with linear energy losses corresponding to the linear energy losses of He, B, O, and Ar ions. The flights took place in conditions of low solar activity. V. P.

A66-40474 #
BIOLOGICAL INVESTIGATIONS ON BOARD THE SPACESHIPS VOSKHOD AND VOSKHOD 2 [BIOLOGICHESKIE ISSLEDOVANIIA NA KOSMICHESKIKH KORABLIAKH "VOSKHOD" I "VOSKHOD-2"].
N. N. Zhukov-Verezhnikov, I. N. Maiskii, N. L. Delone, N. I. Rybakov, V. A. Kozlov, B. I. Davydov, V. V. Antipov, P. P. Saksonov, K. D. Rybakova, and G. P. Tribulev.
Kosmicheskie Issledovaniia, vol. 4, July-Aug. 1966, p. 634-640. 15 refs. In Russian.

Discussion of onboard experiments performed with Voskhod 1 and 2, in which lysogenic bacteria E. coli K-12 (λ) were exposed to outer space conditions in capillary type containers. Some of the capillaries contained β-mercaptopropylamine. It is found that the number of viable cells onboard Voskhod 1 did not differ from the control test, while a slight increase in viable cells was observed for Voskhod 2. The protective properties of β-mercaptopropylamine could not be established. Neither was there a difference between the experimental and control results concerning the degree of phage induction and frequency of auxotropic mutations. The conditions of outer space did not increase the frequency of chromosome rearrangement in higher plants. (Author)

A66-40480
NITROGEN- AND HELIUM-INDUCED ANOXIA - DIFFERENT LETHAL EFFECTS ON RYE SEEDS.
R. L. Latterell (Union Carbide Corp., Research Institute, Tarrytown, N. Y.).
Science, vol. 153, July 1, 1966, p. 69, 70. 8 refs.
Contract No. NASw-767.

Prolonged exposures to acute anoxia caused progressive reductions in the viability of hydrated seeds of Prolific rye. For equal exposures of nine days or longer, mortality was significantly higher in helium than in nitrogen. The findings suggest that prolonged use of helium as a component of atmospheres in manned space capsules may be harmful. (Author)

A66-40481
SLEEP DEPRIVATION IN THE RAT.
Robert A. Levitt (Florida, University, Dept. of Psychology, Gainesville, Fla.).
Science, vol. 153, July 1, 1966, p. 85-87. 9 refs.
National Institutes of Health Grant No. MH-03881-03.

Study of the effects of sleep deprivation in rats, induced by injections of dextroamphetamine or forced treadmill activity. A temporary increase in daily sleep time is found to result; however, increasing the period of sleep deprivation above 24 hr to 72 or 120 hr does not result in increased recovery sleep above that present in the 24-hr group. B.B.

A66-40487
CORTICOSTEROID RESPONSES TO LIMBIC STIMULATION IN MAN LOCALIZATION OF STIMULUS SITES.
Robert T. Rubin, Arnold J. Mandell, and Paul H. Crandall (California, University, Center for Health Sciences, Dept. of Psychiatry and Dept. of Neurosurgery, Los Angeles, Calif.).
Science, vol. 153, Aug. 12, 1966, p. 767, 768. 5 refs.
California Department of Mental Hygiene Grant No. 62-2-40; Public Health Service Grant No. B-2808; Grant No. NsG-237-62.

Corticosteroids in human plasma and urine increase after amygdala stimulation, and plasma corticosteroids decrease after hippocampus stimulation. Five subjects underwent unilateral temporal lobectomy, and histopathologic localization of electrode sites was attempted. Localization was successful for six sites - three in basolateral amygdala and three in hippocampus. (Author)

A66-40501 #
EXPERIMENTAL INVESTIGATIONS OF THE FAR POINT IN SCOTOPIC VISION [RICERCHE SPERIMENTALI SUL PUNTO REMOTO NELLA VISIONE SCOTOPICA].
R. Neuschüller and C. Terrana.
Rivista di Medicina Aeronautica e Spaziale, vol. 29, Apr.-June 1966, p. 167-180. 8 refs. In Italian.

Experimental investigation of the far point of scotopic vision, by means of a Cialdea and Bagolini optometer. The method made it possible to rule out some optical phenomena as possible causes of nocturnal myopia, as stated by previous investigators. Appreciable variations were found in the distance of the far point in scotopic vision, although not necessarily in the myopic sense. M. M.

A66-40502 #
THROMBOELASTOGRAPHIC DATA IN RATS SUBJECTED TO CHEST-TO-BACK DECELERATIONS OF APPRECIABLE INTENSITY AND VERY SHORT DURATION [DATI TROMBO-ELASTOGRAFICI NEL RATTO SOTTOPOSTO A DECELERAZIONI PETTO-SCHIENA DI NOTEVOLE ENTITA' E DI BREVISSIMA DURATA].
G. Lalli and L. Cascino.
Rivista di Medicina Aeronautica e Spaziale, vol. 29, Apr.-June 1966, p. 181-192. 22 refs. In Italian.

Thromboelastographic investigation performed on the oxalated plasmas of rats subjected to chest-to-back decelerations of approximately 700 g lasting a few thousandths of a second. Serious pathological damages were observed, mainly in the liver, to complete mashing and, consequently, tissue material entered the circulation. Small changes were observed in plasmas with platelets of decelerated animals, after impact. Reaction time, clotting time, maximum amplitude, and elasticity coefficient tended to increase slightly, while the thromboelastographic index did not show any significant changes. M. M.

A66-40503 #
INTERPRETATION OF FRACTURE MECHANISMS IN SEAT-EJECTED PILOTS, WITH EMPHASIS ON THE F 104 G AIRCRAFT [INTERPRETAZIONE SUI MECCANISMI DI FRATTURA IN PILOTI DI AVIOGETTI, EJETTATI CON IL SEGGIOLINO, CON PARTICOLARE RIGUARDO AGLI F. 104 G].
P. Italiano.
Rivista di Medicina Aeronautica e Spaziale, vol. 29, Apr.-June 1966, p. 193-228. 11 refs. In Italian.

Description of traumatic lesions caused by pilot ejection. A typical bailing-out fracture of the lower limbs, although worsened by ground impact, is among them. The many cases investigated concern in particular vertebral fractures experienced during ejection from the F 104 G aircraft, this lesion being reported in five pilots out of six. This lesion is mainly located in the twelfth dorsal vertebra and is defined as typical spinal fracture from bailing out. The connection between the ejection seats of the F 104 G aircraft and the fractures is examined. M. M.

A66-40504 #
CHARACTERISTICS OF LIQUID OXYGEN FOR ON-BOARD BREATHING EQUIPMENT [LE CARATTERISTICHE DELL'OSSIGENO LIQUIDO PER RESPIRATORI DI BORDO].
C. Marangoni and E. Rossi.
Rivista di Medicina Aeronautica e Spaziale, vol. 29, Apr.-June 1966, p. 229-256. 28 refs. In Italian.

Discussion of the hazards, sometimes harmful to human health, that can be caused by contaminants present in the liquid oxygen of aircraft breathing equipment. Various contaminants are examined from the standpoint of noxiousness to people, the possibility of clogging equipment, explosiveness, etc. Observations are made on the possible use of contaminated liquid oxygen. M. M.

A66-40505 #
AIRBORNE BACTERIA SAMPLING BY MEANS OF A ROTARY-PLATE DEVICE [IL PRELIEVO DEI BATTERI AEROGENI CON UNA APPARECCHIATURA A PIASTRA ROTANTE].
L. Mammarella.
Rivista di Medicina Aeronautica e Spaziale, vol. 29, Apr.-June 1966, p. 257-267. In Italian.

Description of a simple airborne bacteria sampler consisting of a rotating plate that can be operated either electrically or by means of a spring. A series of tests performed to compare the sampling effectiveness of a static plate in accordance with Koch's model and a rotating plate with a speed of 25 to 120 rpm showed an appreciable increase in the number of colonies grown after incubation of the rotating plates, as compared with the plates exposed to air only. M. M.

A66-40506 #
PRINCIPAL PHYSIOPATHOLOGIC PHENOMENA CONNECTED WITH SPACEFLIGHT [I PRINCIPALI FENOMENI FISIOPATOLOGICI CONNESSI CON IL VOLO SPAZIALE].

A. Scano (Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy).
(ANSMI, Settimana di Studio, Rome, Italy, June 1966, Lecture.)
Rivista di Medicina Aeronautica e Spaziale, vol. 29, Apr.-June 1966, p. 269-304. In Italian.

Consideration of weightlessness, the most typical phenomenon of spaceflight. Investigations carried out by means of the subgravity tower designed by Lomonaco and his coworkers are briefly reviewed. Results obtained from actual spaceflights on the vestibular and visual functions, the cardiovascular system, energetic consumption, metabolism and trophicity of body frame, the urinary function, locomotion, etc. are described. Considerations are made on convective, diffusive, and thermal phenomena in a spacecraft as well as between a spacecraft and the cosmic environment, always in terms of weightlessness and of means for avoiding it. M. M.

A66-40507 #
TOXICITY OF UNSYMMETRICAL DIMETHYLHYDRAZINE (UDMH) [SULLA TOSSICITA' DELLA DIMETILIDRAZINA ASIMMETRICA].
Gualtiero Paolucci.
Rivista di Medicina Aeronautica e Spaziale, vol. 29, Apr.-June 1966, p. 305-328. 9 refs. In Italian.

Discussion of investigations performed since 1962 in the field of the toxicity of UDMH. It was found that UDMH does not cause any trouble or anatomo-pathologic changes at low dosage because the substance does not accumulate in the body. Large dosages, however, will cause convulsion and death due to respiratory paralysis; fatty degeneration was reported at these dosages, particularly in the liver and kidney. Regarding metabolism UDMH increases blood sugar level and causes moderate hematocrit changes, as well as some increase in glutamic-oxalacetic transaminase. Pyridoxine (together with a few other compounds) was found useful in combatting the toxic effects of this substance, at a dose of 50 mg/kg of body weight. M. M.

A66-40668 #
THE MEDICAL ASPECTS OF SKILL.
A. J. Barwood (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
Royal Aeronautical Society, Centenary Congress; International Council of the Aeronautical Sciences, Congress, 5th, London, England, Sept. 12-16, 1966, Paper. 8 p.

Study of the factors involved in the skill of flying a modern aircraft. Medical factors such as health and personal factors such as age are discussed. The environment in which a pilot is working will also have a direct effect on his ability to work well. Three controllable variables affect the degree of thermal comfort in the cockpit. These are the actual temperature, the relative humidity of the air, and the rate of the air movement. Other factors discussed which affect the skill of the pilot are the noise levels, the placing of the controls, the barometric pressure, the altitude, and the work load. M. F.

A66-40858 #
TRAINING FOR VIGILANCE - A COMPARISON OF DIFFERENT TECHNIQUES.
W. P. Colquhoun (Medical Research Council, Applied Psychology Unit, Cambridge, England).
Human Factors, vol. 8, Feb. 1966, p. 7-12. 9 refs.

In a 40-min vigilance session, 72 subjects inspected a series of displays, each of which consisted of a row of six small disks, for the occasional presence of a disk 17% greater in area than the remainder. The possibility of improving the generally low levels of performance observed with this task by special training was studied by pre-exposing subjects to a session of similar length with either knowledge of results (KR), one of three kinds of cueing of signal occurrence, a mixed KR/cueing program, or no task information. No differential effect of the various training techniques was found, but both the efficiency with which signals were discriminated, and the degree of caution exercised in reporting their occurrence increased during the experiment. It is concluded that greater understanding of the factors affecting signal detectability and decision-criteria in vigilance tasks is required before an appropriate method of training can be devised. (Author)

A66-40861 #
A COMPARISON OF CZECHOSLOVAKIAN HUMAN ENGINEERING STANDARDS FOR CONTROL PUSHBUTTONS WITH UNITED STATES STANDARDS.
C. M. Bertone (Bunker-Ramo Corp., Manual Control Systems Dept., Canoga Park, Calif.).
Human Factors, vol. 8, Feb. 1966, p. 62-70. 6 refs. Translation.
Contract No. NASw-869.

Description of the Czechoslovak standards for control pushbuttons, and comparison with similar standards established in the U.S. The comparison shows specific differences between the criteria used in the two countries in establishing standards in this area. It is pointed out that the Czechoslovak standards are rigid and specific, while the U.S. standards are variable and left to the individual's interpretation. M. M.

A66-40862 #
TARGET CONSPICUITY AND VISUAL SEARCH.
Leon G. Williams (Honeywell, Inc., Military Products Group, Research Div., Human Factors Section, Minneapolis, Minn.).
Human Factors, vol. 8, Feb. 1966, p. 80-92. 9 refs.
Contract No. Nonr-4774(00).

A general measure of target conspicuity is proposed for predicting the level of search performance as a function of spatial and temporal variables. The probability of locating a target is shown to depend on two factors: target "conspicuity" (the rate at which the observer can scan the field) and information input rate (the rate at which the field is presented to the observer). Predictions of the effects of such factors as size, scale, rate of movement, and time available are made for reconnaissance displays. Some experimental support is presented. (Author)

A66-40965 #
LOCAL AND STRAY LIGHT COMPONENTS OF THE HUMAN ELECTRORETINOGRAM DUE TO STIMULATION BY LIGHT SUBTENDING A 20° VISUAL FIELD.
Yu-Min Liu and Chen-Yü Yang (Academia Sinica, Institute of Physiology, Shanghai, Communist China).
Scientia Sinica, vol. 15, May 1966, p. 696-705. 23 refs.

By means of a lens accommodated on the wall of an integrating sphere, the eye can be stimulated either through a Maxwellian view field of 20° or diffusely except the local field. The essence of the present study is to compare and analyse the thresholds, b-wave latencies, stimulus intensity/b-wave amplitude relationships, and the effects of diffuse adaptation (excluding also the Maxwellian field) upon the electroretinograms (ERGs) elicited by the two types of presentation of the light stimuli under identical conditions of the eye. Parallel study of this kind allows one to identify strictly the local (or image) and stray light components of the b-wave and to define the conditions of diffuse adaptation in isolating little attenuated local response at the suppression of the stray light component. (Author)

LC ENTRIES

A66-82017
INCREASE OF HUMAN-OPERATORS' RELIABILITY THROUGH PHYSICAL TRAINING [K VOPROSU O POVYSHENII NADEZHNOSTI RABOTY OPERATOROV S POMOSCH'IU FIZICHESKOI TRENIROVKI].
I. I. Petrushevskii (P. F. Lesgraft Sci.-Res. Lab., Leningrad, USSR).
Voprosy Psikhologii, no. 2, Mar.-Apr. 1966, p. 57-67. 15 refs. In Russian.

The influence of long physical training (2.5 months) on radio-telegraphist students' productivity of work in telegraph printing and performing some psychological tasks was studied. An improvement of productivity, attention, and memorization, especially when subjects underwent great physical tension, was revealed. The changes in quality and quantity of work, i.e., increase of volume of work done and decrease of number of errors per unit time, were observed. It is suggested that these changes are, to a significant extent, a result of nonspecific organismal stability increased through physical training.

A66-82018
SIMPLE MOTOR REACTION TIME TO TACTILE STIMULATION [VREMIA PROSTOI DVIGATEL'NOI REAKTSII NA TAKTIL'NOE RAZDRAZHENIE].
A. K. Moskatova (USSR, Acad. of Med. Sci., N. N. Burdenko Inst. of Neurosurg., Moscow).
Voprosy Psikhologii, no. 2, Mar.-Apr. 1966, p. 68-74. 21 refs. In Russian.

In 10 healthy subjects simple motor reaction time to tactile stimulation was measured. The difference between average values of reaction time for the right and left hands was 2.5 msec. depending on the character of motor action of the hands, and 2.8 msec. depending on the character of sensitivity. It is evident that these mechanisms do not determine the difference between reaction time accomplished along the short way (when a subject reacts with the homolateral hand), and that accomplished along the long way (when a subject reacts with the contralateral hand). This difference is statistically significant and can be considered as a measure of time necessary for the transfer of impulses from one hemisphere to the other through commissural connections. This difference ranges from 2.8 to 8.2 msec. and on the average is less than in reactions to light and sound stimulation.

A66-82019
CHANGE OF EEG BACKGROUND SLOW WAVE ACTIVITY AS AN INDICATOR OF DISCOMFORT STATE [IZMENENIE AKTIVNOSTI MEDLENNYKH RITMOV V EEG KAK POKAZATEL' DISKOMFORTNOGO SOSTOIANIIA].
V. V. Suvorova
Voprosy Psikhologii, no. 2, Mar.-Apr. 1966, p. 75-82. 23 refs. In Russian.

The electroencephalogram (EEG) was recorded before and after stress experiments, which consisted of an assignment difficult to fulfill, and required mental concentration and memory. The analysis of EEG showed that in subjects who made an attempt to fulfill the assignment the theta-rhythm activity decreased, while in subjects who showed no desire to continue the task the theta-rhythm activity increased. Literature data are cited which show the increase of the theta-rhythm activity in humans and animals in many different discomfort states.

A66-82020
INFLUENCE OF ALCOHOL ON TIME JUDGMENT [O VLIIANII ALKOGOLIA NA OTSCHET VREMENI].
D. G. El'kin and T. M. Kozina (I. I. Mechnikov Odessa U., UkrSSR).
Voprosy Psikhologii, no. 2, Mar.-Apr. 1966, p. 147-152. 9 refs. In Russian.

The effect of alcohol on time judgment was studied in one subject. After ingestion of 100.00 cc. of 96% alcohol, there was a tendency to overestimate the time interval. This effect, which can be due to changes in the nervous system, consisted of two stages, excitation and suppression. The number and type of errors depended on the stage of intoxication. In another experiment with four subjects, the effects of 150 cc. of 40% alcohol on the auditory discrimination threshold were studied. In all subjects the threshold was increased shortly after the alcohol intake, but it was slightly decreased an hour after the beginning of the experiment.

A66-82021
METHODS OF MEASURING THE VELOCITY OF INFORMATION TRANSMISSION OF VARIOUS VISUAL SIGNALS [METODY IZMERENIIA SKOROSTI PERENOSA INFORMATSII PRI RAZLICHENII ZRITEL'NYKH SIGNALOV].
Iaro Krzhivoglavy (Cnetral Profess. Union Soviet, Sci.-Res. Inst. of Ind. Safety, Prague, Czechoslovakia).
Voprosy Psikhologii, no. 2, Mar.-Apr. 1966, p. 160-165. 7 refs. In Russian.

A modified Landolt method is discussed in which the table is substituted by rings, each with 8 to 12 breakpoints. The method can be used in diagnostic psychology for measuring the effect of inadequate working conditions or for the appraisal of light and technical requirements. In general, this method can be used for determination of visual signals of various characters, applying only one-factor-information expressed in bits per second.

A66-82022
METHOD OF INCREASING TIME FOR RECEPTION OF STABILIZED IMAGE [METOD UVELICHENIIA VREMENI VOSPRIIATIIA STABILIZIROVANNOGO OBRAZA].
N. Iu. Vergiles (M. V. Lomonosov Moscow State U., Dept. of Psychol., USSR).
Voprosy Psikhologii, no. 2, Mar.-Apr. 1966, p. 166-169. In Russian.

A graphic presentation of various phases of a continuous process of disappearance of stable retinal image and an appearance of the following image, which in turn fades away, is given, together with some mathematical expressions, and the method used by the author in the study of increasing time of perception of stable visual image. During trials for finding optimal conditions for perception of stable image the subjects noted fluctuation of the image and its parts. Once the optimal conditions were established, the image could be brought out during the rest of the experiment. This method can be useful in solving visual problems, which require time. Thus, it can facilitate the study of eye movement in visual perception.

A66-82023
INTERCEPTIVE INFLUENCES ON TONIC LABYRINTHINE REFLEXES [OB INTEROTSEPTIVNYKH VLIIANIIAKH NA TONICHESKIE LABIRINTNYE REFLEKSY].
V. S. Raitses (Ivano-Frankov Med. Inst., Dept. of Normal Physiol., USSR).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 61, May 1966, p. 3–7. 18 refs. In Russian.

Chronic experiments on rabbits with the aid of electromyograms were used to study the influence of the interoceptive impulse emission on the tonic reaction of the muscles—extensors of the anterior extremities and the neck—occurring as a result of stimulation of the labyrinthine apparatus (rotation of the animal about the bitemporal axis). It was established that the influence of stimulating the interoceptors of the rectum produced a certain activation or inversion of tonic labyrinthine reflexes, which was associated with an increase in the stimulability of the stem centers of these reflexes. In decerebrated animals, the changes in reflexes from the labyrinths to the skeletal muscles in cases of interoceptive stimulation were more pronounced. The administraition of aminazine caused a sharp reduction in the labyrinthine reflexes and in the interoceptive influence on them

A66-82024
COMPARATIVE ANALYSIS OF THE INFLUENCE OF GRAVITATIONAL STRESS AND HYPOXIA ON OXYGEN TENSION IN THE BRAIN TISSUES [SRAVNITEL'NYI ANALIZ VLIIANIIA GIPERVESOMOSTI I GIPOKSII NA NAPRIAZHENIE KISLORODA V TKANIAKH MOZGA].
B. M. Savin (S. M. Kirov Acad. of Mil. Med., Leningrad, USSR).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 61, May1966, p. 19–23. 25 refs. In Russian.

A chronic experiment on cats and rabbits was conducted to investigate by the method of polarography the influence of gravitational stress and hypoxic hypoxia on the p_{O_2} value in various parts of the brain. Differences were found in the character of p_{O_2} changes depending on the value, direction, and recurrence of overload influences.

A66-82025
MOTOR FUNCTION OF THE STOMACH AND CERTAIN CLINICAL ASPECTS OF EXPERIMENTAL LEAD INTOXICATION [FUNKTSIIA DVIGATEL'NOGO APPARATA ZHELUDKA PRI EKSPERIMENTAL'NOI SVINTSOVOI INTOKSIKATSII].
A. A. Mambreeva (USSR, Acad. of Med. Sci., Inst. of Normal and Pathol. Physiol., Lab. of Physiol. and Pathol. Nutr., Moscow and Kazakh Inst. of Reg. Pathol., Alma-Ata).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 61, May 1966, p. 36–40. 21 refs. In Russian.

It was established in chronic experiments on dogs that the picture of experimental lead poisoning was to a considerable extent similar to that seen during clinical manifestations of saturnism in human beings. This similarity was manifested by the intermittent character of its course, i.e., repeated changes of aggravation (corresponding "exacerbation") and amelioration (correspondingly "lead carrier state") periods. Registration of the motor function of the stomach in these animals indicated that disturbances in chronically intoxicated animals also had a course with alternating periods of aggravation and normalization. Obvious lead intoxication was always accompanied by a marked depression of the motor function of the stomach.

A66-82026
DATA ON ACCLIMATIZATION OF ALBINO RATS TO CHRONIC-INTERMITTENT UNFAVORABLE TEMPERATURE CONDITIONS [OB AKKLIMATIZATSII BELYKH KRYS V USLOVIIAKH KHRONICHESKOGO PRERYVISTOGO VOZDEISTVIIA NEBLAGOPRIIATNYKH TEMPERATUR].
B. A. Katsel'son, and L. G. Babushkina (Sverdlovsk Inst. of Hyg. Labor and Prof. Diseases, USSR).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 61, May 1966, p. 40–43. 20 refs. In Russian.

Experiments on albino rats regularly exposed over a period of six months to temperatures from 38 to 40°C. for five to six hours daily or from 7 to 8°C. for five to six hours every other day showed acclimatization to such intermittent temperature conditions and certain reactions accompanying this process.

A66-82027
INFLUENCE OF VIBRATION AS A FACTOR ASSOCIATED WITH SPACE FLIGHTS ON THE K-12 (LAMBDA) E. COLI LYSOGENIC CULTURE [VLIIANIE VIBRATSII KAK FAKTORA, SVIAZANNOGO S KOSMICHESKIM POLETOM, NA LIZOGENNUIU KUL'TURY E. COLI K-12 (LAMBDA)].
N. I. Rybakov and V. A. Kozlov (Inst. of Exptl. Biol., Lab. of Genet. of Microorganisms, Moscow, USSR).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 61, May 1966, p. 64–67. In Russian.

Samples of lysogenic bacteria *Escherichia coli* K-12 (lambda) carried on board the Soviet spacecrafts "Vostok-5" and "Vostok-6" showed a threefold increase in phage production when compared with samples left on the ground. This increase corresponded to radiation equivalent to 58 r, which was three times higher than radiation received by the spacecraft during flight. The observed phage production increase may be due to other space flight factors, such as vibration, acceleration, and weightlessness. Experiments on the ground showed that vibration above had no effect on phage production, but it may have predisposed the culture for radiation effect even of small intensity. The effect of weightlessness and acceleration has not been sufficiently studied in order to furnish any valuable information.

A66-82028
AFTERIMAGE FUSION IN VISUAL OBSERVATIONS.
Thomas Behrendt (Jefferson Med. Coll., Dept. of Ophthalmol., Philadelphia, Pa.).
Publications of the Astronomical Society of the Pacific, vol. 78, Jun. 1966, p. 258–260. 6 refs.
Grant NINDB NB 5456-01.

The psychophysiological fusion which links the afterimages of separate visual stimuli may cause artifacts in visual astronomical observations, for instance, some of the canal structures on the surface of Mars. The similarities between laboratory experiences on visual fusion of afterimages and reports of certain visual observations of markings on Mars are examined.

A66-82029
CHEMORECEPTOR REFLEXES IN THE NEW-BORN INFANT: EFFECTS OF VARYING DEGREES OF HYPOXIA ON HEART RATE AND VENTILATION IN A WARM ENVIRONMENT.
June P. Brady and Eliana Ceruti (Calif. U., San Francisco Med. Center, Cardiovascular Res. Inst. and Dept. of Pediat.).
Journal of Physiology, vol. 184, Jun. 1966, p. 631–645. 27 refs.
Grant PHS HE-06285.

The effects of varying degrees of hypoxia for three-min. periods were studied on the heart rate and respiration of 33 healthy full-term infants in a warm environment. During the first five days of life a decrease in alveolar oxygen tension ($P_{A_{CO2}}$), below 80 mm. Hg induced hyperventilation, a decrased alveolar carbon dioxide tension ($P_{A_{CO2}}$), and tachycardia during the first minute of hypoxia. During the second and third minute, while the decreased $P_{A_{CO2}}$ and tachycardia persisted, ventilation fell. There was a further fall in ventilation when the baby breathed 21% O_2 again. This response was also observed when the inspired gas was heated to 35°C. During the first five days of life a decrease in $P_{A_{CO2}}$ between 81 and 100 mm. Hg did not affect ventilation or $P_{A_{CO2}}$ during the first minute of hypoxia, but still induced a tachycardia and a fall in minute volume during the second and third minute. When the $P_{A_{CO2}}$ was elevated and maintained constant during hypoxia, ventilation increased during the first minute and fell during the second and third minutes, suggesting that hypocapnia did not explain the transient ventilatory response of hypoxia. After the first week of life a greater and maintained increase in ventilation was seen during hypoxia. This response was potentiated by the addition of CO_2.

A66-82030
EFFECTS OF ARTERIAL HYPOXIA ON THE CUTANEOUS CIRCULATION OF THE RABBIT.
J. P. Chalmers and P. I. Korner (New South Wales U., School of Physiol., Sydney, Australia).
Journal of Physiology, vol. 184, Jun. 1966, p. 685–697. 40 refs. Natl. Heart Found., Australia and Life Insurance Med. Res. Fund, Australia and New Zealand supported research.

Changes in blood flow of the skin of the rabbit's ear and hind limb were studied during arterial hypoxia by a calibrated heat conductivity method, together with changes in arterial pressure and aortic blood temperature. There was little change in the blood flow of the hind-limb skin during the early phase of arterial hypoxia, reflecting a balance between the local dilator effects of hypoxia and the increased constrictor activity mediated through the sympathetic nerves as a result of arterial chemoreceptor excitation. During more prolonged arterial hypoxia there was a small gradual dilatation of the vessels of the hind-limb skin as a result of some diminution in the initial intensity of vasoconstrictor activity. There was much more extensive vasodilatation in the ear than in the hind-limb skin during arterial hypoxia. Vasoconstrictor activity was slight in this region. Comparison of the ear responses to arterial and to primary tissue hypoxia suggests that in the former type of hypoxia stimulation of the arterial chemoreceptors inhibits thermoregulatory vasoconstriction to the ear, while in the latter type of hypoxia baroreceptor reflexes maintain or intensify it.

A66-82031
THE CONTROL OF THE CIRCULATION IN SKELETAL MUSCLE DURING ARTERIAL HYPOXIA IN THE RABBIT.
J. P. Chalmers, P. I. Korner, and S. W. White (New South Wales U., School of Physiol., Sydney, Australia).
Journal of Physiology, vp. 194, Jun. 1966, p. 698–716. 54 refs. Natl. Heart Found., Australia and Life Insurance Med. res. Fund, ustralia and New Zealand supported research.

The effects of arterial hypoxia on muscle blood flow were examined in normal unanesthetized rabbits in relation to simultaneously determined changes in cardiac output, arterial pressure, and heart rate. Muscle blood flow was estimated from the difference between total limb flow (local thermodilution) and the estimated skin flow (using a calibrated heat conductivity method). The role of the arterial chemoreceptors and baroreceptors in the control of muscle blood flow was examined and the nature of the sympathetic efferent discharge analyzed. In mild hypoxia (P_{O_2} 35 mm. Hg) in the rabbit, muscle blood flow did not change, although cardiac output increased. During moderate hypoxia (P_{O_2} 30–35 mm. Hg) there was initial vasoconstriction in muscle, followed by a return to control values paralleling the changes in cardiac output. In severe arterial hypoxia (P_{O_2} 30 mm. Hg) the initial vasoconstriction was less marked, and during the 'steady state' there was a large vasodilatation and increase in muscle blood flow, at a time when the cardiac output was not elevated.

A66-82032
EXPERIMENTS ON THE GENESIS OF BUBBLES AS A RESULT OF RAPID DECOMPRESSION.
M. J. Lever, K. W. Miller, W. D. M. Paton, and E. B. Smith (Oxford U., Dept. of Pharmacol. and Phys. Chem., Great Britain).
Journal of Physiology, vol. 184, Jun. 1966, p. 964–969.

The time course of intravascular bubble formation in mice after rapid decompression from 150 lb./sq. in. was followed in vivo in a flap preparation of thoracic and abdominal skin. Gas appeared first in the arteries, moving distally after a latent period of three min. or more. Then bubbles appeared, moving centrally, in the venous system. The arterial bubbles could not be attributed to air forced into the circulation from the lungs or lumen of the gut.

A66-82033
SEASONAL CHANGES IN SERUM LIPIDS AND PROTEINS IN THE 13-LINED GROUND SQUIRREL.
William A. Galster and Peter Morrison (Wis. U., Depts. of Zool. and Physiol., Madison and Alaska U., Inst. of Arctic Biol., Lab. of Zoophysiol., College).
Comparative Biochemistry and Physiology, vol. 18, Jul. 1966, p. 489–501. 20 refs. Kan. Heart Assn. supported research. Grants NSF G24039 and NIH GM10402.

Blood lipid, protein, and hematocrit levels in *Spermophilus tridecemlineatus* follow yearly cycles. Total lipid, α-lipid, β-lipid and chylomicrons were minimal in late spring (7.0, 2.5, 2.3 and 1.0 g./liter) and maximal in late fall (27.0, 5.8, 9.8 and 6.0 g./liter). Secondary maxima or plateaux were observed in late summer in all, and in the spring for α-lipid. All proteins were minimal in late spring except β-globulin which was minimal in January. Albumin concentration increased to threefold (from 18 g./liter) by midsummer, and then to fourfold in early fall, a level maintained through the winter (av. 65 g./liter) until early spring when levels decreased sharply. All globulin components increased briefly at midsummer. Brief maxima also occurred in January and March for β-globulin and in February and May for α- and γ-globulin.

A66-82034
ELECTROCARDIOGRAPHIC CHANGES DURING EXPOSURE TO HIGH ALTITUDE.
Charles W. Harris and James E. Hansen (Fitzsimons Gen. Hosp., U.S. Army Med. Res. and Nutr. Lab., Physiol. Div., Denver, Colo.)
American Journal of Cardiology, vol. 18, Aug. 1966, p. 183–190. 22 refs. ARPA supported research.

Serial electrocardiograms were obtained in 22 sea level residents and 20 Denver residents while at altitudes of 11,400 or 14,110 feet for four to five weeks. Significant QRS changes were noted in the groups at each high altitude; however, only minimal changes occurred in the Denver subjects at 11,400 feet. Pertinent findings included transient increases in heart rate, decreases in QRS amplitude, and T wave inversion; rightward and posterior shifts in QRS axis were progressive and prolonged. The variables of daily controlled exercise, depth of inspiration, and speed of ascent did not significantly influence the electrocardiographic findings. It is suggested that changes in QRS amplitude and T waves at altitude are transient effects on cardiac hypoxia, while prolonged shifts of the QRS axis may represent early stages of myocardial hypertrophy and are secondary to changes in pulmonary perfusion rather than ventilation.

A66-82035
LASER RADIATION: ACUTE EFFECTS ON CEREBRAL CORTEX.

Thomas E. Brown, Peter Hornby, R. James Rockwell (Children's Hosp. Res. Found., Laser Lab., Cincinnati, Ohio), Charles True (Cincinnati Gen. Hosp., Dept. of Neuropathol., Ohio), and Robert L. McLaurin (Cincinnati U., Coll. of Med., Dept. of Surg., Div. of Neurosurg., Ohio).

Neurology, vol. 16, Aug. 1966, p. 730–737. 15 refs. John A. Hartford Found. supported research.

Effects of focused ruby laser beams on the cerebral cortex of dogs were studied. Energy levels were tested from 5- to 40-joule exit energy with convergent, surface-focused and divergent beams from the liquid nitrogen cooled ruby laser. Discrete and reproducible lesions could be induced. Possible mechanisms of laser effect in tissues include thermal injury as determined by histopathologic criteria, and local anoxia caused by vascular injury. Laser effects in biologic systems are probably determined to a significant extent by the local vascularity and, of course, by pigmentation of the tissues. Laser effects on the cellular elements of the cerebral cortex were not uniform, the neurons being very susceptible to laser energy whereas astrocytes proved more resistant. However, the local vascular bed was severely damaged by laser, and it is possible that the apparent difference in cell susceptibility to laser energy may be secondary to the local anoxia.

A66-82036
THE DISTRIBUTION OF ACOUSTIC ENERGY WITHIN THE COCHLEA.

L. Naftalin (St. George's Hosp., Biochem. Lab., Lincoln, Great Britain).

Life Sciences, vol. 5, Aug. 1966, p. 1345–1348. 16 refs.

An investigation of three-dimensional distribution of acoustic energy in water, in containers of several geometrical patterns and sizes was conducted in order to simulate the acoustic energy within the cochlea. In a uniform column of water, interference patterns were set up. As the shape was gradually changed to approximate the cochlear design, interference patterns changed so that upper frequencies were obtained near the basal coil and lower frequencies were found near the model's apex.

A66-82037
ADAPTIVE COLOR SHIFTS.

Horst Scheibner (Rochester U., Center for Visual Sci., N. Y.). *(Renshaw Vision Conf., Columbus, Ohio, May 6, 1965). Journal of the Optical Society of America*, vol. 56, Jul. 1966, p. 938–942. 29 refs.

Some experiments on chromatic adaptation are reviewed. The adaptive color shifts due to changes of chromatic adaptation are interpreted as linear mappings. The results show that the special type of mappings known as the von Kries coefficient law does not generally hold. One conclusion is that the processes connected with chromatic adaptation cannot take place at the first retinal stage of the visual pathway alone but also at higher stages.

A66-82038
EYE-MOVEMENT RESPONSES TO STEP AND PULSE-STEP STIMULI.

Leon L. Wheeless, Jr., Robert M. Boynton, and Gerald H. Cohen (Rochester U., N. Y.).

Journal of the Optical Society of America, vol. 56, Jul. 1966, p. 956–960.

Grants PHS 2G540 and NB-00624.

A spot of light is presented to an observer who tracks its movement visually, doing so as quickly and accurately as possible. The positions of the eye are continuously recorded so that direction and magnitude of eye movements as a function of time can be assessed. Without warning, the target spot steps from its resting position, moving 6° horizontally to one side, followed after a time W by a 12° step in the opposite direction. The result is a pulse-step pattern of target motion with the time interval W msec. defining the pulse duration. The directions of the pulse and step are always opposite but otherwise are unpredictable. Trials consisting of pulses followed by steps are intermixed randomly with a larger number of trials consisting of 6° steps alone. The experiments demonstrate that the visual system is sometimes able to cancel an eye-movement response to a pulse, on the basis of information contained in the subsequent step, to which it responds instead. As the step is delayed by progressively longer pulses, the probability increases that a response to the pulse will occur. If a response does occur in the direction of the step, it begins about 325 msec. after the beginning of the step. This latency is independent of pulse time W and is about 40 msec. longer than the latency of responses to steps presented alone. It is concluded that the visual system utilizes this 40 msec. to operate upon a latent response to a pulse, and thereby to cancel its overt manifestation (eye movement) before initiating a response to the second, incompatible stimulus.

A66-82039
NEW THEORY ON APPARENT MOVEMENT.

Martha J. Guastella.

Journal of the Optical Society of America, vol. 56, Jul. 1966, p. 960–966. 8 refs.

A theory is presented to explain the difference between the true motion of a figure and its apparent motion, as in the Ames trapezpoid illusion. Of central importance are the changes in geometric relationships between the boundaries of a figure as they project on the retina. The changes in retinal image that accompany rotation of the figure have been analyzed by use of a unique picture-plane model, to which the dimension of depth is added. The only assumption necessary to predict the perceived effect from the geometry of the illusion is that the observer will be most affected by whatever element of the retinal image is changing at the greatest rate. Apparent size, displacement, and rates of change are quantified. The interrelationship of the horizontal and vertical edges are shown. The projection of the edge of the figure farthest from the observer recedes in an opposite direction and at varying speed and size from the true edge. The lack of a perfect one-to-one

relationship between the physical and psychological stimulus is determined by the nature of the projection of the physical stimulus. While other theoreis based their explanations on past experience, this theory designates the mechanisms underlying the illusion.

A66-82040
ANALYSIS OF RESPONSE PATTERNS OF LGN CELLS.
Russell L. De Valois, Israel Abramov, and Gerald H. Jacobs (Ind. U., Dept. of Psychol., Bloomington).
Journal of the Optical Society of America, vol. 56, Jul. 1966, p. 966–977. 12 refs.
Grants PHS NB-02274 and NSF G-24125.

A detailed analysis was made of the response characteristics of single cells in the lateral geniculate nucleus of the macaque nomkey. The goal was to understand how these cells contribute to the processing of visual information. Data were analyzed from a representative sample of 147 cells, whose responses to equal-energy spectra (presented as diffuse flashes of monochromatic light) were recorded at three radiance levels. On the basis of their responses, the cells were divided into two general classes: spectrally nonopponent cells which respond to all wavelengths with either an increase or decrease in firing rate, and spectrally opponent cells (about two-thirds of the sample) which respond with an increase in firing rate to some parts of the spectrum and a decrease to other parts. Four types of opponent cells were found: (1) red excitatory and green inhibitory (+R−G), (2) green excitatory and red inhibitory (+G−R), (3) yellow excitatory and blue inhibitory (+Y−B), (4) blue excitatory and yellow inhibitory (+B−Y). Comparisons with psychophysical data indicated that nonopponent cells transmit brightness information; opponent cells, however, carry information about color, the hue of a light being determined by the relative responses of the four types. The saturation of spectral lights appears to be related to the differences in responses of opponent and nonopponent cells.

A66-82041
RELATIONSHIP OF TOXOPLASMA ANTIBODIES TO ALTITUDE.
Bryce C. Walton, Irma De Arjona, and Barbara M. Benchoff (U.S. Army Med. Res. Unit Component, Middle Am. Res. Unit, Balboa Heights, Canal Zone).
(First Intern. Congr. of Parasitol., Rome, Sep. 21–26, 1964). American Journal of Tropical Medicine and Hygiene, vol. 15, Jul. 1966, p. 492–495. 14 refs.

A total of 504 sera from school children from three ethnologically and socio-economically similar communities at differing altitudes in Panama (700, 4300, and 6000 ft.) were tested for antibodies to *Toxoplasma gondii* with the indirect fluorescent antibody test. Statistically significant differences in prevalence were noted, with the lowest prevalence at the highest altitude and highest prevalance near sea level.

A66-82042
STUDY ON THE EFFECT OF PRESERVATION OF CHLORELLA CULTURES ON THEIR PRODUCTIVITY [IZUCHENIE VLIIANIIA USLOVII KHRANENIIA KUL'TUR CHLORELLA V KOLLEKTSII NA POSLEDUIUSHCHUIU IKH PRODUKTIVNOST'].
M. G. Vladimirova and M. A. Ignat'evskaia.
Mikrobiologiia, vol. 35, May–Jun. 1966, p. 538–548. 26 refs. In Russian.

High productivity was preserved on a constant level in mesophilic *Chlorella pyrenoidosa* 82 cultures and thermophilic *Chlorella* sp. K., *Chlorella* sp. 19 n/v, *Chlorella* sp. (p.-1 str.), *Scenedesmus* sp. (Tx, 22-1 str.) if the cultures were kept at +10°C. under slight illumination (500 lx) on Tamija medium and were transferred once in 1.5–2 months. The thermophils grew well even after preservation at 25–27°C.; *Cl. pyrenoidosa* 82 lost its productivity after being kept at this temperature. The productivity of the thermophilic algae cultures is significantly affected by the conditions under which they are prepared for the productivity tests (e.g., special intermediate media). The latter are in their turn affected by the preservation conditions.

A66-82043
EFFECT OF ULTRAVIOLET RADIATION ON THE FUNCTIONAL STATE OF BASIC CEREBRAL NERVOUS PROCESSES OF MAN [VLIIANIE UL'TRAFIOLETOVOGO OBLUCHENIIA NA FUNKTSIONAL'NOE SOSTOIANIE OSNOVNYKH NERVNYKH PROTESESSOV KORY GOLOVNOGO MOZGA CHELOVEKA].
E. F. Al'bitskaia and Z. D. Gorkin (Kharkov Med. Inst., Dept. of Hyg. Labor, USSR).
Gigiena i Sanitariia, no. 6, Jun. 1966, p. 17–23. 7 refs. In Russian.

The effect of ultraviolet radiation of the higher nervous system activity of man was studied. The authors examined young subjects of 15–16 years (500 tests). The A. B. Ivanov-Smolensky speech and motor method and that of oriented speech reactions (associative experiment) were used. A mercury-quartz lamp was the source of radiation. The radiation time was constant. The radiation intensity was measured by means of yΦM-5 in (mcvt/cm^2)/min. Multiple ultraviolet irradiations with 1-1/2 biodose (237.9(mcvt/cm^2)/min.) produced an improvement in the functioning of the second signal system; this could be traced by the intensification of the closing function (absence of negative reaction, improvement of responses) and increase in velocity of nervous processes (shortening of latent period).

A66-82044
SHIFTS IN THE FUNCTIONAL STATE OF THERMAL ANALYZER IN WORKERS EXPOSED TO INFRARED RADIATION [SDVIGI V FUNKTSIONAL'NOM SOSTOIANII TEMPERATURNOGO ANALIZATORA U RABOCHIKH V USLOVIIAKH VOZDEISTVIIA INFRAKRASNOI RADIATSII].
N. A. Kokhanova (F. F. Erisman Moscow Sci.-Res. Inst. of Hyg., USSR).
Gigiena i Sanitariia, no. 6, Jun. 1966, p. 20–23. 12 refs. In Russian.

Investigation showed that due to the relatively low air temperature (19–23°C.) and ventilation of working sites at the forge-stamping shop, the skin temperature of different areas of the body (chest and forearm) of persons working near ovens was slightly lower than that of persons performing "cold" work. However, the perspiration intensity, the decrease of the latent period in reaction to thermal stimulation, and the rise of sensitivity to thermal stimulation were much more pronounced in these subjects than in workers who were not exposed to the action of infrared radiation during work.

A66-82045
EFFECT OF IMPULSE NOISE ON THE HUMAN BODY [VLIIANIE IMPUL'SNOGO SHUMA NA ORGANIZM CHELOVEKA].

A. A. Arkad'evskii and L. I. Maksimova (F. F. Erisman Moscow Sci.-Res. Inst. of Hyg., USSR).
Gigiena i Sanitariia, vol. 31, May 1966, p. 29–33. 7 refs. In Russian.

Experiments were carried out on young male adults in order to establish the effect of intermittent and continuous noise on human body functions. Intermittent noise of 90 db. and 180 bursts per minute produced greater increase in pulse rate than continuous noise of the same intensity, or intermittent noise of only 20 bursts per minute. Intermittent noise produced a sympathetic effect on the autonomic nervous system. Intermittent noise of 180 bursts per minute produced in most cases a decrease in maximal arterial pressure and an increase in minimal pressure. The same effect was noted during action of continuous noise, but 20 bursts per minute did not affect the blood pressure. Both intermittent noise of 180 bursts per minute and continuous noise of the same intensity produced a suppression of motor and visual analyzers. No such effect was noted at 20 bursts per minute. Intermittent and continuous noise had a temporary suppressing effect on hearing.

A66-82046
SPECTRAL ANALYSIS OF VIBRATION, NOISE AND THE FEATURES OF PHYSIOLOGICAL SHIFTS OCCURRING IN WORK WITH HIGHSPEED POLISHING MACHINES [SPEKTRAL'NYI ANALIZ VIBRATSII, SHUMA I KHARAKTERISTIKA FIZIOLOGICHESKIKH SDVIGOV, VOZNIKAIUSHCHIKH PRI RABOTE VYSOKOOBOROTNYMI SHLIFOVAL'NYMI MASHINKAMI].
L. Ia. Tartakovskaia, N. M. Gridin, and V. K. Agapova (Sverdlovsk Inst. Hyg. Labor and Prof. Diseases, USSR).
Gigiena i Sanitariia, vol. 31, May 1966, p. 33–37. 5 refs. In Russian.

Studies of vibrations caused by the use of high speed polishing machines showed a wide range of vibration effects. Pneumatic machines with speeds of 320–600 c.p.s. or electric types were used. After using the pneumatic type for 30 min. the subjects showed an increased vibrational sensitivity threshold, a fall in hand skin temperature, a slight increase in blood pressure, and a slight decrease in muscle strength and endurance. During the use of electric type the skin temperature of the hands increased slightly because of the heating of the machine handle during use.

A66-82047
ACCLIMATION TO COLD AND NOREPINEPHRINE; EFFECTS OF IMMUNOSYMPATHECTOMY.
E. Schonbaum, G. E. Johnson, and E. A. Sellers (Toronto U., Dept. of Pharmacol., Ontario, Canada).
(Am. Soc. for Pharmacol. and Exptl. Therapeutics, Fall Meeting, Philadelphia, 1965).
American Journal of Physiology, vol. 211, Sep. 1966, p. 647–650. 18 refs.
Grants DRB, Canada 9325-10, 9370-07 and MRC, Canada MA 1595.

Immunosympathectomized (nerve-growth factor antiserum-treated) rats acclimated to 23°C. excreted less norepinephrine than normal rats, but no difference in excretion was found between antiserum-treated and normal animals which had been acclimated to cold. Normal and antiserum-treated rats, with or without adrenal medullas, were acclimated to cold and then subjected to severe cold stress produced by removal of the fur. Normal as well as nerve-growth factor antiserum-treated rats responded with a temporary increase of urinary norepinephrine excretion—antiserum-treated rats less than normal rats—that reached a maximum after 24 hr.,

A66-82048
HEPATIC LYSOSOME AND SERUM ENZYME ALTERATIONS IN RATS EXPOSED TO HIGH ALTITUDE.
B. Dean Nelson (NIH, Natl. Inst. of Arthritis and Metab. Diseases, Lab. of Phys. Biol., Bethesda, Md.).
American Journal of Physiology, vol. 211, Sep. 1966, p. 651–655. 15 refs.

Exposure to simulated high altitude reduced the stability of rat hepatic lysosomes. This was shown by the rise, after exposure, in nonsedimentable acid phosphatase in liver tissue, and also by the accelerated release of acid phosphatase from lysosome-rich pellets incubated in vitro after isolation from livers of rats exposed to high altitude. Changes in serum glutamic oxalacetic transaminase, glutamic pyruvic transaminase, and acid phosphatase, measured as indices of tissue damage, paralleled the rise in nonsedimentable liver acid phosphatase during exposure to 32,000 ft. At less extreme altitudes (24,000–28,000 ft. for two hr.) however, a marked increase in nonsedimentable acid phosphatase preceded a comparable rise of serum enzymes. It is suggested that in altitude-exposed rats, lysosomal enzymes may play a cardinal role in initiating tissue damage and the release of tissue enzymes into the serum.

A66-82049
MEASUREMENT OF MYOCARDIAL DEVELOPED TENSION AND ITS RELATION TO OXYGEN CONSUMPTION.
Robert H. McDonald, Jr., Roger R. Taylor, and Horacio E. Cingolani (NIH, Natl. Heart Inst., Lab. of Cardiovascular Physiol., Bethesda, Md.).
American Journal of Physiology, vol. 211, Sep. 1966, p. 667–673. 20 refs. NIH and Natl. Heart Found., Australia supported research.

Myocardinal oxygen consumption was studied in a canine right heart-bypass preparation. Left ventricular developed tension, dependent on intraventricular pressure and internal radius of the ventricle, was determined at 20-msec. intervals throughout the cardiac cycle. Left ventricular end-diastolic and end-systolic volumes were measured by thermodilution and instantaneous volume was determined by the relative changes in a mercury in rubber gauge placed on the left ventricular circumference. Throughout a wide range of hemodynamic states, the best correlate with myocardial oxygen consumption (ml./100 g. per min.) was found to be the peak developed tension multiplied by heart rate.

A66-82050
MICROCIRCULATORY EFFECT OF SEROTONIN ON HEMOSTASIS FOLLOWING WHOLE-BODY X-IRRADIATION.
Evelyn Kivy-Rosenberg and Benjamin W. Zweifach (N. Y. U., Med. Center, Dept. of Pathol., New York City).
American Journal of Physiology, vol. 211, Sep. 1966, p. 730–734. 11 refs.
Contract AEC AT (30-1)-1680 and Grant NIH HE-4298(03).

The terminal vascular bed of the mesentery was examined in rats following exposure to relatively high doses of whole-body X-irradiation. The mesocecum was exteriorized (under anesthesia) at selected intervals between 3–30 days post-irradiation. Vascular reactivity and the status of the blood-tissue barrier were examined in conjunction with evidence for a hemostatic defect per se. Results indicate a sustained

exaggereated response to epinephrine. The hemostatic defect could be counteracted by repeated serotonin injections starting on day three or five post irradiation; but a defect in the venular and capillary wall as demonstrated by topical application of Versene still remained. Neither intravascular thrombus formation following local injury, nor in vitro clotting time in both treated and untreated rats was correlated with platelet numbers.

A66-82051
INTRACELLULAR P_{O_2}: A LIMITING FACTOR IN CELL RESPIRATION.
W. J. Whalen (Iowa U., Dept. of Physiol., Iowa City).
American Journal of Physiology, vol. 211, Sep. 1966, p. 862–868. 27 refs.
Grant PHS H5390.

Previously it was demonstrated that O_2 consumption of isolated muscles was reversibly depressed in low oxygen tension (P_{O_2}), without altering other measured cell functions. These findings suggested the possibility that some oxidative processes "run free" simply generating heat, if the P_{O2} exceeds a certain minimal level. The present study was undertaken to see whether the oxygen available ($a^{O}2$) to the cell in vivo was as low as had been found in vitro. Microelectrodes were inserted into an isolated muscle, and alternately, into the muscle of an intact frog, rat, or rabbit. The membrane potential could often be used to establish the location of the tip of the microelectrode. The results suggest that the intracellular $a^{O}2$ in vivo is lower than in vitro, and thus probably limits O_2 consumption in vivo. This possibility permits consideration of P_{O_2} as a regulator of heat production, as well as other cell functions.

A66-82052
PAIRED-ASSOCIATE LEARNING AND THE TIME OF AROUSAL.
D. E. Berlyne, Donna M. Borsa, Jane H. Hamacher, and Isolde D. V. Koenig (Toronto U., Canada).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 1–6. 24 refs.
Grants NIMH MH-06324 and Natl. Res. Council, Canada APT 73.

In a paired-association learning experiment, 75 db. white noise during presentation of stimulus and response terms in training trials significantly increased recall in a test trial held one day later. White noise after the response made no significant difference, and there was no significant interaction. White noise produced no effects on anticipations during training or on a test held immediately after training trials. The results are discussed with reference to four kinds of hypotheses regarding the relations between arousal and reinforcement and to the possible outcomes of interaction between short-term detrimental effects of arousal on performance and durable facilitatory effects of arousal on learning.

A66-82053
INTENSITY-TIME RELATIONSHIP AND PERCEIVED SHAPE.
H. W. Leibowitz, Sharon E. Toffey, and John L. Searle (Pa. State U., University Park).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 7–10. 12 refs.
Grant NIMH MH08061.

The effect of exposure duration on perceived shape was determined for intensity-time combinations which were adjusted to produce an equal amount of effective photolytic energy in accordance with the reciprocity relationship. Matched shape tends to remain constant for the shorter exposure durations, but increases with exposure duration, particularly above the critical duration of 0.1 sec. The results are interpreted as reflecting the importance of temporal summation within the visual system in the perception of shape, and the critical contribution of time, independent of intensity, in the manifestation of the tendency toward shape constancy.

A66-82054
SIMPLE REACTION TIME AS A FUNCTION OF THE RELATIVE FREQUENCY OF THE PREPARATORY INTERVAL.
Theodore P. Zahn and David Rosenthal (Natl. Inst. of Mental Health, Bethesda, Md.).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 15–19. 8 refs.

Simple auditory reaction time (RT) was investigated in relation to the length and relative frequency of each member of two pairs (1 and 3 sec. and 3 and 10 sec.) of preparatory intervals (PI) presented in an irregular sequence. For each pair, RT on trials with the shorter of the two PIs was a decreasing function of the relative frequency of that PI, even when the length of the PI on the preceding trial (PPI) was controlled. The detrimental effects of long PPIs were greater for the longer than for the shorter pair of PIs. The effects of relative frequency are attributed to "expectancy", and the effects of the PPI are attributed to its influence on time estimation.

A66-82055
IDENTIFICATION VERSUS SAME-DIFFERENT JUDGMENT: AN INTERPRETATION IN TERMS OF UNCORRELATED PERCEPTUAL ERROR.
Charles W. Eriksen, Harry L. Munsinger, and Thomas S. Greenspon (Ill. U., Urbana).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 20–25.
Grants PHS MH-1026 and K6-MH-22,014.

Two studies are reported concerning the relation between identification of a single tachistoscopically presented stimulus and the discrimination of pairs of stimuli presented at comparable exposure durations. The results of both studies show that accuracy of identification of a single item is higher than accuracy of discrimination of two items as same or different. A simple model is proposed which assumes that errors of identification of two simultaneous forms are independent. The predictions based upon the model fit the obtained accuracy scores and permit the prediction of simultaneous discrimination accuracy on the basis of single identification threshold.

A66-82056
INDEPENDENCE OF SUCCESSIVE INPUTS AND UNCORRELATED ERROR IN VISUAL FORM PERCEPTION.
Charles W. Eriksen (Ill. U., Urbana).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 26–35. 7 refs.
Grants PHS MH-1206 and K6-MH-22,014.

A model is presented for determining perceptual independence, defined as when information received on two successive form stimulations does not interact and the internal

perceptual system error present on the separate stimulations is uncorrelated. Two experiments are reported where the same stimulus form is presented on different foveal areas with lags between the stimulations of 0–1500 msec. A third experiment presented different forms on the two stimulations. All three experiments indicate that the successive inputs are independent even when separated by lags of less than one msec. The results are interpreted in terms of uncorrelated error or sensitivity at any given moment in time for different elements in the visual perceptual system represented by different foveal areas.

A66-82057
VIBROTACTILE THRESHOLDS FOR HAIRY SKIN.
Ronald T. Verrillo (Syracuse U., Lab. of Sensory Commun., N. Y.).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 47–50.
Contract ONR NOnr 669(13) and 140-145.

Absolute vibrotactile thresholds were determined as a function of stimulus frequency and contractor area on the hairy skin of the volar forearm. Thresholds for vibration decreased in direct proportion to the contractor area with a slope of −3 db. per doubling of area. When plotted as a function of frequency these data yield a U-shaped curve with a slope of −12 db. in lower frequencies and +9 db. in frequencies above 220 c.p.s. Both these findings confirm previous data obtained on glabrous skin. Some differences between hairy and glabrous skin were found and are discussed. Evidence is presented in support of a hypothesis advanced in earlier papers which suggests that there may be two types of mechanoreceptors in cutaneous tissue.

A66-82058
EFFECT OF SURROUND SIZE ON THE PERCEPTION OF TEXTURE PATTERNS.
Jacob Beck (Harvard U., Cambridge, Mass.).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 68–75. 8 refs.
Grants NSF GB-94 and GB-1521 and Carnegie Corp. supported research.

Halftone reproductions can be used to embed symbols in a checkerboard pattern so that the symbols cannot be readily identified. Three experiments studied the legibility of embedded symbols as a function of surround size. Over a range of experimental conditions legibility improved with increasing surround size. The form of the relationship varied with the size of the symbol, the exposure time, and the way in which the symbol was embedded. Phenomenally, as the size of the surround increased, those elements of the halftone pattern which could be assimilated to the surround were partialed out to form a single frame-work in relation to which the symbol was seen. The results are discussed in connection with the effect of the surround on figure-ground organization.

A66-82059
TASK PREDICTABILITY AND THE DEVELOPMENT OF TRACKING SKILL UNDER EXTENDED PRACTICE.
Merrill Noble, Don Trumbo, Lynn Ulrich, and Kenneth Cross (Kan. State U., Manhattan).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 85–94.
Grant AFOSR 526-64.

The influence of task predictability upon the organization of responses was studied in the context of an irregular step-fuction tracking task. Task predictability was determined by the proportion of elements in a 12-unit sequence that were repeated each time the sequence was presented. Proportions employed were 1.00, 0.83, 0.75, 0.67 and 0.00. Separate groups of nine subjects each were assigned to conditions. There were 820 repetitions of the 12-unit sequence during training and 80 repetitions after a three-mo. retention interval. Measures of absolute integrated error showed that performance efficiency was positively related to proportion of repeating elements; differences among means were significant. The relations suggested by plotting information measures against integrated error were similar but differed in detail. Differences in integrated error among conditions were related to specific indexes of temporal and spatial error. There were substantial losses after the three-mo. retention interval, with the greatest absolute and relative losses for the more predictable task.

A66-82060
EFFECTS OF DIMENSIONAL REDUNDANCY ON VISUAL DISCRIMINATION.
G. R. Lockhead (Johns Hopkins U., Baltimore, Md.).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 95–104. 17 refs.
(Contract Nonr-4010(03) and Grant NIMH MH-15,835-02.

Absolute judgments of line lengths and line positions, under easy and difficult viewing conditions were obtained when the stimulus dimensions were varied separately, together and perfectly correlated, and together and uncorrelated. Results showed that a redundance gain is obtained—performance is better—from correlated dimensions and that this gain is independent of sensory limitation. Analyses suggest that redundancy gains are obtainable only when stimulus dimensions are integral and that dimensions may also have to be continuous. An empirical method of measuring the amount of integrality of stimulus dimensions is suggested.

A66-82061
FIRST-ORDER RESPONSE DEPENDENCIES AT A DIFFERENTIAL BRIGHTNESS THRESHOLD.
R. G. Lathrop (Chico State Coll., Calif.).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 120–124. 8 refs.

Prior studies have shown the existence of significant sequential dependencies at the visual absolute threshold. Results of the current study indicate no such relationship at a differential brightness threshold. A tentative hypothesis advanced to account for these results assumes that, with initially subthreshold stimuli, reticular activity is low and excitability of cells in the visual cortex increases. With a now suprathreshold input, reticular activity facilitates further visual stimuli until adaptation occurs. With adaptation, stimuli are again subthreshold and the cycle begins again. This hypothesis may account for contradictory findings concerning intersensory stimulation.

A66-82062
SQUIRREL MONKEYS AND DISCRIMINATION LEARNING: FIGURAL INTERACTIONS, REDUNDANCIES, AND RANDOM SHAPES.

Allan J. Nash and Kenneth M. Michels.
Journal of Experimental Psychology, vol. 72, Jul. 1966, p 132–137. 7 refs.
Grant Natl. Inst. of Child Health and Human Develop. HD-1454; Purdue Res. Found. and Temple U. supported research.

The experiment investigated the extent to which contextual variables which arise from a multiplicity of forms in the visual field can influence the discrimination of random shapes. Ten squirrel monkeys performed a series of 2-choice discrimination tasks. Each problem was classified by the number of shapes present, the redundancy among the shapes, their relative spatial positions, and by their individual complexity. Analysis of the number of correct responses to the different problem types showed complex interactions of the variables. It was concluded that a comprehensive psychophysics of shape, in addition to isolating the stimulus characteristics of individual shapes, must specify the collective and interactive properties of a plurality of shapes as they typically appear in natural visual experience.

A66-82063
TWO REPLICATIONS OF AVOIDANCE CONDITIONING OF THE GSR.
H. D. Kimmel, H. S. Sternthal, and H. Strub (Fla. U., Gainesville).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 151–152.
Grant MINH MH-06060-03.

Two replications of an earlier study of avoidance conditioning of the galvanic skin response (GSR) were done. The first involved 22 pairs of subjects who received a visual conditioned stimulus (CS) and the second used 21 pairs of subjects who received an auditory CS. The CS-unconditioned stimulus interval was 5 sec. in both studies. Following a series of CS-only trials, paired acquisition trials were run in which the avoidance stimuli of a pair could make a criterion GSR that resulted in both subjects of the pair avoiding the shock. Following acquisition all subjects were given 10 extinction trials. The results of both studies showed that the avoidance subjects made larger GSRs than the control subjects during acquisition and extinction, but the only significant effect was that of the combined extinction differences. It was concluded that these results provided further support for the assertion that the GSR can be conditioned with an avoidance procedure.

A66-82064
RELATION BETWEEN STIMULUS PRESENTATION TIME, SERIAL LEARNING, AND THE SERIAL-POSITION EFFECT.
Gloria J. Fischer (South Fla. U., Tampa).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 153–154.

Bugelski (1962) found total time in paired-association (PA) learning to be constant and hypothesized that stimulus presentation time (T_p) X number of trials to learn (N)=k. The present study tested the extension of this hypothesis to serial learning. The influence of stimulus presentation time on the serial-position effect was also tested. Subjects learned to anticipate a list of 12 nonsence syllables of 33% association value, at 2, 4, 6, 8, or 16 sec. presentation times. Results extended $T_p(N)=k$ to serial learning, at least for short presentation times. The latter were found to have no effect on the serial-position curve.

A66-82065
SERIAL-LIST ITEMS AS STIMULI IN PAIRED-ASSOCIATE LEARNING.
Sheldon M. Ebenholtz (Conn. Coll., New London).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 154–155. 5 refs.

Previous experiments have shown a serial-position effect (SPE) in paired-association (PA) learning where the pairs contained stimuli previously learned in serial order. The present experiment extended the number of pairs from 10 to 14. Pairs containing stimuli from terminal serial positions were learned with significantly fewer errors than pairs whose stimuli derived from central positions. The latter produced a dip in the PA error distribution suggesting the presence of sequential associations in SL between items occupying central positions.

A66-82066
STIMULUS INTERVALS, STIMULUS DURATIONS, AND DIFFICULTY LEVEL IN PAIRED-ASSOCIATES LEARNING.
Calvin F. Nodine and Barbara F. Nodine (Carnegis Inst. of Tech., Pittsbrgh, Pa.).
Journal of Experimental Psychology, vol. 72, Jul. 1966, p. 156–158.
Grant PHS MH10165-01 and Miami U., Oxford, Ohio supported research.

Presentation of paired associates (PA) using the anticipation method was investigated in a 3X3X2 factorial design as functions of (a) interval between stimulus term and stimulus–response (ST–R) pair (interstimulus interval, ISI); 0, 1, or 2 sec., (b) interval between ST–R pair and stimulus term of succeeding PA unit (interunit interval, IUI); 0, 1, or 2 sec., and (c) exposure duration of stimulus terms (ST duration) and exposure duration of ST–R pairs (Pair duration); 1/2:1/2 or 2:2 sec. Performance increased directly with ISI, IUI, and durations. However, the data indicated that when durations were 1/2:1/2 sec., IUI produced significantly larger increments in correct responses than ISI from 0 to 2 sec. When durations were 2:2 sec., the reverse was true.

A66-82067
ANALYSIS OF CIRCADIAN RHYTHMS IN HUMAN ADRENOCORTICAL SECRETORY ACTIVITY.
Grant W. Liddle (Vanderbilt U., School of Med., Dept. of Med., Nashville, Tenn.).
(Am. Clin. and Climatol. Assn., 78th Ann. Meeting, Williamsburg, Va., Oct. 25–27, 1965).
Archives of Internal Medicine, vol. 117, Jun. 1966, p. 739–743. 30 refs.
Grants NIH 5-K6-AM-3782, 5 ROI-AM-05318, TI-AM-5092, and 8-MOI-TR-95.

The major rhythms in adrenal steroid secretion appear to be related to habitual patterns of activity and are not related in any fixed way to the external environment. They exhibit distinct circadian (approximately 24-hour) periodicity only if habitual activity patterns follow a circadian schedule. The dominant factor conferring apparent circadian rhythmicity upon aldosterone secretion is the effect of upright posture, which acts apparently by stimulating the renal production of renin. The dominant factor conferring apparent circadian rhythmicity upon adrenocorticotropic hormone (and thereby cortisol) secretion is the sleep–wake schedule. By rescheduling postural and sleep–wake patterns, it is possible to abolish the 24-hour periodicity of adrenal steroid secretion. The concept that there is an adrenal cycle with inherent periodicity of about 24 hours cannot be accepted without further reappraisal.

A66-82068
THE LOCALIZATION OF WARM STIMULI.
P. W. Nathan and R. C. Rise (Pa. U., Med. School, Philadelphia).
Neurology, vol. 16, Jun. 1966, p. 533–540. 7 refs. Pa. U. supported research.

The ability of normal subjects to localize a pure warm stimulus consisting of radiant heat was investigated and compared with the ability to localize a tactile stimulus. It was found that the warm stimulus was localized less accurately than the tactile stimulus, but it was localized far better than could have occurred by change. When the intensity of the stimulation was increased so that the sensation passed from one of pure warmth to one of warmth with pricking or stinging or hot, the accuracy of localization was similar to that for tactile stimulation. It is argued that stimuli setting up impulses only in the anterolateral conducting system of the spinal cord are well localized.

A66-82069
OCULOMOTOR ACTIVITY IN COSMONAUTS IN ORBITAL FLIGHT.
I. T. Akulinichev, M. D. Emel'yanov, and D. G. Maksimov. *(Izvestiia Akademii Nauk SSSR, Seriia Biologicheskaia, no. 2, 1965, p. 274. In Russian.)*
Federation Proceedings, vol. 25, Jan.–Feb. 1966, p. T31–T33. 9 refs. Translation supplement.

Electrooculograms (EOG) were recorded of four Soviet cosmonauts (A. G. Nikolayev, P. R. Popovich, V. F. Bykovskii and V. V. Tereshkova) during orbital space flights. Analysis of the EOG revealed that none of the cosmonauts showed signs of persistently disturbed coordination of eye movements during the three–five days they were in a state of weightlessness. Transient disturbances (asymmetry of oculomotor reactions and nystagmoid movements) were observed in two cosmonauts. The transient and slight nature of these disturbances pointed to an active process of adaptation to the unusual setting.

A66-82070
INVOLVEMENT OF CO_2 IN THE HILL REACTION.
Birgit Vennesland (Chicago U., Dept. of Biochem., Ill.).
Federation Proceedings, vol. 25, May–Jun. 1966, p. 893–898. 11 refs.
Grant PHS GM 08735 and NSF supported research.

For the blue-green alga *Plectonema* at saturating light intensity, the CO_2 requirement of the Hill reaction can be satisfied with lower CO_2 tensions than those required to satisfy the CO_2 requirement of photosynthesis. Such a result is not incompatible with the hypothesis that the CO_2 effect on the Hill reaction reflects a chemical reaction of CO_2 common to both processes. In photosynthesis at maximal rates, CO_2 is rapidly being removed from the system; in the Hill reaction there is no net consumption of CO_2. One might expect that higher CO_2 tensions would at times be needed to support the steady-state process which is utilizing CO_2 at maximum rates. This kind of reasoning presupposes that the CO_2 effect on the Hill reaction reflects a process of CO_2 fixation of fundamental importance in photosynthesis.

A66-82071
CIRCADIAN VARIATIONS IN RENAL EXCRETION OF MAGNESIUM, CALCIUM, PHOSPHORUS, SODIUM, AND POTASSIUM DURING FREQUENT FEEDING AND FASTING.
Hun Ki Min, John E. Jones, and Edmund B. Flink (W. Va. U., Med. School, Dept. of Med., Morgantown).
Federation Proceedings, vol. 25, May–Jun. 1966, p. 917–921. 12 refs
Grants PHS AM05578 and NB03152.

In normal human subjects, with evenly spaced diet and minimum activity a definite circadian rhythm and identical sine-curve pattern for Mg^{++} and Ca^{++} excretion were observed with peak excretion in early morning. Phosphorus excretion followed a pattern almost exactly 180° out of phase with Mg^{++} and Ca^{++} excretion. The circadian fluctuation of Na^+ and K^+ was that of late morning rise and night fall. In fasting obese patients, also, identical circadian rhythm for Mg^{++} and Ca^{++} with peak excretion in early morning was observed. Sodium excretion followed almost the same pattern as that of Mg^{++} and Ca^{++} excretion. The circadian rhythm of K^+ and P observed in normal subjects disappeared during fasting. The identical circadian rhythm of Mg^{++} and Ca^{++} supports the concept that these ions are handled by the kidney in a similar manner.

A66-82072
EFFECTS OF IN VIVO HYPEROXIA ON ERYTHROCYTES. III. IN VIVO PEROXIDATION OF ERYTHROCYTE LIPID.
Charles E. Mengel and Herbert E. Kann, Jr. (Ohio State U., Depts. of Med. Columbus and Duke U., Durham, N. C.).
(Southern Soc. for Clin. Invest., New Orleans, La., Jan. 1965). *Journal of Coinical Investigation,* vol. 45, Jul. 1966, p. 1150–1158. 66 refs.
Grants PHS CRTY-5042, CA-064520, and CA-08170.

Studies of the effect of in vivo oxygen under high pressure on erythrocytes were carried out in tocopherol-deficient and tocopherol-supplemented mice. Hemolysis occurred only in tocopherol-deficient mice exposed to oxygen under high pressure. In vitro lytic sensitivity of red cells to hydrogen peroxide paralleled their in vivo lytic sensitivity to hyperoxia. These studies established the in vivo formation of lipid peroxides in tocopherol-deficient mice during hyperoxia, an effect which preceded hemolysis. The relationship between hemolysis and liquid peroxidation is discussed.

A66-82073
MEASUREMENT OF O_2 DIFFUSION CAPACITY OF THE LUNGS WITH A STABLE O_2 ISOTOPE.
R. W. Hyde, R. E. Forster, G. G. Power, J. Nairn, and R. Rynes (Pa. U., Dept. of Med. and Div. of Graduate Med., Dept. of Physiol., Philadelphia).
Journal of Clinical Investigation, vol. 45, Jul. 1966, p. 1178–1193. 40 refs. Life Insurance Res. Fund supported research.

The rate of disappearance of a stable O_2 isotope, $^{34}O_2$, from the alveoli during breath holding was used to measure the single breath oxygen diffusing capacity of the lungs (DLO_2SB). In five resting subjects at an average oxygen pressure (PO_2) of 42 mm. Hg, DLO_2SB was 33 ml. per (minute X mm. Hg). In three of the subjects DLO_2SB was measured at a PO_2 of approximately 220 mm. Hg and found to be only 6 ml. per (minute X mm. Hg). This finding is attributed to the slower velocity of the reaction of O_2 and hemoglobin at the higher O_2 tensions. The alveolar-end capillary O_2 gradient (A-a gradient calculated from the average values of DLO_2SB found in our subjects by the Bohn integration procedure was two to three mm. Hg at an alveolar PO_2 of 47 mm. Hg and less than 0.5 mm. Hg at an alveolar PO_2 of 100 mm. Hg. DLO_2SB calculated from the carbon monoxide diffusing capcity was almost twice as great as the value obtained by directly measuring DLO_2SB with $^{34}O_2$. This discrepancy

could not be explained by uneven distribution of alveolar volume and diffusing capacity throughout the lungs but could be explained by uneven distribution of diffusing capacity and blood flow (uneven DL/Qc).

A66-82074
THE PRECORDIAL ELECTROCARDIOGRAM DURING AND AFTER STRENUOUS EXERCISE.

David M. Berkson, Jeremiah Stamler, and Walter Jackson (Chicago Board of Health, Div. of Adult Health and Aging, Heart Disease Control Program and Northwestern U., Med. School, Dept. of Med., Chicago, Ill.).

American Journal of Cardiology, vol. 18, Jul. 1966, p. 43–51. 34 refs.

Grant NHI H4197 and Chicago Heart Assn. supported research.

Forty-nine apparently healthy, physically active middle-aged men were selected for progressive exercise on a treadmill in an attempt to achieve a near-maximal or maximal effort. Electrocardiographic recordings during and after exercise were made utilizing the ear–ensiform–precordial (EEP) electrode lead system. In 20% of the men a sagging, downward-sloping S–T segment depression of 0.5 mm. or greater developed; in most of these men it was recorded both during and after exercise. In an additional 24%, electrodiograms showed horizontal flattening of the S–T segment, observed in most of these men with one or more coronary risk factors (e.g., hyperchloesterolemia, heavy cigarette smoking, overweight) than in men with none of these. Short runs of premature ventricular beats in two men antedated a sagging, downward-sloping S–T segment response. Further long term studies of large populations are needed to determine whether or not the usual standards of normal and abnormal electrocardiographic response after moderate exercise can be applied to the electrocardiogram during and after near-maximal and maximal exercise.

A66-82075
A SIMPLE TEST OF CARDIAC FUNCTION BASED UPON THE HEART RATE CHANGES INDUCED BY THE VALSALVA MANEUVER.

Albert B. Levin (Hammersmith Hosp., Depts. of Cardiol. and Med. and Postgraduate Med. School, London, Great Britain).

American Journal of Cardiology, vol. 18, Jul. 1966, p. 90–99. 29 refs.

Grant NHI 1-F2-HE-22,530-01.

The Valsalva ratio (the ratio of the maximal tachycardia to the maximal bradycardia induced by a standard Valsalva maneuver) was determined in 200 normal subjects and 220 patients with heart disease and related disorders. Ninety-six percent of the normal subjects had Valsalva ratios of 1.50 or higher, and this value was defined as the lower limit of normal. The Valsalva ratio tended to decrease with increasing severity of dyspnea in patients with aortic and mitral valve disease, ischemic heart disease, and cardiomyopathies. There was a statistically significant tendency ($p<0.01$) for patients with radiologic evidence of pulmonary congestion to have abnormally low Valsalva ratios, and for patients without pulmonary congestion to have normal values. Abnormal Valsalva ratios were recorded in patients with right ventricular failure secondary to thromboembolic pulmonary hypertension and chronic pulmonary disease. Measurement of the changes in heart rate induced by the Valsalva maneuver provides a rapid, safe, and inexpensive method of evaluating cardiac function, and permits the prediction of certain hemodynamic variables without subjecting patients to cardiac catheterization.

A66-82076
GEOTROPISM IN SIMULATED LOW-GRAVITY ENVIRONMENTS.

R. R. Dedolph, S. A. Gordon, and D. A. Oemick (Argonne Natl. Lab., Div. of Biol. and Med. Res., Ill.).

American Journal of Botany, vol. 53, Jul. 1966, p. 530–533. 15 refs. NASA supported research.

The assumption that changes in growth associated with horizontal clinostat rotation are caused by the nullification of the directional component of the gravity-force vector has not been rigorously tested. It was found that geotropic response is dependent upon the calculated degree of nullification of the directional component of the gravity-force vector. This relationship increases the probability that clinostat rotation at appropriate rates produces conditions simulating low gravity. Using oat seedlings and clinostat techniques that cancel only a portion of the gravity-force vector, there is no threshold of gravity perception. The geotropic curvature response increases with the force imposed. Forces of 0.06 and 0.08 X g were sufficient for maximum response of oat roots and coleoptiles, respectively.

A66-82077
PRODUCTION OF PANTOTHENIC ACID AND INOSITOL BY CHLORELLA VULGARIS AND C. PYRENOIDOSA.

Robertson Pratt and Evelyn Johnson (Calif. U., San Francisco Md. Center, School of Pharm.).

Journal of Pharmaceutical Sciences, vol. 55, Aug. 1966, p. 779–802. 14 refs. Calif. U., supported research.

Two unicellular green algae, *Chlorella vulgaris* and *C. pyrenoidosa*, were compared with respect to pantothenic acid and inositol content at different times during a three-week culture cycle. Pantothenic acid was found in the cells and in the external medium at all times; the concentration in the cells (mmcg./mg. dry weight) decreased sharply toward the end of the first week and then less abruptly through most of the remaining two weeks. However, due to increase in the cell mass, the absolute yield (mmcg./ml. harvested culture) increased. The concentration in the external medium, after a relatively small decline during the first week, rose substantially and at the end of the culture period far exceeded that in the cells. Inositol content of the cells increased slowly throughout the culture period. No extracellular inositol was detected at any time. *C. pyrenoidosa* excels *C. vulgaris* as a source of both compounds.

A66-82078
EFFICACY OF SOCIOMETRIC RATINGS IN PREDICTING LEADERSHIP SUCCESS.

Herbert H. Reynolds (Aeromed. Res. Lab., Holloman AFB, N. Mex.).

Psychological Report, vol. 19, Aug. 1966, p. 35–40. 11 refs.

Thirty-three senior Air Force ROTC college students were assigned positions of responsibility in the cadet training program based upon combined staff and peer sociometric ratings. The object of the study was to determine the efficacy of the peer ratings in predicting leadership success. Staff officer ratings at the end of the study period (one semester) served as the success criterion. A rho of .83 between peer ratings and the success criterion was obtained ($p<.01$). A test of the estimated reliability of staff ratings yielded a coefficient of .93 when the average staff correlation of .73 was "stepped up" by the Spearman–Brown Prophecy Formula. It was concluded that sociometric ratings are quite valuable as a predictive instrument of leadership success. Use of this technique in the many areas of leadership appears not only justified but highly desirable for optimal utilization of organizational members.

A66-82079
TEST OF THE CONCEPT OF "AVAILABILITY OF FUNCTIONS" IN PROBLEM SOLVING.
Norman R. F. Maier and Ronald J. Burke (Mich. U., Ann Arbor).
Psychological Reports, vol. 19, Aug. 1966, p. 119–125. 11 refs.
Grant PHS MH-02704.

One-hundred-thirty-five male college students solved Maier's Hatrack Problem (Maier, 1945) in an experiment designed to evaluate Saugstad's "availability of functions" concept. Saugstad has stated that subjects will solve any problem if they have the necessary functions available. The data indicated that: (1) persons failing to solve the problem had the necessary or relevant experiences, (2) subjects who solved and those who did not solve the problem had very similar experiences, and (3) selecting the relevant experience resulted in the immediate solution of the problem by a majority of subjects. Contrary to Saugstad's contention, persons will not necessarily solve a problem if they have the essential functions or past experiences. Recognizing experiences as relevant to a problem's requirements, selecting experiences from a given repertoire, fragmenting experiences into parts, and recombining parts of experiences into solutions are functions that seem essential, yet are excluded when problem solving is regarded as a form of generalized learning. Three groups of problem solvers, differing in their degrees of success with the Hatrack Problem, had strikingly similar available functions, but differed in the way they selected from their past experiences when confronted with the problem of finding uses for the pole structure.

A66-82080
CRITERIA AND TRANSFER OF TRAINING.
Joseph Weitz (N. Y. U., Res. Center for Ind. Behavior, New York).
Psychological Reports, vol. 19, Aug. 1966, p. 195–210. 12 refs.
Grant NOnr 285 (51).

Using a new matrix learning task an attempt is made to determine the basis of transfer by observing the effect of using criterion measures at different points in time during the transfer sequence. It was found that for "easy" transfer situations the effect of an independent variable is apparent early in the transfer sequence and on a more "difficult" task the effect of the independent variable is apparent later in the transfer sequence. The effectiveness of the transfer of task approach is discussed within the framework of task difficulty. From these findings some implications for training and some hypotheses concerning the validation of personality tests are suggested.

A66-82081
ACQUISITION OF A TEMPORAL DISCRIMINATION BY HUMAN SUBJECTS.
David E. Carter and Glenn J. MacGrady (Columbia U., New York City, N. Y.).
Psychonomic Science, vol. 5, Jul. 15, 1966, p. 309–310. 6 refs.

Acquisition of a button-pressing response for three values of a DRL schedule (differential reinforcement of low rates of responding) was observed for 12 humans under instructions to win as many points, indicated by a flashing light, as possible. All subjects showed a rapid development of a temporal discrimination and a rapid transition from DRL 3 sec. to DRL 6 sec. to DRL 10 sec. Several characteristics of stable DRL behavior were similar to those found with animals.

A66-82082
EFFECTS OF DARKNESS, CONSTANT ILLUMINATION, AND SYNCHRONIZED PHOTIC STIMULATION OF AUDITORY SENSITIVITY TO PULSED TONES.
J. A. Sheridan, R. S. Cimbalo, J. A. Sills, and E. A. Alluisi (Louisville U., Ky.)
Psychonomic Science, vol. 5, Jul. 15, 1966, p. 311–312. 9 refs.
Contract DA-49-193-MD-2567.

Pulsed-tone thresholds at five frequencies (250, 500, 1000, 2000, and 6000 c.p.s.) were obtained from subjects under three conditions of visual surround: darkness, normal ambient illumination, and relatively high-intensity tone-synchronized photic stimulation. Auditory sensitivity to the highest frequency was lowered by visual stimulation of both types.

A66-82083
EFFECTS OF INCENTIVE AND INCENTIVE-CUE POSITION ON SHORT-TERM RETENTION.
Roger M. Tarpy and Sam Glucksberg (Princeton U., N. J.).
Psychonomic Science, vol. 5, Jul. 15, 1966, p. 313–314.
Grant PHS MH 10742-01.

Subjects recalled CCC trigrams differing in incentive value, temporal position of incentive cue, and length of retention interval. Recall varied as a function of incentive and retention interval, but was unrelated to cue position. Additional evidence suggested that differential learning and covert rehearsal may mediate the facilitative effects of incentive.

A66-82084
CONFIDENCE RATINGS IN RECALL PAIRED-ASSOCIATES: THE RTT PARADIGM.
Milton D. Suboski, Bruce A. Pappas, and D. J. Murray (Queen's U., Kingston, Canada).
Psychonomic Science, vol. 5, Jul. 15, 1966, p. 315–316.
Grants Can. NRC APA 160 and APT 126.

Having subjects rate their confidence in the correctness of their responses in the RTT recall paired-associates paradigm produced proportions of correct and incorrect responses in substantial agreement with all-or-none predictions. The confidence rating results, however, are inconsistent with all-or-none theory, suggesting instead a continuum of stimulus–response (S–R) associative strength.

A66-82085
SHORT-TERM RETENTION, PRESENTATION RATE, AND NUMBER OF DISPLAY CYCLES.
M. S. Mayzner, M. E. Tresselt, S. Adler, A. Cohen, and K. M. Schoenbert (N. Y. U., New York).
Psychonomic Science, vol. 5, Jul. 15, 1966, p. 317–318. 5 refs.
Contract Nonr 285(56).

Previous work of Bugelski (1962) Mayzner and Schoenberg (1965), and Murdock (1965) has shown that if total display time is held constant trade offs may be found between number of display cycles (i.e., the number of times a list is repeated before recall is requested) and display presentation rates. The present study extends these earlier findings by showing that for the short-term retention of a string of 20 digits, trade offs may be obtained over the range from one display cycle and a presentation rate of eight sec. per digit to 16 display cycles and a presentation rate of one-half sec. per digit. A breakdown does apparently occur with 32 display

cycles and a presentation rate of one-fourth sec. per digit where clear input registration is apparently degraded by the rapidly changing display.

A66-82086
PRESSURIZATION SYSTEMS—AIRCRAFT CABINS AND FLIGHT SUITS.
L. K. Hoff (Southern Alberta Inst. of Technol., Canada).
Canadian Aeronautics and Space Journal, vol. 12, Jan. 1966, p. 17–27. 20 refs.

Pressurization is the primary life-sustaining system in high altitude and space flight today. In high altitude aircraft, pressurization of the aircraft cockpit maintains the crew in a safe environment and allows them to control the aircraft with maximum efficiency and minimum danger. Pressure suits are worn by these crews as a back-up system in the event of failure of the main cabin pressure. In space applications, pressurization is absolutely essential to maintain life, for without it body fluids would boil and death would occur instantly. On space flights pressurized suits are worn as a safety system to prevent bodily harm if main system failure occurs. For excursions outside the spacecraft these suits become the prime life-sustaining unit. While pressurized they must afford maximum mobility and proteotion. Looking to the near future, orbiting space stations will be permanently placed in space and will be manned for experimental and research purposes.

A66-82087
CARDIAC OUTPUT, BLOOD PRESSURE AND FREE FATTY ACID RESPONSES TO SMOKING IN THE NONBASAL STATE.
William S. Frankl, Ronald Friedman, and Louis A. Soloff (Temple U., Med. Center, Dept. of Cardiol. and Cardiovascular Res. Center, Philadelphia, Pa.).
American Journal of the Medical Sciences, vol. 252, Jul. 1966, p. 73–78. 15 refs.
Grant PHS HE-06313 and Council for Tobacco Res. supported research.

Cardiac output, cardiac index, stroke volume and free fatty acids have been shown to rise after smoking, in the resting, basal state. This study was undertaken to ascertain whether a similar response occurred in the nonbasal subject. Cardiac output and free fatty acids were elevated prior to smoking. In none of the subjects was there a significant further rise in cardiac output or free fatty acids after smoking (except for a borderline significant rise in cardiac index immediately after completion of smoking). These findings cast some doubt on whether tobacco actually exerts any significant effect on cardiac output, stroke volume or blood free fatty acids in the nonbasal state.

A66-82088
CORTICOFUGAL REGULATION OF LATENT PERIODS OF BIOELECTRICAL RESPONSES TO PHOTIC STIMULATION IN THE RABBIT VISUAL CORTEX.
R. M. Meshcherski, Cs. Adorjáni, and A. K. Malikova (USSR, Acad. of Sci., Inst. of Higher Nervous Activity and Neurophysiol., Moscow and Hung. Acad. of Sci., Inst. of Psychol., Budapest).
Acta Physiologica Academiae Scientiarum Hungaricae, vol. 29, no. 3–4, 1966, p. 235–246. 18 refs.

Under pentobarbital (35 to 55 mg./kg.) anesthesia a lengthening of the latent periods of lateral geniculate nuclear and visual cortical responses to flash stimulation was observed. Slight strychninization of the visual cortex in unanesthetized rabbits did not influence the latency of visual cortical responses, but in anesthetized animals it caused a shortening of latent periods. Strong strychninization of the visual cortex, as well as the spreading cortical depression resulted in a lengthening of the latency of visual cortical responses. The latent periods of visual cortical responses did not change under the effect of direct electrical stimulation, or of a stimulation of the lateral geniculate nucleus after the application of strychnine or KCl. Changes in the latency of visual cortical responses occurring in association with changes in the functional state are related to the corticofugal slowing down or acceleration of the afferent volley conduction through the lateral geniculate nucleus. The obtained data support the assumption concerning the activation of excitatory and inhibitory corticofugal effects under conditions of strychnine or KCl application to the visual cortex, i.e., during increased or decreased visual cortical reactivity.

A66-82089
THE EFFECT OF PYROGEN ON BODY TEMPERATURE AND OXYGEN CONSUMPTION IN THE RAT AT DIFFERENT ENVIRONMENTAL TEMPERATURES.
S. Kerpel-Fronius, Annamária Kiss, and G. Than (U. Med. School, Inst. of Pathophysiol., Pécs, Hungary).
Acta Physiologica Academiae Scientiarum Hungaricae, vol. 29, no. 3–4, 1966, p. 267–271. 8 refs.

The effect of pyrogen (highly purified lipopolysaccharide of *Escherichia coli*) was studied at neutral (30°C.), cool (20°C.) and cold (10°C.) environmental temperatures. Pyrogen caused a similar increase in body temperature at 30°C. and at 20°C., but the rise in the metabolic rate was considerably greater at 20°C. At 35°C. administration of pyrogen did not increase further the initially hyperthermic temperature, nor did heat production change in the majority of cases. Pyrogen failed to increase body temperature at 10°C., although heat production increased in every instance.

A66-82090
THE INFLUENCE OF CO_2 CONCENTRATION AND pH ON TWO CHLORELLA SPECIES GROWN IN CONTINUOUS LIGHT.
E. Steemann Nielsen and M. Willemoes (Roy. Danish School of Pharm., Botan. Dept., Copenhagen, Denmark).
Physiologia Plantarum, vol. 19, no. 2, 1966, p. 279–293. 19 refs. Danish State Res. Found. supported research.

Both *Chlorella pyrenoidosa* and *Chlorella vulgaris* grew equally well at 20°C. aerated with ordinary air or mixtures of air with 5 or 12% CO_2 (5 klux continuous light). Whereas *C. vulgaris* rapidly adapted to a higher CO_2 tension, adaptation took about 24 hours for *C. pyrenoidosa*. In *C. vulgaris* pH of 3.6–7.6 had no apparent influence on the rate of photosynthesis in experiments having a duration of two hours. This was true both for algae grown aerated by ordinary air and for algae grown with a mixture of 5% CO_2 in air. In *C. pyrenoidosa* the same was found for algae in ordinary air, but an influence of pH was seen in 5% CO_2 in air. The rate of photosynthesis in *C. pyrenoidosa* during the first two hours was influenced by the concentration of free CO_2. The highest rate was found at the CO_2 concentration at which the algae had been growing previously. The influence on the rate of photosynthesis in *C. vulgaris* was less, although in principle the same. The rate of respiration varied from one series to another especially in *C. vulgaris*.

A66-82091
ACTION SPECTRA OF PHOTOSYNTHETIC ACTIVITIES OF CHLORELLA ELLIPSOIDEA.
H. Lundegardh (Res. Lab., Penningby, Sweden).
Physiologia Plantarum, vol. 19, no. 2, 1966, p. 540–553. 22 refs.

Flash experiments on suspensions of *Chlorella ellipsoidea* showed the existence of a steady state carotene to xanthophyll ratio that was moved to reduction in blue and green light and to oxidation in red light. All experiments pointed to the existence of two light reactions, the first one involving excitation of carotenoids, with ferredoxin triphosphopyridine nucleotide as acceptor, the second one involving excitation of chlorophyll, with the cytochrome system of the chloroplasts acting as donors of electrons and thus completing an energy converting circulation between pigments and enzyme systems. The operation of combined light reactions appeared also from experiments with simultaneous or succedaneous illumination with monochromatic light of different wave-lengths. Some effects may be explained from separate excitations of carotenoids and chlorophylls, others may depend on still unknown photic reactions. The action spectrum in ultrared showed a positive band at c. 900 nm but very small effects in the region 950–1400 nm. Ultrared radiation had an enhancing effect on light excitation in the visible spectrum. A combination of infrared and visible radiation showed a roughly linear relation between incident energy and photosynthetic effect. All experiments were performed in the region of linear relation between intensity of incident light and O_2 production. Combined monochromatic regions showed a very rapid initial change in the steady states that in one or two minutes simmered down to a balanced state of continued photosynthesis. No change was observed in the total quantity of the pigments.

A66-82092
CEREBRAL CELL POPULATION UNDER HYPOXIA.
Richard R. Shivers and Paul Gibbons Roofe (Kan. U., Dept. of Zool., Lawrence)
Anatomical Record, vol. 154, Apr. 1966, p. 841–845. 27 refs. Grant NIH NB 04992-4.

Three pregnant albino Sprague-Dawley rats were subjected to simulated high altitudes of 18,000 feet (365 mm. Hg) in low pressure chambers during their entire pregnancy. The brains of the newborn rats were removed immediately after birth and placed in 10% formalin. The brains were sectioned, stained, and analyzed for changes in the number of cells in the cerebral cortex of the frontal lobes. An equal volume of control material was similarly prepared and analyzed. A volume of tissue of about one-fourth cubic millimeter was used in the control and in the experimental tissue. The results indicated a 19.29% increase in the number of cells in the frontal cortex of newborn rats subjected to simulated high altitude anoxia. This increase is believed to be due to a proliferation of glial elements in the areas of the cortex which were studied. The cell hyperplasia seen here may be a response to physiological stresses placed upon the fetus by maternal anoxia.

A66-82093
APICAL DOMINANCE AND THE EFFECT OF GRAVITY ON NUTRIENT DISTRIBUTION.
Harry Smith and P. F. Wareing (London U., Queen Mary Coll., Dept. of Botany, Great Britain).
Planta, vol. 70, no. 1, 1966, p. 87–94. 12 refs.

The effect of orientation with respect to gravity on the accumulation of phosphorus-32 into lateral and leader apices was investigated in seedling trees of *Betula pubescens*. In upright, well-branched seedlings, showing only weak apical dominance, basally injected ^{32}P was distributed among the lateral and leader apices. Re-orientation treatments which resulted in the assumption of strong dominance by a lateral apex also resulted in a marked accumulation of ^{32}P into that apex. This effect of orientation on nutrient transport was manifested within two to four days after application of the gravimorphic treatments. The results are discussed in the light of modern concepts of hormone-directed nutrient transport and a working hypothesis for the role of gravity in apical dominance of woody plants in suggested.

A66-82094
GROWTH RESPONSES OF BARLEY SEEDLING TO SIMULATED WEIGHTLESSNESS INDUCED BY TWO-AXIS ROTATION.
Takashi Hoshizaki, W. R. Adey, and K. C. Hamner (Calif. U., Center for the Health Sci., Brain Res. Inst., Los Angeles).
Planta, vol. 69, no. 3, 1966, p. 218–229. 11 refs.
NASA Grant NsG 538-63 and Contract AF 49(638)-1387.

A device used for simulated weightless studies is described and is called the Nogravatron. The Nogravatron apparatus produces simulated weightlessness by rotating seedlings simultaneously at the rate of 0.24 r.p.m. and 1.0 r.p.m. in two axes perpendicular to each other. Atlas barley seedlings grown on the apparatus grew at rates different from that of stationary controls. Coleoptile elongation in rotated barley was not inhibited by light during the first 55 hours of rotation treatment whereas stationary controls were photoinhibited. After 55 hours the growth of rotated coleoptiles was inhibited by light. The coleoptiles did not show movements and were oriented along the longitudinal axis of the seed. Roots also did not show geotropic movements but the growth direction was affected by the proximity of other roots. Coleoptiles rotated in dark were significantly longer than stationary controls on the third and fourth day but not so on the fifth day and later. Coleoptiles rotated in light were about 35% longer than the stationary coleoptiles by the third day and maintained this significant difference to the end of the experiment.

A66-82095
INFLUENCE OF DIFFERENT WAVE LENGTHS ON THE COMPOSITION OF CHLORELLA GROWN IN GLUCOSE MEDIUM WITH INHIBITED PHOTOSYNTHESIS [EINFLUSS VERSCHIEDENER LICHTWELLENLANGEN AUF DIE ZUSAMMENSETZUNG VON CHLORELLA IN GLUCOSEKULTUR BEI GEHEMMTER PHOTOSYNTHESE].
Wolfgang Kowallik (Göttingen U., Pflanzenphysiol. Inst., West Germany).

Increasing blue light intensity inhibited the growth of *Chlorella pyrenoidosa* in glucose culture in which photosynthesis was blocked by DCMU (dichlorophenyldimethylurea); red light supported growth which was the same as, or better than, that in dark controls. The action spectrum of light induced protein synthesis from exogenous glucose (photosynthesis inhibited, blue light addition resulting in growth >90% of the dark control) and showed only one broad maximum at 450–490 nm which resembled the absorption spectrum of carotenoids.

A66-82096
EXPERIMENTS IN THE ANALYSIS OF THE GEOTROPIC PERCEPTION. V. THE INFLUENCE OF THE GRAVITATIONAL FIELD ON THE AUXIN-SENSITIVITY OF HELIANT HYPOCOTYLS [VERSUCHE ZUR ANALYSE DER GEOTROPISCHEN PERZEPTION. V. MITTEILUNG UBER DEN EINFLUSS DES SCHWEREFELDES AUF DIE AUXINEMPFINDLICHKEIT VON HELIANTHUS-HYPOKOTYLEN].
L. Brauner (Munich U., Botany Inst., West Germany).
Planta, vol. 69, no. 4, 1966, p. 299–318. 17 refs. In German.

Experiments with hypocotyls of decapitated *Helianthus* seedlings were carried out to determine whether a change in their sensitivity to growth substances participates in the geotropic reaction chain. The elongation of pre-stimulated and of non-stimulated hypocotyls in identical indole acetic acid (IAA) solutions was compared. The pre-induction increased the total elongation of the samples. After a 15-min. stimulation the effect was already distinct, and after a 30-min. induction it attained its maximum (+42%); a further prolongation of the exposure time led to a gradual decrease of the effect. After a 1-hour period of horizontal exposure, the absolute elongation of the stimulated hypocotyls as well as of the vertical controls reached its maximum value in the 10^{-4} M step of the series. A further increase in the IAA-concentration reduced the elongation. The relative furtherance of the elongation by the gravitational stimulus continued slightly even in the 10^{-3} M step. It can be concluded that the observed effect of the geoinduction can only be due to an increase of the auxin-sensitivity of the organ. Vertical inverse position produced an auxin-depleted hypocotyls an increase of their IAA-sensitivity, approximately corresponding to the effect of a horizontal exposure of the same duration. The reaction was an optimum function of the induction time. The maximum, +24.5%, was reached after a one-hour inverse position. The gravity-induced increase of the auxin-sensitivity developed only in the presence of oxygen. Rotation of the plants on the clinostat parallel to its horizontal axis also caused a rise in the auxin sensitivity. The strongest effect was observed after a three-hour stay on the clinostat: +13.5%. The increase of the auxin-effect brought about by geoinduction can probably be attributed to a spatial shifting in the gravitational field of a cofactor of the growth substance which is available even in the decapitated organ.

A66-82097
MEASUREMENT AND INTERPRETATION OF HEARING THRESHOLD LEVELS.
Edward C. Riley (Eastman Kodak Co., Kodak Parks Works, Lab. of Ind. Med., Rochester, N. Y.).
New York State Journal of Medicine, vol. 66, Aug. 15, 1966, p. 2126–2128. 12 refs.

Even though reference zero levels are not intended as a standard for normal hearing, the use of a physiologic norm as the standard for calibrating an instrument to measure sound pressure and a basis for reporting hearing threshold levels suggests that a deviation from zero represents a hearing loss and is likely to be so interpreted. A physical standard is preferred since it can provide a basic unchanging unit of measurement; would eliminate the confusion between noise and hearing levels; would not imply a relationship between audiometer zero and normal hearing since normal hearing would be expressed as a range depending on age and sex, no change would be needed in audiometric calibration in response to determination of new physiologic norms; would facilitate the international exchange of audiometric information; would supply a basis standard for all; and would stand the test of time.

A66-82098
MEASUREMENT AND DESCRIPTION OF AIRCRAFT NOISE IN THE VICINITY OF AIRPORTS.
Fritz Ingerslev (Tech. U., Acoust. Lab., Lyngby, Denmark).
(Soc. of Acoust. Technol., Conf., Coventry, England, Jun. 1–4, 1964).
Journal of Sound and Vibration, vol. 3, Jan. 1966, p. 95–99.

A procedure for the measurement and description of aircraft noise in the vicinity of airports is of a fundamental importance in connection with land-use planning in the vicinity of airports. The procedure described specifies four steps to be followed for this purpose: (1) a method of measurement and a procedure for presenting the physical data describing the noise; (2) a method for determining the perceived noise level; (3) a procedure for mapping contours of equal perceived noise level; and (4) a procedure for the final assessment of noise exposure.

A66-82099
A HUMAN CRITERION FOR THE ACCEPTANCE OF TRANSVERSE SEAT VIBRATION.
W. D. Bryce (Natl. Gas Turbine Estab., Farnborough, Hants, Great Britain).
Journal of Sound and Vibration, vol. 3, May 1966, p. 384–392. 6 refs.

A controlled laboratory experiment was carried out in order to provide some information on the maximum level of transverse (side-to-side) seat vibration which is permissible for a few minutes for passenger comfort. The subjective responses of 121 individuals were used to establish a tolerance criterion applicable to sinusoidal motion over a frequency range extending from 5 c.p.s. to 32 c.p.s. The results indicate that a peak acceleration limit of 0.2 g from 5 c.p.s. to 8 c.p.s. and a constant velocity limit above 8 c.p.s. will be acceptable to 95% of the population for a short period. The major factor limiting the allowable vibrations was associated with visual effects and hence the provision of a moving visual target is considered to be an important feature of the experiment. From a comparison with other work in this field, it is suggested that when appreciable lateral support is incorporated into the seat the acceptable level of vibration is increased and the minimum tolerance is in the region of 5 c.p.s.

A66-82100
RESPIRATORY AND CIRCULATOR EFFECTS OF BREATHING 100% OXYGEN IN THE NEW-BORN LAMB BEFORE AND AFTER DENERVATION OF THE CAROTID CHEMORECEPTORS.
M. J. Purves (Calif. U., Med. Center, Cardiovascular Res. Inst., San Francisco).
Journal of Physiology, vol. 185, Jul. 1966, p. 42–59. 33 refs.
Grant PHS HE-06285.

Methods are described for measuring tidal volume and frequency, end-tidal CO_2, blood pressure and heart rate, and arterial gas tensions in the unanesthetized new-born lamb. The resting values of minute ventilation ($\dot{V}$)/kg. body wt. and arterial oxygen and carbon dioxide tension, ($P_a.O_2$) and ($P_a.CO_2$) were similar to those which have been reported in the new-born baby. There was a direct and significant relation between $P_a.O_2$ and $P_a.CO_2$ and the age of the lamb. Thirty-five unanesthetized lambs aged 40 min. to 10 days breathed 100% oxygen; minute ventilation fell by an average of 19% of control, end-tidal CO_2 increased, and the ratio of change in tidal volume (ΔV_T) to change in pressure (ΔP) ($\Delta V_T/\Delta P$) remained constant. In a proportion of lambs, a

small decrease in blood pressure and heart rate was observed. The effect of breathing 100% O_2 on lung compliance was variable. These changes in ventilation were virtually abolished after both sinus nerves had been cut. The results therefore suggest that a significant hypoxic drive to ventilation exists in the new-born lamb and that this drive is mediated by functioning and mature peripheral chemoreceptors. Preliminary evidence suggested that, on 100% O_2, the sensitivity of new-born lambs to inhaled CO_2 was reduced.

A66-82101
THE EFFECTS OF HYPOXIA IN THE NEW-BORN LAMB BEFORE AND AFTER DENERVATION OF THE CAROTID CHEMORECEPTORS.
M. J. Purves (Calif. U., Med. Center, Cardiovascular Res. Inst., San Francisco).
Journal of Physiology, vol. 185, Jul. 1966, p. 60–77. 41 refs. Grant PHS HE-06285.

Twenty-seven unanesthetized new-born lambs, six hr.–10 days old, responded to two levels of inspired oxygen, 125 and 110 mm. Hg (alveolar CO_2 being controlled) with a sustained increase in minute ventilation ($\dot{V}$), a small increase in heart rate, and a less consistent rise in systemic blood pressure. An increase in $\dot{V}$ was observed when arterial oxygen tension (P_a, O_2) had fallen by 6–15 mm. Hg. There appeared to be no fixed threshold of P_a, O_2 at which ventilation started to increase. The increase in ventilation caused by these levels of hypoxia was significantly and directly related to the age of the lamb and to its control alveolar CO_2. More severe hypoxia caused a progressive increase in $\dot{V}$ until P_a, O_2 was about 25 mm. Hg when respiration failed. This increase at P_a, O_2>25 mm. Hg was markedly potentiated when alveolar P_{CO_2} (P_A, CO_2) was increased and abolished after bilateral denervation of the carotid chemoreceptors. Significant (>10%) left-to-right shunts were found in ten out of twelve lambs lightly anesthetized with pentobarbitone sodium, breathing air. Hypoxia diminished the left-to-right pressure gradient largely by its pressor effect on the pulmonary circulation. When inspired O_2 tension (P_I, O_2) was 70 mm. Hg, all seven lambs studied showed a reversal of the pressure gradient and evidence of right-to-left shunts (11–42%) across the ductus arteriosus. The implications of these findings are discussed with reference to previously studies of the new-born response to hypoxia and it is concluded that the peripheral chemoreceptors are fully active at birth and in the new-born period.

A66-82102
THE RESPIRATORY RESPONSE OF THE NEW-BORN LAMB TO INHALED CO_2 WITH AND WITHOUT ACCOMPANYING HYPOXIA.
M. J. Purves (Calif. U., Med. Center, Cardiovascular Res. Inst., San Francisco).
Journal of Physiology, vol. 185, Jul. 1966, p. 78–94. 41 refs. Grant PHS HE 06285.

The respiratory response to inhaled CO_2 was measured in twenty unanesthetized new-born lambs aged 4 hr.–10 days. Measurement of resting arterial pH, P_{CO_2}, and plasma bicarbonate showed a non-respiratory acidosis immediately after birth which was corrected in the first 24–28 hr.: thereafter, the acid-base pattern was of a compensated respiratory alkalosis. When CO_2 was added to the inspired gases and resting arterial oxygen tension (P_a, O_2) was controlled, the average increase in minute ventilation ($\dot{V}$) was 0.075 l./min./kg. Mm. Hg, P_a, CO_2^{-1}, and duplicate responses in the same lamb differed by 6–22.5%. The slope of the $\dot{V}/P_a$, O_2 line (S) varied inversely with P_a, O_2. In one lamb, severe hypoxia (P_a, O_2=21 mm. Hg) caused a marked depression of the slope. Neither the slope S nor the horizontal intercept B of the lines was related to the age of the lamb. B was not related to pH_a and only slightly affected by acute hypoxia. B was related to arterial [HCO_3^-] and values for both were reduced with the acid-base disturbances seen in the first ten days after birth. Evidence was given which suggested that the response of the new-born lamb to inhaled CO_2 was similar to that of man acclimatized to a P_a, O_2 of 70–75 mm. Hg. In the lightly anesthetized lamb, bilateral section of the sinus nerves caused a small reduction in the sensitivity to inhaled 5% CO_2 in air, an increase in the respiratory lag and a reduction in the rate at which $\dot{V}$ increased. It is concluded that, in the new-born lamb, the carotid chemoreceptors are involved in the response to inhaled CO_2 and that hypoxia potentiates this response.

A66-82103
STUDIES OF THE MORPHOLOGIC CHANGES AND BEHAVIOR OF RATS EXPOSED TO HYPERBARIC OXYGEN [EXPERIMENTELLE UNTERSUCHUNGEN UBER DAS ALLGEMEINVERHALTEN UND DIE MORPHOLOGISCHEN VERANDERUNGEN UNTER HOHEM SAUERSTOFFDRUCK].
M. Nasseri, H.-J. Kirstaedter and E. S. Bucherl (Freier U. Berlin, Pathol. Inst., East Germany).
Virchows Archiv, vol. 341, Jun. 21, 1966, p. 148–154. 11 refs. In German.

Rats were exposed to different oxygen pressures in a hyperbaric chamber. All animals survived a six-hour experiment with oxygen pressures at one and two atmospheres and revealed no special symptoms. At 3 atm., 30% of the animals died between the fifth and sixth hour. Under 4 atm. 90% of the animals died during the experiment, most of them between the third and fourth hour with signs of pulmonary insufficiency. The effects of increased hyperbaric oxygen pressure were pulmonary congestion, dys- and atelectases and lung edema. Edema of the brain was maximal at 2 atm. At higher oxygen pressures, the brain edema diminished because fluid loss into the lungs was increased.

A66-82104
ROLE OF CHANGES IN ACCOMMODATION AND CONVERGENCE IN THE PERCEPTION OF SIZE.
H. Leibowitz (Pa. State U., University Park) and Donovan Moore (Wis. U., Madison).
(Opt. Soc., Meeting, Washington, D. C., Apr. 7–9, 1960).
Journal of the Optical Society of America, vol. 56, Aug. 1966, p. 1120–1123. 16 refs.
Grants NIMH M-1090 and MH-08061.

The effect on perceived size of changes in accommodation and convergence was determined at various observation distances. Accommodation and convergence were varied by lenses and prisms chosen so as to preserve the normal relationship between these two functions for all conditions of observation. For observation distances up to about one meter, perceived size was proportional to the distance at which the accommodation and convergence in force would normally obtain. At greater distances, this relationship became progressively less marked. It is concluded that accommodation and convergence could mediate size constancy only at observation distances of one meter or less, and that other mechanisms must be operative at greater distances of observation.

A66-82105
EFFECTS OF AN ARTIFICIAL PUPIL AND ACCOMMODATION ON RETINAL IMAGE SIZE.

William R. Biersdorf and John C. Baird (Walter Reed Army Inst. of Res., Washington, D. C.).
Journal of the Optical Society of America, vol. 56, Aug. 1966, p. 1123–1129. 13 refs.

A very small artificial pupil in front of the eye allows a distinct view of an object when accommodation is incorrect. Helmholtz (1962) reported that the retinal image size of the object is changed when the eye is not accommodated for the object. Binocular size matching with an artificial pupil before one eye is used to provide quantitative data relating image-size change to accommodation and distance of the artificial pupil from the eye. Control experiments, including paralysis of accommodation in one eye, establish that the phenomenon is related to accommodation and is not an artifact of other variables.

A66-82106
DIPHASIC NATURE OF THE VISUAL RESPONSE AS INFERRED FROM THE SUMMATION INDEX OF n FLASHES.
Mitsuo Ikeda and Tohru Fujii (Minolta Camera Res. Lab., Daisen–Nishimachi, Sakai, Japan).
Journal of the Optical Society of America, vol. 56, Aug. 1966, p. 1129–1132.

A summation index was originally defined to show the summating effect of two test flashes in determining the increment threshold. The definition was extended here for any number of test flashes and the index was measured for n light flashes which were presented to the eye successively. When the interflash interval was 60 msec., the index showed the inhibition for any number of flashes (n), that is the index value of near zero. At t=40 msec., the index value was about 0.1 for two flashes and it remained about the same as n was increased. At t=120 msec, on the other hand, the index gradually increased from 0.1 to 0.2 as n was increased from 2 to 10. It is suggested that these results are reasonably explained assuming a diphasic response for the peripheral visual system corresponding to each light flash, and superposing a number of them linearly with suitable intervals.

A66-82107
CONCERNING THE MEASUREMENT OF BRIGHTNESS.
S. S. Stevens (Harvard U., Lab. of Psychophys., Cambridge, Mass.).
Journal of the Optical Society of America, vol. 56, Aug. 1966, p. 1135–1136. 24 refs.

Two experimental approaches to the determination of the relation of brightness to flash duration and luminance are discussed. Brightness depended on duration of flashes of constant peak luminance. Both experiments demonstrated Bloch's law, the Broca–Sulzer effect, and the shift in Broca–Sulzer maximum to shorter durations with increased luminance.

A66-82108
NUTRITIVE VALUE OF ALGAE GROWN ON SEWAGE.
H. F. Hintz, H. Heitman, Jr., W. C. Weir, D. T. Torell, and J. H. Meyer (Calif. U., Davis).
Journal of Animal Science, vol. 25, Aug. 1966, p. 675–681. 19 refs.
Grant PHS WP-00026.

Chlorella spp., *Scenedesmus obliquus* and *S. quadricauda*, depending upon the season, were grown on sewage. In the feeding trials algae had to be pelleted with other feeds to insure consumption and prevent sorting. Algae contained 51% crude protein, which was 73% digestible when fed to cattle and sheep, but only 54% digestible when fed to pigs. The digestible energy content for cattle and sheep was 2.6 kcal./gm. Two feeding trials indicated that algae supplied adequate protein to supplement barley for growing-finishing pigs. Alfalfa–algae pellets resulted in higher gains than alfalfa pellets, when fed to lambs on dry summer range. Although algae grown on sewage are not a high-energy feed because of a high ash content and low digestibility of the nonprotein, nonfat organic matter, it appears to have potential as a livestock feed because of the high content of protein, plus significant amounts of carotene, phosphorus, calcium, and trace minerals.

A66-82109
THE ROLE OF RESPIRATION AND PHOTOSYNTHESIS IN THE CHLOROPLAST REGENERATION IN THE "GLUCOSE-BLEACHED" CELLS OF CHLORELLA PROTOTHECOIDES.
Mitsuo Matsuka and Eiji Hase (Tokyo U., Inst. of Appl. Microbiol. and Tokugawa Inst. for Biol. Res., Tokyo, Japan).
Plant and Cell Physiology, vol. 7, 1966, p. 149–162. 22 refs.
Min. of Educ. supported research.

Changes in respiratory activity of *Chlorella prototheocoides* cells during the process of greening (chloroplast regeneration) were followed, and the effects of various inhibitors of respiration and photosynthesis on the greening process were examined. The glucose-bleached cells showed a very low activity of respiration, and the activity increased markedly during an early phase of chloroplast regeneration, showing, however, a decrease during the subsequent phase of greening. Some antimetabolites which inhibited the cell respiration suppressed also the greening of cells. 2,4-Dinitrophenol and azide, potent inhibitors of oxidative phosphorylation, accelerated considerably both the respiration and greening of algal cells. 3-(p-chlorophenyl)-1, 1 dimethylurea (CMU) inhibited completely photosynthesis of the greening cells, but suppressed only slightly the greening process. Based on these results it was concluded that the primary role of respiration in the chloroplast regeneration in the glucose-bleached cells is to produce oxidized carbon compounds (and perhaps reduced forms of NAD and NADP) for various biosynthetic reactions. It was further suggested that ATP may be supplied for the chloroplast regeneration by a certain means different from the oxidative phosphorylation or photophosphorylation. The activities of photosynthetic phosphorylation and CO_2-fixation developing in the greening cells do not appear to play any essential role in the chloroplast regeneration.

A66-82110
TOLERANCE TO HIGH ACCELERATION STRESS AFTER EXPOSURE TO IONIZING RADIATION [PERENOSIMOST' EKSTREMAL'NOGO USKORENIIA POSLE VOZDEISTVIIA IONIZIRUIUSHCHEI RADIATSII].
B. I. Davydov.
Doklady Akademii Nauk SSSR, vol. 168, no. 3, 1966, p. 691–693. 9 refs. In Russian.

White mice exposed to 200–4,000 r showed, 1–6 days after exposure, a greater tolerance to high acceleration stress than controls. The mechanism of this effect has not been fully studied. The greater tolerance to acceleration stress after radiation exposure may be due to changes in the system of blood clotting and cell membrane permeability. The degree of tolerance depends on the amount of radiation received.

A66-82111
PHYSIOLOGICAL REACTIONS OF COSMONAUTS EXPOSED TO ACCELERATIONS DURING THE "VOSKHOD" SPACE FLIGHT [FIZIOLOGICHESKIE REAKTSII KOSMONAVTOV PRI DEISTVII PEREGRUZOK VO VREMIA POLETA NA KOSMICHESKOM KORABLE "VOSKHOD"].

A. R. Kotovskaia, N. Kh. Eshanov, R. A. Vartbaronov, and S. F. Simpura.
Izvestiia Akademii Nauk SSSR, Seriia Biologicheskaia, no. 3, May–Jun. 1966, p. 337–345. 18 refs. In Russian.

Physiological reactions of cosmonauts exposed to accelerations during the Voskhod space flight are reported. Electrocardiograms, seismocardiograms, pneumograms, television observations, and personal reports of the crew are discussed. The crew members showed a higher emotional stress than during simulated flights in the centrifuge. In the course of re-entry K. P. Feoktistov and B. B. Egorov showed peculiar physiological responses to increased g due to a change in their reactivity that followed vestibulo-vegetative disturbances which occurred in the weightless state. Nevertheless, the authors do not attribute these peculiarities to a significant change in the cosmonauts' tolerance to accelerations during the space flight.

A66-82112
PATHOMORPHOLOGICAL CHANGES IN HEMOPOIETIC ORGANS OF MICE EXPOSED TO THE SYNERGISTIC EFFECT OF IONIZING RADIATION AND DYNAMIC SPACE FLIGHT FACTORS [PATOMORFOLOGICHESKIE IZMENENIIA V KROVETVORNYKH ORGANAKH MYSHEI PRI KOMBINIROVANNOM DEISTVII NEKOTORYKH VIDOV IONIZIRUIUSHCHEI RADIATSII I DINAMICHESKIKH FAKTOROV KOSMICHESKOGO POLETA].
N. A. Gaidamakin, V. G. Petrukhin, V. V. Antipov, P. P. Saksanov, and V. S. Shashkov.
Izvestiia Akademii Nauk SSSR, Seriia Biologicheskaia, no. 3, May–Jun. 1966, p. 346–354. 20 refs. In Russian.

A study was carried out to reveal pathomorphological changes in hemopoietic organs of mice exposed to the synergistic effect of proton radiation and vibration and to that of gamma irradiation and acceleration. A single total exposure of animals to vibration three days and, particularly, a day prior to proton radiation increased the lesion of the spleen lymphoid tissue and decreased that of hemopietic cells of myelo- and erythroblastic processes in the spleen and marrow. The recovery of all types of hemopoiesis in these organs increased. The effect of vibration applied three and especially five days after proton radiation enhanced destructive changes in hemopoietic organs. Necrotic foci were found in these organs during the recovery period; reparative processes were slowed down. Acceleration applied a day before gamma-irradiation decreased the depletion of the hemopoietic organs and promoted their recovery. Acceleration applied a day after gamma-irradiation produced no effect upon the level at which the organs were damaged by the penetrating radiation.

A66-82113
SYNERGISTIC EFFECT OF IONIZING RADIATION AND VIBRATION UPON THE ANIMAL ORGANISM [KOMPLEKSNOE VOZDEISTVIE NA ORGANIZM ZHIVOTNOGO IONIZIRUIUSHCHEGO IZLUCHENIIA I VIBRATSII
T. S. L'vova.
Izvestiia Akademii Nauk SSSR, Seriia Biologicheskaia, no. 3, May–Jun. 1966, p. 355–361. 20 refs. In Russian.

Exposure of mice to vibration of 70 c.p.s. frequency 4 and 24 hours prior to irradiation decreased their mortality by 10–20% and increased their average longevity by 10–40% as compared with control animals subjected to irradiation alone. Vibration applied five days prior to irradiation increased the mortality and decreased average longevity of animals. Exposure to vibration 4 and 24 hours and five days after irradiation decreased the mortality of mice by 15–38% and increased the average longevity of test animals. Preliminary one-hour exposure of animals to 700 c.p.s. vibration produced no noticeable modifying effect on the development and results of radiation damage. Vibration of 700 c.p.s. applied a day after irradiation exerted no effect while that applied five days after irradiation promoted radiation disease.

A66-82114
PECULIARITIES IN THE FUNCTION OF THE HUMAN ACOUSTIC ANALYZER EXCITED BY CORIOLIS ACCELERATIONS OF DIFFERENT VALUES [OSOBENNOSTI FUNKTSII SLUKHOVOGO ANALIZATORA CHELOVEKA PRI VOZDEISTVII RAZLICHNYKH VELICHIN USKORENII KORIOLISA].
Iu. V. Krylov.
Izvestiia Akademii Nauk SSSR, Seriia Biologicheskaia, no. 3, May–Jun. 1966, p. 424–426. 5 refs. In Russian.

Experiments were carried out to establish changes in the acoustic thresholds of man during a day-long stay in a slowly rotating room with angular velocities of 5.3, 10.6, 21.3°/sec. During rotation, changes in the thresholds of the acoustic sensitivity exceeded the baseline data at the velocities of 10.6 and 21.3°/sec.

A66-82115
MINERAL AND PROTEIN LOSSES DURING STARVATION.
Josephine Scheck, Herta Spencer, Isaac Lewin, and Joseph Samachson (Veterans Admin. Hosp., Metab. Sect., Hines, Ill.).
Journal of the American Dietetic Association, vol. 49, Sep. 1966, p. 211–214. 11 refs.
Grant NIAM A-5572.

Five obese men were studied to determine the effects of starvation and refeeding on nitrogen, calcium, phosphorus, and sodium balances. These were measured under controlled conditions during full caloric intake, during extreme dietary restriction (starvation), and during refeeding. The starvation phase covered a period of 18 to 40 days. Total weight losses ranged from 40 to 113.2 lb., with the greatest losses occurring in the first twelve days. Catabolism during fasting was shown by extremely negative nitrogen and phosphorus balances. Calcium balances also became more negative though not to the same degree as nitrogen and phosphorus. During refeeding with a 600-calorie, 500-mg. sodium diet of approximately 35 gm. protein, the nitrogen and mineral balances improved, indicating anabolism and repletion of body stores. During refeeding, weights fluctuated, and two subjects showed a small gain. Increases in weight correlated with nitrogen and sodium retention.

A66-82116
RAPID RECORDING OF RESPIRATORY VOLUMES FOR DETERMINING ENERGY EXPENDITURE WITH A PORTABLE SPIROMETER.
Carl Zenz and Byron A. Berg (Allis-Chalmers Mfg. Co., Milwaukee, Wis.).
Journal of Science Technology, vol. 12, Jul.–Sep. 1966, p. 135–138.

A description is presented of a camera device to photographically record the dial readings on spirometers and other instruments at predetermined intervals. Physiological responses encountered in a wide variety of situations may be accurately recorded for later study.

A66-82117
EXPERIMENTAL COLD INJURY: METHODOLOGY AND ASSESSMENT.
J. R. Talwar, S. M. Gulati, and B. M. L. Kapur (All-India Inst. of Med. Sci., Dept. of Thoracic Surg., Cardiovascular Res. Lab., New Delhi).
Indian Journal of Medical Research, vol. 54, Jul. 1966, p. 643–648. 26 refs. Indian Council of Med. Res. Supported research.

Methods of experimental cold injury are reviewed briefly and a new insulated cooling chamber which can be used to vary the type and extent of cold injury is described. Proper selection of animals (including rats, mice, rabbits, and hamsters), and techniques and criteria of assessment of experimental cold injuries are suggested on the basis of studies carried out so far.

A66-82118
STUDY ON THE RENAL PYRAMID, LOOPS OF HENLE AND PERCENTAGE DISTRIBUTION OF THEIR THIN SEGMENTS IN MAMMALS LIVING IN DESERT, SEMI-DESERT AND WATER-RICH ENVIRONMENT.
I. Munkácsi and M. Palkovits (Med. U., Inst. of Anat. and Hung. Acad. of Sci., Inst. of Exptl. Med., Dept. of Pathophysiol., Budapest, Hungary).
Acta Biologica Academiae Scientiarum Hungaricae, vol. 17, no. 1, 1966, p. 89–104. 30 refs.

Dimensions of the loops of Henle and the percentage distribution of the thin segments in the renal pyramid were analyzed in different kinds of animals living in desert, semi-desert, and water-rich environment. The length, number, and volume of the deep loops of Henle appeared to be greatest in the desert rodent (*Jaculus jaculus*), and the percentage distribution of the thin segments in the inner zone of the medulla was twice as much as in the other three species examined. The result corresponds to the countercurrent hypothesis of urine concentration, this mechanism being most effective in the kidney of the desert rodent. There were found no thin segments of loops of Henle in a wide area of the cortico–medullary region. Their percentage distribution rises above 10% towards the junction of the outer and inner zones, then it decreases towards the tip of the papilla. Levels at the tip of the papilla consist of very few thin segments. In the desert rodent this empty area is 150 μ only, while in the other species it is much more than that.

A66-82119
THE INFLUENCE OF VENOUS OCCLUSION AND EXERCISE ON SERUM MAGNESIUM CONCENTRATION.
R. Whang and R. Wagner (N. Mex. U. School of Med., Dept. of Med. and Bernalillo County-Indian Hosp., Med. Serv., Albuquerque).
Metabolism, vol. 14, Jul. 1966, p. 608–612. 19 refs.
Grant PHS 5 R01 HE 08673-02.

Following venous occlusion and exercise, there was increased serum K, Mg, and osmolality as well as an increase in hematocrit in human subjects. The per cent increase in K was approximately twice that observed for Mg, osmolality, and hematocrit. These data are consistent with an intracellular shift of water and an extracellular transfer of K. The results indicate that, at least under the conditions of this experiment, the two major intracellular cations, K^+ and Mg^{++}, are not handled by man in precisely the same manner.

A66-82120
HEATSTROKE.
Joseph A. Romeo (Irwin Army Hosp., Dept. of Med., Fort Riley, Kan.).
Military Medicine, vol. 131, Aug. 1966, p. 669–677. 15 refs.

A severe case of heatstroke with marked hyperthermia, coma, and shock followed by complete absence of neurologic or other sequalae on recovery is reported. The theories of pathogenesis of the syndrome and its systemic effects are reviewed and the treatment, still controversial, is discussed. The rationale behind the use of steroids and mannitol in therapy is also noted. A knowledge of the predisposing factors in heatstroke and the conditions under which it may occur are essential for prevention of the syndrome which all too frequently is fatal in its outcome.

A66-82121
POTASSIUM DEPLETION IN HEAT STROKE: A POSSIBLE ETIOLOGIC FACTOR.
Jack W. Coburn and Richard C. Reba (Walter Reed Army Inst. of Res., Div. of Med., Dept. of Metab., Washington, D. C.).
Military Medicine, vol. 131, Aug. 1966, p. 678–687. 47 refs.

A reduced exchangeable potassium content was found in a patient with fatal heat stroke. Various aspects of the etiology and pathogenesis of heat stroke are reviewed. The features associated with heat exposure which would be expected to result in reduced body potassium are presented, and data are collected which indicate that potassium depletion may have been frequent among previously reported heat stroke victims. An association between potassium depletion and heat stroke could result if potassium depletion increased the susceptibility of a person to heat injury. Although this report does not establish a cause and effect relationship between potassium depletion and susceptibility to heat stroke, it does suggest that such a relationship might exist.

A66-82122
TRAINING THE VESTIBULE FOR AEROSPACE OPERATIONS: CENTRAL CONTROL OF VESTIBULAR FUNCTION.
Kent K. Gillingham.
Military Medicine, vol. 131, Aug. 1966, p. 696–704. 17 refs.

Evidence indicating that the vestibular system is capable of being trained is presented. One aspect of the mechanism, the vestibular efferent system by which training can be wrought, is discussed. On the basis of our understanding of the vestibular system, of spatial disorientation, and of motion sickness, we should be able to deal with operational vestibular problems by using the tools of education and training. It remains to be determined whether the most effective and economical approach to vestibular training lies in more effective didactics, more sophisticated utilization of the suppression mechanism, the actual changing of erroneous vestibular responses into correct responses, or any combination thereof. Whatever method, the need for vestibular training persists as long as spatial disorientation wastes the lives of aircrew and motion sickness compromises military effectiveness.

A66-82123
SOME ASPECTS OF THE CHANGES OF NEUROMUSCULAR EXCITABILITY CURVES DURING EXPOSURE TO HIGH TEMPERATURES [QUELQUES ASPECTS DES MODIFICATIONS DES COURBES D'EXCITABILITE I.D. NEUROMUSCULAIRE AU COURS DE L'EXPOSITION A UNE TEMPERATURE ELEVEE].
Rosin Elias, Iulia Vaida, and Rodica Mateescu.
Medicina del Lavoro, vol. 57, Jun.–Jul. 1966, p. 401–408. 13 refs. In French.

Experimental studies on chages of neuromuscular excitability during exposure to high temperatures were carried out on five acclimatized and non-acclimatized subjects. The

tests were repeated every four–five days. The exposure to a high temperature decreased neuromuscular excitability and efficiency. The adjustment to these new ambient conditions occurred in about five trials and seemed to depend on the general physical status of the subject. The study of excitability demonstrated the sensitivity of the nervous system and its means of fast adjustment to ambient factors.

A66-82124
MAXIMAL AEROBIC WORK IN WOMEN [IL MASSIMO LAVORO AEROBICO NELLA DONNA].
C. Lasi (Turin U., Inst. of Gen. Physiol., Italy).
Medicina del Lavoro, vol. 57, Jun.–Jul. 1966, p. 449–457. 9 refs. In Italian.

Using a treadmill and applying the Knipping technique, maximal aerobic work was measured on 30 young women. The mean maximal aerobic work was 717±101 kg./min. (1.67± 0.76 Cal./min.); these values were 10% lower than those measured in men. The mechanical efficiency of the work performed was 22.4%.

A66-82125
INDIGENOUS FABRICATION OF AN ALTITUDE CHAMBER.
S. L. Goswami, Harshvardhan, and R. K. Gupta (Med. Coll., Dept. of Pharmacol. and Therap., Jabalpur, India).
Indian Journal of Medical Research, vol. 54, May 1966, p. 462–467. 11 refs. Indian Council of Med. Res. supported research.

A simple and inexpensive altitude and hypoxia chamber was fabricated for exposing monkeys to progressive lowering of barometric pressure, oxygen tension, and temperature. The unit consists of an outer refrigerated cabinet and an inner hypoxia chamber. In the apparatus, rhesus monkeys weighing about two kilograms each were decompressed to 30,000 ft. altitude in about 10 min. and were returned to base level at 10,000 ft./min. The temperature within the cabinet was maintained at 5°C.

A66-82126
RADIATION DAMAGE IN RATS UNDER THE INFLUENCE OF HEXAMETHYLENETETRAMINE [STRAHLENSCHADIGUNG BEI RATTEN UNTER EINFLUSS VON HEXAMETHYLENTETRAMIN].
Karl and R. Peters (Tübingen U., Med. Strahleninst., West Germany).
Naturwissenschaften, vol. 53, Jun. 1966, p. 275. In German.

Hexamethylene-tetramine was administered to rats mixed in their drinking water ten days before, after, and before and after exposure to whole-body X-radiation (920 and 800 r). The results show that administration prior to exposure, and before and after exposure, is giving a higher degree of protection than administration after exposure.

A66-82127
SUMMATED HUMAN EEG POTENTIALS WITH VOLUNTARY MOVEMENT.
L. Gilden, H. G. Vaughan, Jr., and L. D. Costa (Albert Einstein Coll. of Med., Saul R. Korey Dept. of Neurol., New York City, N. Y.).
Electroencephalography and Clinical Neurophysiology, vol. 20, May 1966, p. 433–438. 14 refs.
Grants PHS NB-03356, MH-06723, and MH-6418.

Electroencephalographic recordings obtained prior to and during voluntary muscular contractions of human subjects were analyzed by the summation method. A characteristic wave form called the motor potential (MP) was found to be associated with foot dorsiflexion and fist contraction. It consisted of three major components. Beginning as much as one sec. prior to contraction, a slow negative shift developed. Frequently, central rhythm blockade occurred at this time. The slow potential culminated in an abrupt negative wave having an amplitude of 10–15 V. The onset of the abrupt negative component occurred 50–150 msec. before the first signs of contraction and reached a peak with maximal muscle contraction. This was followed by a late positive deflection which tended to persist for the duration of the contraction. MPs developed concurrently in the two hemispheres with unimanual contraction but differed significantly. Both the abrupt negative wave and the subsequent positive deflection were larger in the hemisphere contralateral to the activated limb. The possibility that the slow negative shift reflected facilitatory events associated with preparation for movement is suggested. The abrupt negative wave is interpreted as a sign of synaptic potentials associated with corticospinal discharge, and the positive deflection may represent afferent, movement-produced feedback.

A66-82128
EEG AND BEHAVIORAL EFFECTS OF DEPRIVATION OF PARADOXICAL SLEEP IN THE CAT [EFFETS EEG ET COMPORTEMENTAUX DES PRIVATIONS DE SOMMEIL PARADOXAL CHEZ LE CHAT].
P. Vimont-Vicary, D. Jouvet-Mounier, and F. Delorme (Fac. de Méd., Lab. de Pathol. Exptl., Lyon, France).
Electroencephalography and Clinical Neurophysiology, vol. 20, May 1966, p. 439–449. 23 refs. In French.
Grant USAF EOAR 62-67.

Selective deprivation of paradoxical sleep (PS) was carried out in cats with chronically implanted electrodes for 1–26 days by different methods (swimming pool or electric shocks). Total deprivation of sleep was also carried out for 24–48 hr. under electroencephalogram (EEG) control. During selective PS deprivation, a need for PS appeared which required an increasing number of awakenings on successive days in order to prevent it. After PS deprivation longer than eight days discrete behavioral disturbances appeared, mostly drowsiness, muscular hypotonia, and hypersexuality. There was also a constant tachycardia. Behavior suggesting hallucinations was not seen. In sleep during recovery, after selective PS deprivation, a selective rebound of PS appeared, which was associated with an increase of the phasic phenomena of PS and always periodically interrupted by slow sleep; its duration equalled half the duration of PS deprivation. The return to a normal heart rate closely followed the return to a normal amount of PS. There was no complete recovery of the debt of PS which accumulated during deprivation. Deprivation of both slow and paradoxical sleep was not followed by a PS rebound but on the contrary by an increase of slow sleep.

A66-82129
DIFFUSE REGULATION OF VISUAL THALAMO-CORTICAL RESPONSIVENESS DURING SLEEP AND WAKEFULNESS.
M. Demetrescu, Maria Demetrescu, and G. Iosif (R. S. R. Acad., Inst. of Endocrinol., Bucharest, Rumania).
Electroencephalography and Clinical Neurophysiology, vol. 20, May 1966, p. 450–469. 55 refs.

The responsiveness of the visual cortex to a special delay combination of four pulses was studied during wakefulness

and sleep in cats with chronically implanted electrodes. Wakefulness, when relaxed, induced a first response of variable amplitude, and strong reduction of the subsequent three. The onset of sleep occurred with a transitory (30–180 sec.) phase of decreased responsiveness. A first phase of sleep with slow wave electrocorticogram (ECoG) SSW-I) presented a picture of balance between the first and second responses, which alternately became large. In the second phase of sleep with slow wave ECoG (SSW-II) the first, and especially the second responses were increased with some variability. During both SSW phases the radiation (first) spike was decreased in all responses; the large increase of the fourth response supported the conclusion on disinhibition. A transitory (15–60 sec.) phase of giant potentials (first and third, without inhibition of the second) systematically appeared at the onset of deep sleep. The deep sleep (paradoxical or rapid eye movement) phase was characterized by constant and still larger first and second responses, evidence of partial disinhibition similar to that of SSW. The increase of the radiation spike in all responses, and occasional facilitation of the whole third response, showed reappearance of facilitatory influences.

A66-82130
ELECTROCORTICOGRAM DURING WHOLE BODY VIBRATION.

A. N. Nicholson and J. C. Guignard (Roy. AF Inst. of Aviation Med., Farnborough, Great Britain).
(Fifth Intern. Space Sci. Symp., Florence, May 1966 and E.E.G. Soc., Oct. 1964).
Electroencephalography and Clinical Neurophysiology, vol. 20, May 1966, p. 494–505. 11 refs.

The influence of the widespread excitation of mechanoreceptors (by whole body vibration) was measured on spontaneous electrocortical and deep brain activity of monkeys, dogs, and cats. In conscious monkeys, rhythms at the vibration frequency appeared intermittently in the electrocorticogram (ECoG) during low frequency vibration (4.5–19.5 c.p.s.). The rhythms were commonly dissociated between recordings from different but adjacent areas of the cortex and augmented with changes in the orientation of the head. The appearance of the rhythms was force dependent and independent of the frequency of vibration. The rhythms were observed during anesthesia provided that a sufficient intensity of vibration was applied to the animal. The disappearance of the rhythms often induced by anesthesia during steady state vibration is considered to result from the loss of postural activity and the associated changes in the pattern of vibration reaching the head. On cessation of vibration, normal ECoG activity and behavior were observed. During vibration restricted to the trunk the rhythms were not present. Bilateral section of the fifth or seventh and eighth cranial nerves in dogs and cats did not abolish the rhythms.

A66-82131
CHANGES IN TOTAL AMOUNT OF STAGE FOUR SLEEP AS A FUNCTION OF PARTIAL SLEEP DEPRIVATION.

Willaim Dement and Stephen Greenberg (Stanford U., School of Med., Dept. of Psychiat., Palo Alto, Calif.).
Electroencephalography and Clinical Neurophysiology, vol. 20, May 1966, p. 523–526. 19 refs.

Following a series of baseline nights, four adult subjects slept a series of nights in which the time allowed for sleep was reduced by approximately 2.5–3 hr. The amount of time during which stage 4 electroencephalographic sleep (high voltage, slow wave) was present showed a substantial elevation although the procedure resulted in no prior reduction of the total nightly amount of stage 4. This was most apparent on the final ("recovery") night in the series which could be treated as a "short sleep" night by simply not considering the final hours of recording.

A66-82132
EFFECT OF LASER ON GUINEA PIG COCHLEA [EFFETS DU LASER SUR LA COCHLEE DU COBAYE].

Maurice Aubry, Michel Burgeat, and Mrs. Bernard Burgeat-Menguy (Fac. de Med., Hop. Lariboisiers, Clin. O.R.L., Lab. de Biophys. et d'Explorations fonctionnelles O.R.L. and Lab. de Biophys., Paris, France).
Comptes Rendus des Seances de l'Academie des Sciences, vol. 262, Mar. 28, 1966, p. 1476–1479. In French.

Cochlear microphonic potentials of guinea pigs were not modified by a beam from a ruby laser corresponding to sound pressure of 5000 hertz. In a few instances, cochlear acoustic vibration was measured as a result of the laser beam. The phase deflections recorded may be due to a direct stimulation of the afferent fibers of the cochlear nerve without passing through the Corti organ, or to a transistory change of the resting potential rather than the cochlear microphonic potentials.

A66-82133
CIRCULATORY CONTROL IN HYPOXIA BY THE SYMPATHETIC NERVES AND ADRENAL MEDULLA.

P. I. Korner and S. W. White (New South Wales U., Schools of Physiol. and Surg., Sydney, Australia).
Journal of Physiology, vol. 184, May 1966, p. 272–290. 41 refs. Natl. Heart Found., Australia and Life Insurance Med. Res. Fund, Australia and New Zealand supported research.

The effects of severe arterial and primary tissue (carbon monoxide) hypoxia on cardiac output, arterial and right atrial pressures, heart rate and ventilation, were studied in unanesthetized normal rabbits, and in animals subjected to adrenalectomy, sympathectomy (guanethidine), adrenalectomy + sympathectomy, and section of the carotid sinus and aortic nerves. In both arterial and primary tissue hypoxia the sympathetic nerves played a more important part in the normal circulatory response than the adrenal medullary hormones. Provided one adrenergic effector pathway remained intact, animals with intact chemoreceptors and baroreceptors tolerated both types of hypoxia well. Circulatory control during both types of hypoxia by means of sympathetic nerves alone produced relatively more peripheral vasoconstriction than was observed during reflex control through increased adrenal catecholamine secretion. The results in guanethidine-treated animals suggest that the sympathetic discharge to the arterial chemoreceptors is a factor sustaining chemoreceptor discharge during prolonged arterial hypoxia.

A66-82134
THE REFLEX EXCITATION OF THE SOLEUS MUSCLE OF THE DECEREBRATE CAT CAUSED BY VIBRATION APPLIED TO ITS TENDON.

P. B. C. Matthews (Australian Natl. U., Dept. of Physiol., Canberra).
Journal of Physiology, vol. 184, May 1966, p. 450–472. 38 refs.

Vibration was applied longitudinally to the fully innervated soleus muscle of the decerabrate cat by attaching its tendon to a vibrator. Vibration at frequencies of 50–500/sec. with amplitudes of 10 upwards caused the muscle to contract

reflexly for as long as the vibration was maintained. The response was recorded myographically and electromyographically. The minimum latency for the appearance of the reflex response at the beginning of a period of vibration was about 10 msec. The latency of cessation of the response at the end of vibration was similarly short. On increasing the amplitude of vibration at any particular frequency in the range 100–300/sec. the resulting reflex tension increased to an approximate plateau for amplitudes of vibration of 100–200 μ. Further increase in the amplitude decreased the size of the contraction, though there was no such reduction in records of the integrated electromyogram. Large-amplitude vibration influenced the contractile mechanism of the muscle. Increasing the frequency of vibration increased the value of the plateau tension reached on increasing the amplitude. The effect was, however, relatively small and the largest increase seen was 3 g.wt. of contractile tension per c.p.s. increase in vibration frequency. The primary afferent ending of the muscle spindle is considered to be the receptor whose excitation leads to the reflex response to vibration. The vibration reflex appears to be the well-known stretch reflex, elicited by a rather unusual form of stretching. The size of the vibration reflex and its variation with frequency are discussed in relation to the servo theory of muscular contraction.

A66-82135
PHYSIOLOGICAL FOUNDATIONS OF HEAT ACCLIMATIZATION. MEDICO-MILITARY CASUALTIES [BASES PHYSIOLOGIQUES DE L'ACCLIMATEMENT A LA CHALEUR. INCIDENCES MEDICO-MILITAIRES].

René Henane (Centre de Rech. du Serv. de Santé des Armées, Div. de Physiol., Paris, France).

Revue des corps de santé des armées terre, mer, air, vol. 7, Apr. 1966, p. 293–318. 85 refs. In French.

Human physiological adaptation to hot dry and hot humid climates is discussed in terms of the interrelationships among thermoregulatory and heat transfer mechanisms, water evaporation, electrolyte balance, and endocrine reactions. The criteria to determine heat acclimatization are defined and the methods and results of natural and artificial heat acclimatization are described.

A66-82136
RECENT ASPECTS OF RESPIRATORY PHYSIOLOGY DURING TRANSVERSE ACCELERATION [ASPECTS RECENTS DE LA PHYSIOLOGIE RESPIRATOIRE AU COURS DES ACCELERATIONS TRANSVERSES].

J. Jacquemin and P. Varène (Centre d'essais en vol, Lab. de méd. aérospatiale, Brétigny-sur-Orge, France).

(Aerospace Med. Panel, A.G.A.R.D. (O.T.A.N.), 22nd Session, Furstenfeldbruck, Germany, Sep. 2–6, 1965).
Revue des corps de santé des armées terre, mer, air, vol. 7, Apr. 1966, p. 335–358. 114 refs. In French.

A review of the pulmonary effects of transverse acceleration is presented in terms of ventilatory mechanics and respiratory gas exchange. Thoracic compression during acceleration is usually opposed by the regulatory inspiratory diaphragmatic and other muscles. During centrifugation, increased respiratory dead space and a change in the ventilation-perfusion ratio are usually noted.

A66-82137
EFFECT OF A HYPEROXIC MEDIUM ON SOME PHYSIOLOGICAL FUNCTIONS OF THE ANIMAL ORGANISM [PRO VPLYV HIPEROKSYCHNOHO SEREDOVYSHCHA NA DEIAKI FIZIOLOHICHNI FUNKTSII TVARYNNOHO ORHANIZMU].

H. V. Troshykhin (USSR, Acad. of Sci., I. P. Pavlov Inst. of Physiol., Lab. of Respiration Physiol., Leningrad).

Fiziolohichnyi Zhurnal, vol. 12, May–Jun. 1966, p. 313–320. 28 refs. In Ukrainian.

To ascertain the effect of a hyperoxic medium with various percentages of oxygen content on the animal organism the author studied the dynamics of oxygen consumption and the process of development of a positive defensive conditioned reflex to light in albino mice. Four series of experiments were conducted, in which the animals were subjected to prolonged action of hyperoxic media: (1) 40% oxygen for 27 days; (2) 60% oxygen for 39 days; (3) 30% oxygen for 42 days; and (4) 90% oxygen for 10 days. In animals of the first series a transitory rise in respiratory metabolism was observed at the beginning, and subsequently the oxygen consumption was elevated in the experimental animals, and the conditioned reflexes were developed more slowly. In the third series the respiratory metabolism level and the elaboration of conditioned reflexes were perceptibly reduced. Finally, in the experiments of the fourth series there was a sharp fall in the respiratory metabolism level, complete depression of conditioned reflex activity and death of the animals. The changes in respiratory metabolism observed when the animals were kept for a long time in hyperoxic media evidently reflect the changes at the tissue metabolism level, which affects the rate of formation of conditioned reflexes.

A66-82138
COMPARATIVE-PHYSIOLOGICAL STUDY OF OXIDATION PROCESSES IN ANIMAL TISSUES AFTER LONG ACCLIMATIZATION IN MOUNTAINS [PORIVNIALNO-FIZIOLOHICHNE DOSLIDZHENNIA OKYSLIUVALNYKH PROTSESIV U TKANYNAKH TVARYN PISLIA TRYVALOI AKLIMATYZATSII V HORAKH].

N. M. Shumytska (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Lab. of Comp. Physiol., Kiev).

Fiziolohichnyi Zhurnal, vol. 12, May–Jun. 1966, p. 334–338. 13 refs. In Ukrainian.

In laboratory rats and speckled ground squirrels prolonged acclimatization to high altitude (Mount Elbrus, Novy Krugozor, at 3000 m. above sea level and 14.5% oxygen content) produced an increase in the quantity of hemoglobin and erythrocytes in the blood. No tissue adaptation to hypoxia was found in sections of the brain, liver, myocardium, and skeletal muscles when compared with control animals.

A66-82139
EXTERNAL RESPIRATORY FUNCTION AND BASIC METABOLISM IN HUMANS UNDER HIGH-MOUNTAIN CONDITIONS (MOUNT ELBRUS) [FUNKTSIIA ZOVNISHNOHO DYKHANNIA TA OSNOVNYI OBMIN U LIUDEI V UMOVAKH VYSOKOHIR'IA (HORA ELBRUS)].

H. A. Horiana and V. I. Danyleiko (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol. and Kiev Inst. of Phys. Culture, Dept. of Physiol., Kiev).

Fiziolohichnyi Zhurnal, vol. 12, May–Jun. 1966, p. 339–345. 54 refs. In Ukrainian.

Data are presented on the results of investigations of basic metabolism and some criteria of external respiration

and blood circulation, conducted on human beings during acclimatization by stages to high-mountain climatic conditions at altitudes of 2200, 3500 and 4200 m. (Mount Elbrus, 1965). Changes in basic metabolism during adaptation and acclimatization to a high-mountain climate were observed.

A66-82140
EFFECT OF MICROWAVES ON THE ABSORPTIVE CAPACITY OF THE KNEE JOINT UNDER THE EFFECT OF ATROPINE AND CARBOCHOLINE [VPLYV MIKROKHVYL NA VSMOKTUVALNU ZDATNIST KOLINNOHO SUHLO SUHLOBA V UMOVAKH DII ATROPINU I KARBOKHOLINU].
M. I. Iatsenko (I. I. Mechnikov Odessa U., Dept. of Human and Animal Physiol. and Kirov Physiotherap. Hosp., Makeevka, UkrSSR).
Fiziolohichnyk Zhurnal, vol. 12, May–Jun. 1966, p. 377–381. 19 refs. In Ukrainian.

Experiments were carried out on 54 rabbits weighing from two to three kg. After injecting radioactive phosphorus, the activity of the blood was determined at constant time intervals from 3 to 120 minutes. The absorptive function of the knee joint rose under the effect of irradiation with 40 w microwaves and fell under the effect of atropine. Irradiation of the knee joint with 40 w microwaves for 20 minutes together with atropine administration raised radioactive phosphorus absorption from the knee joint cavity. Carbocholine injection raised absorption from the knee joint. Irradiation of the joint with microwaves against a background of carbocholine administration lowered P^{32} absorption from the joint cavity.

A66-82141
RESPONSES OF OCULOMOTOR UNITS TO STIMULATION OF SINGLE SEMICIRCULAR CANALS.
Ermanno Manni and Carlo Desole (Sassari U., Inst. of Human Physiol., Sardinia, Italy).
(Ital. Physiol. Soc., Ann. Meeting, Sorrento, Sep. 1965). Experimental Neurology, vol. 15, Jun. 1966, p. 206–219. 17 refs. Consiglio Nazl. delle Ric. supported research.

Extracellular recording of the electrical activity of the oculomotor nuclei was carried out in paralyzed guinea pigs by means of tungsten microelectrodes. The influence of each one of the three semicircular canals of one side on such unitary discharge was studied. Labyrinthine stimulation was carried out by short-lasting (1–2 sec.) localized warming or cooling of each single semicircular osseous canal. All the recorded osulomotor units underwent modifications. These consisted either of rhythmical (slow or quick) responses or of a long-lasting increase in the discharge rate of the units with recruitment of new units without clear signs of rhythm (continuous activation). In about 40% of the experiments the recorded units responded differently to the warm stimulation of each semicircular canal, while in the remaining 60% of the cases two out of three canals elicited the same type of response. In the great majority of the experiments the warm stimulation of the lateral ampulla induced a type of response different from that provoked by stimulating the superior one.

A66-82142
EFFECT OF PHYSICAL ACTIVITY ON THE MAINTENANCE OF INTELLECTUAL CAPACITIES.
F. Clement (Centre de Gérontol. de l'Assn. Claude Bernard, Paris, France).
(Intern. Congr. of Appl. Psychol., XVth, Ljubljana, Yugoslavia, Aug. 8, 1964). Gerontologist, vol. 6, Jun. 1966, p. 91–92, 126.

Two groups of healthy subjects between 16 and 90 were examined twice five years apart in order to determine the effect of regular physical exercise on the intellectual capacities with progression of time. The individuals of the two groups, athletes and non-athletes, were matched in age, education, and economic level. Height and weight, vital capacity, maximum breathing for one minute, hand-grip, endurance, reaction time to light stimulus, and intellectual performance capacity (vocabulary, mental efficiency in coding, and memory) were measured. After five years, the athletes were lighter in weight and showed a faster response to light. Several psychophysiological functions deteriorated, and small variations in intellectual functions of the two groups were also found. Regular physical exercise, however, safeguards against obesity and facilitates respiratory functions.

A66-82143
GAS PHYSIOLOGY IN SPACE OPERATIONS (CONTINUED).
Emanuel M. Roth (Lovelace Found. for Med. Educ. and Res., Albuquerque, N. Mex.).
New England Journal of Medicine, vol. 275, Jul. 28, 1966, p. 196–203. 120 refs.
NASA Contract NAS-115.

A mathematical expression of the growth dynamics of a bubble is discussed in order to facilitate the understanding of the role of inert gas factors in decompression sickness. The physiological symptom complex of decompression sickness is examined, including bends (pain in locomotor system), chokes (chest pain, cough, and respiratory distress), four types of skin manifestations, and neurocirculatory disturbances including the possibility of fat emboli caused by extravascular gas bubbles. Theoretical speculations of Case 1-4 bubbles are given. Comparison of relative values suggests that neon is the safest gas, followed by helium and nitrogen.

A66-82144
EVOKED SOMATOSENSORY POTENTIALS IN MAN.
Sanford J. Larson, Anthony Sances, Jr., and Peter C. Christenson (Marquette U., School of Med., Dept. of Neurosurg., Milwaukee, Wis.).
Archives of Neurology, vol. 15, Jul. 1966, p. 88–99. 31 refs.

In order to establish a base line for the evaluation of evoked somatosensory potentials in patients with neurological diseases, studies were done on normal individuals by recording cortical potentials through the scalp. The findings indicate that such potentials evoked by transcutaneous stimulation of peripheral nerves can be recorded through scalp electrodes contralateral and ipsilateral to the stimulus. A total paralysis of adjacent muscles by succinlycholine during experiments indicates that the evoked potential originated in the cerebral cortex without any contribution of muscle potentials.

A66-82145
DESIGN FACTORS AND USE OF EAR PROTECTION.
C. G. Rice and R. R. A. Coles (Southampton U., Inst. of Sound and Vibration Res., Audiol. Group, Great Britain).
(Noise Control Conf., Melton Mowbray, Oct. 19–20, 1965). British Journal of Industrial Medicine, vol. 23, Jul. 1966, p. 194–203. 19 refs.

The problems of protecting the ear against hazardous noise are reviewed, supported where relevant by data from the authors' own researches. Ear protectors are classified

into two main types—plugs and muffs—and the general principles of their function and limitations are stated. Examples of representative ear protectors are given in more detail, with particular respect to their relative merits and pure-tone attenuation characteristics. The effects of earplugs on speech communication are considered, and the relationships between pure-tone attenuation and protection against continuous noise are discussed in some detail. The results of temporary threshold shift (T.T.S.) reduction studies of the efficiency of V.51R and Selectone-K earplugs in protecting against reverberant and non-reverberant impulsive noises are presented. The design requirements of ear protectors and some of the problems created by them are also outlined.

A66-82146
RADIOCHEMICAL DETERMINATION OF METALLIC MERCURY VAPOUR IN AIR.
L. Magos (Med. Res. Council Labs., Toxicol. Res. Unit, Carshalton, Surrey, Great Britain).
British Journal of Industrial Medicine, vol. 23, Jul. 1966, p. 230–236. 20 refs.

A radiochemical method has been developed for the estimation of atmospheric mercury. When air containing mercury is passed through a solution of ^{203}Hg-mercuric acetate and KCl, isotope exchange takes place so that the issuing air contains the same concentration of mercury, but labelled and with the same specific activity as the reagent solution. The ^{203}Hg is absorbed on hopcalite and estimated by gamma scintillation counting. The standard deviation of the method is 0.004 μg. Hg/litre in concentrations up to 0.2 μg. Hg/litre, and is 0.075 μg. Hg/litre in the range of 0.2–1.2 μg. Hg/litre concentration. The method is simple and can be used for snap or long-run sampling, and with continuous recording.

A66-82147
PROGNOSTIC ASPECTS OF BENZENE POISONING.
S. Hernberg, M. Savilahti, K. Ahlman, and S. Asp (Inst. of Occupational Health, Helsinki and Hameenlinna, Central Hosp., Finland).
British Journal of Industrial Medicine, vol. 23, Jul. 1966, p. 204–209. 16 refs.

In 1955, benzene poisoning was detected in a shoe factory in Finland. One hundred and forty-seven persons were heavily exposed, and more than 100 had abnormal blood counts. One died and 10 required hospital treatment. Nine years later, one hundred and twenty-five persons were re-examined. Each subject underwent a hematological examination which included hemoglobin, erythrocyte, reticulocyte, leukocyte, and thrombocyte counts, and a differential leukocyte count. The thrombocytes of the whole patient group and the erythrocytes of the men were significantly lower than those of normal controls, whereas the leukocytes of the whole group and the erythrocytes of the women failed to show any statistical difference. The analysis also showed that the prognosis of the severe cases did not differ from that of the mild ones, provided the acute stage had been passed. Some illustrative case reports are added. One patient developed leukemia after a latency of seven years, whereas most of the others—chosen because of grave symptoms in the initial stage—recovered. The results are discussed from the point of view of prognosis.

04
A66-82148
PHYSIOLOGICAL ALTERATIONS IN THE PULMONARY CAPILLARY BED AT REST AND DURING EXERCISE: THE EFFECT OF BODY POSITION AND TRIMETHAPHAN CAMPHORSULFONATE.
Richard A. Krumholz, Richard E. Brashear, Walter J. Daly, and Joseph C. Ross (Ind. U., School of Med., Dept. of Med., Indianapolis).
Circulation, vol. 33, Jun. 1966, p. 872–877. 22 refs.
Contract AF 33(616)8378; Grants PHS HE-06228, HE-04080, and HE-06308.

The reactivity of the pulmonary capillary bed during exercise as estimated by change in the pulmonary diffusing capacity ($D_{L_{co}}$) was shown to be dependent upon at least two separate mechanisms. The initial (0 to 10 second) $D_{L_{co}}$ rise with exercise appears to be volume-pressure dependent and may be altered by mechanisms influencing these factors in the lungs. The later elevation of $D_{L_{co}}$ with exercise was demonstrated to be primarily independent of the initial rise and uninfluenced by factors affecting peripheral venous return, that is, body position and ganglionic blockage.

A66-82149
PERCEPTION OF INTERMITTENT ACOUSTIC STIMULATION BY PURE SOUNDS [LA PERCEPTION DE LA STIMULATION ACOUSTIQUE INTERMITTENTE DANS LE CAS DES SONS PURS].
Hélène Gavini.
Journal de Psychologie, no. 2, Apr.–Jun. 1966, p. 153–170. 39 refs. In French.

Human subjects were submitted to intermittent bursts of pure sound (2,000 to 20,000 c.p.s. at 1 to 10,000 bursts per second). Results indicated that subjective loudness was adjusted to the interruption frequency; and subjective intensity was adjusted to an intensity level independent of the enveloping sound emission, since it was not influenced by ratio of sound duration to total duration nor by frequency or recurrence.

A66-82150
GAS PHYSIOLOGY IN SPACE OPERATIONS (CONCLUDED).
Emanuel M. Roth (Lovelace Found. for Med. Educ. and Res., Albuquerque, N. Mex.).
New England Journal of Medicine, vol. 275, Aug. 4, 1966, p. 255–263. 62 refs.

The physiological as well as the engineering and operational requirements for each space mission must be considered in the selection of the ideal atmosphere. Pressure, oxygen, and inert gas factors in space cabin atmospheres are discussed with relation to the expected incidence of decompression sickness. Of the inert gases, argon, krypton, and xenon can be eliminated on the grounds that they increase the hazard of decompression sickness above that of nitrogen. Neon and oxygen have some theoretical advantages in decompression sickness and ebullism; helium has an advantage in explosive decompression and blast; and nitrogen and oxygen at 7 psia have an advantage in hypoxic survival time after decompression. Mixtures with lower partial pressures of inert diluents are safer than those with high partial pressures from the point of view of decompression sickness, but less safe from that of hypoxic survival time. Other atmospheric gas problems which are discussed include the control of humidity, carbon dioxide, toxic substances, odors, and air circulation; dusts, aerosols, and ions; and weight, power, complexity, and cost factors.

A66-82151
TOTAL AIRWAY RESISTANCE AND ITS RELATIONSHIP TO BODY SIZE AND LUNGVOLUMES [SIC] IN HEALTHY YOUNG WOMEN.
L. Brunes and A. Holmgren (Hosp. for Infectious Diseases, Clin. Physiol. Lab., Stockholm, Sweden).
Scandinavian Journal of Clinical and Laboratory Investigation, vol. 18, no. 3, 1966, p. 316–324. 16 refs. Folksams Forskningsnämnd and Stiftelsen Therese och Johan Anderssons Minne. supported research.

Static lung volumes were measured with helium dilution, dynamic lung volumes with a Bernstein spirometer, and airway resistance and thoracic gas volume with a constant volume body plethysmograph in 60 healthy young women. Airway resistance varied hyperbolically with lung volume according to the equation, $R_A=4.0/TGV$, cm. $H_2O \cdot 1^{-1} \cdot sec.^{-1}$. Airway conductance varied linearly with lung volume. $G_A=0.25 \cdot TGV$, $SD \pm 0.07$, $sec.^{-1} \cdot cm.\ H_2O^{-1}$. Airway conductance per liter thoracic gas volume was inversely related to body height and vital capacity and positively correlated to maximum voluntary ventilation and maximum midexpiratory flow rate.

A66-82152
STEADY STATE MEASUREMENT OF REGIONAL VENTILATION TO PERFUSION RATIOS IN NORMAL MAN.
N. R. Anthonisen, M. B. Dolovich, and D. V. Bates (Roy. Victoria Hosp., Dept. of Med., Joint Cardiorespirat. Serv., Montreal, Canada).
Journal of Clinical Investigation, vol. 45, Aug. 1966, p. 1349–1356. 12 refs. MRC, Canada and John A. Hartford Found, USA supported research.

A method is described whereby the ratio of alveolar ventilation to perfusion ($\dot{V}_A/\dot{Q}$) in individual lung zones may be measured during normal steady state conditions. Regional count rates were recorded during a 5-min. period of constant intravenous infusion of ^{133}Xe dissolved in saline and during a similar period of ^{133}Xe rebreathing into a closed circuit. Theoretical considerations and experimental measurements have indicated that, for practical purposes, a steady state is achieved within these time limits in normal subjects. Similar patterns of regional $\dot{V}_A/\dot{Q}$ were recorded during quiet tidal breathing in four normal subjects seated upright. It was possible to correct these data to allow for the influence of reinspired dead space gas and to compute regional $\dot{V}e/\dot{Q}$, where $\dot{V}e$ represented total gas-exchanging ventilation. Regional respiratory gas concentrations were calculated from such $\dot{V}e/\dot{Q}$ measurements and appeared to show less regional variation than previously reported. Limitations of the technique are discussed.

A66-82153
NEED AND EXPECTANCY AS DETERMINANTS OF AFFILIATIVE BEHAVIOR IN SMALL GROUPS.
Daniel B. Fishman (Harvard U., Cambridge Mass.).
Journal of Personality and Social Psychology, vol. 4, Aug. 1966, p. 155–164. 31 refs.
Grant NSF G25113.

In line with Atkinson's motivational theory, it was hypothesized that fantasy n Affiliation would be positively related to affiliative behavior for subjects who were high as opposed to low on expectancy of affiliative success. In support of this hypothesis, it was found that (a) n Affiliation was positively related to positive (friendly) behavior in a small-group interaction for subjects who were high, but not for subjects who were low on situational affiliative expectancy; and (b) n Affiliation was inversely related to sociometric ratings of generalized negative (hostile) behavior for subjects who were high, but not for subjects who were low on generalized affiliative expectancy. When the n Affiliation score was divided into approach (+ Affiliation) and avoidance (− Affiliation) subscores, the former contributed almost exclusively to the predictive validity of the total n Affiliation score.

A66-82154
MODIFICATION OF A JUDGMENTAL STYLE THROUGH GROUP INTERACTION.
Nathan Kogan (Educ. Testing Serv., Princeton, N. J.) and Michael A. Wallach (Duke U., Durham, N. C.).
Journal of Personality and Social Psychology, vol. 4, Aug. 1966, p. 165–174. 16 refs.
Grant NSF GS-344.

Shifts in judgmental extremity were examined when experimental subjects made judgments individually, then as a group, and finally again as individuals. Control subjects made individual judgments twice. A total of 206 secondary school students (103 males and 103 females) comprised the sample. Discussion to consensus in experimental groups was followed by significant declines in post-consensus extremity, but under different confidence conditions for males and females. Interpretation of these results stressed the role of group-mediated modification of the cognitive risks and the need for uncertainty reduction reflected in individual extremity judgments.

A66-82155
PERSONALITY CHARACTERISTICS AND MOTOR ACTIVITY: SOME EMPIRICAL EVIDENCE.
Curtis D. Hardyck (Calif. U., Med. Center, San Francisco).
Journal of Personality and Social Psychology, vol. 4, Aug. 1966, p. 181–188. 35 refs.

Previously reported research on theoretical formulations concerning personality characteristics and motor activity has uniformly reported negative relationships between motor activity and measures of perceived movement, ego stability, imaginative capacity, and ability to delay gratification. In general, previous experiments have manipulated motor activity and noted effects on other variables. The present study noted individual differences in motor activity and compared high- and low-activity groups on perceived movement and personality measures. Previously obtained results could not be replicated.

A66-82156
MEASUREMENT OF INFORMATION COMPLEXITY: I. CONCEPTUAL STRUCTURE AND INFORMATION PATTERN AS FACTORS IN INFORMATION PROCESSING.
Peter Suedfeld (Rutgers U., New Brunswick, N. J.) and Richard L. Hagen (Ill. U., Urbana).
Journal of Personality and Social Psychology, vol. 4, Aug. 1966, p. 233–236. 8 refs. Ill. U. and Rutgers U. supported research.

A series of problems, varying in informational complexity, was administered to conceptually complex and conceptually simple subjects. Each problem required subject to identify a Kent–Rosanoff stimulus word from 10 response words (clues) which differed in probability of occurrence. There was no significant difference in either the total number of

correct solutions or the number of clues recalled. Conceptually complex subjects solved problems of high informational complexity (hwere no one clue was highly informative) better than conceptually simple subjects; they also considered more of the clues they recalled in making their decisions. Thus, complex subjects were able to (a) process complex information more effectively, and (b) process information in a more complex way.

A66-82157
AN ISOLATOR-MEMBRANE FOR SOUNDPROOFING AIRCRAFT CABINS EXPOSED TO HIGH NOISE LEVELS.
R. A. Mangiarotty (Natl. Gas Turbine Estab., Farnborough, Hants, Great Britain).
Journal of Sound and Vibration, vol. 3, May 1966, p. 467–475.

Current developments in V/STOL aircraft indicate that the predicted acoustical environment of passenger cabins is increasing. It is unlikely that conventional soundproofing treatments will be dramatically improved, and new soundproofing principles are needed. A method is described for achieving the same noise reduction, in the low frequency range below about 1000 c.p.s., as a conventional treatment, but with a radical saving in space, using an acoustic isolator-membrane structure. A range of isolators was studied experimentally to determine the most desirable combination of materials for isolator-membrane components. Further analysis and experiments is desirable to optimize the isolator-membrane principle in soundproofing.

A66-82158
EARPLUGS AND IMPAIRED HEARING.
R. R. A. Coles and C. G. Rice (Southampton U., Inst. of Sound and Vibration Res., Audiol. Group, Great Britain).
Journal of Sound and Vibration, vol. 3, May 1966, p. 521–523.

An investigation studying the effect which earplugs have on speech discrimination is presented. Twelve normal and twelve impaired-hearing subjects were examined. The latter group was divided into two so that three types of cases were examined: (1) normal hearing, (2) moderate high-tone loss, and (3) severe high-tone loss. Those having high-tone losses of moderate degree, when either plugged or unplugged, had optimum discrimination scores (ODS) for lists of monosyllabic P. B. words that were within the range (mean $\pm$ S. D. $\times$ 2) of the normal-hearing group. The ODS of those with sufficiently severe high-tone losses to have an ODS lower than normal even in the unplugged condition had scores lower still when plugged.

A66-82159
COGNITIVE ASPECTS OF PSYCHOMOTOR PERFORMANCE: THE EFFECTS OF PERFORMANCE GOALS ON LEVEL OF PERFORMANCE.
Edwin A. Locke and Judith F. Bryan (Am. Inst. for Res., Washington, D. C.).
Journal of Applied Psychology, vol. 50, Aug. 1966, p. 286–291. 9 refs.
Contract Nonr 4792(00).

An experiment stemming from Mace's work (1935) on the effects of performance standards on level of performance is reported. Subjects given specific (but difficult) standards performed at a higher level on a complex psychomotor task than subjects told to "do their best", thus replicating Mace's finding with a computation task. In contrast to Mace's study where performance goals worked by prolonging effort during the latter part of the work periods, the standards intensified effort at all stages of the work periods in the present case.

A66-82160
AN EFFECT OF NOISE ON THE DISTRIBUTION OF ATTENTION.
Muriel M. Woodhead (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, Great Britain).
Journal of Applied Psychology, vol. 50, Aug. 1966, p. 296–299. 6 refs.

A paced search of a visual display was made in auditory conditions containing bursts of noise at either 68 db. or 105 db. Each selected visual item required two types of response, crossing out and counting. The preferred activity in the quieter condition was counting. When the test instructions emphasized this aspect of the task, attention shifted further toward the preferred activity during loud noise. When the instructions emphasized searching, there were no significant differences between noise and quiet. It appears that although noise will not always induce a redistribution of the attention needed to respond equally often in two paced activities, when it does so, the preferred activity gains.

A66-82161
REACTION TIME AND COMPLEXITY OF SUBSEQUENT RESPONSES.
Albert E. Bartz (Concordia Coll., Moorhead, Minn.).
Psychological Record, vol. 16, Jul. 1966, p. 313–321. 5 refs.
Grant NIMH MH 08738.

Two series of experiments were designed to investigate the delay in reaction time as a function of the subject's expectancy of future responses. The first series (Time Relation) investigated the effect of lengthening the time interval between pairs of choice reaction times and comparing the subject's response to the first signal with his response to a single signal. Interval was not significant and, in addition, this series of experiments failed to replicate the results of earlier investigators who found a significant delay. The second series (Complexity) investigated the effect of making the subject's multiple responses increasingly complex and comparing his first response of this multiple set to his response to a single signal. Complexity level was not a significant variable. However, there was a significant difference between a single response and the first response of a multiple set. The results of the two series are interpreted as being due to a difference in the subject's expectancy.

A66-82162
THE EFFECT OF TRAINING ON RESPONSE FORCE DURING OPERANT EXTINCTION.
John P. Morris (Denison U., Granville, Ohio).
Psychological Record, vol. 16, Jul. 1966, p. 337–344. 8 refs.
Grant PHS MH-02208.

Although the phenomenon of increased response vigor following nonreward is well known, the relationship of this so-called "frustration effect" to previous experience in similar nonreward situations has not been investigated. The purpose of the research was to assess the functional relationship between reinforcement history and the distribution of response forces during the extinction of an operant response.

Human subjects were employed in a 2X2X2 factorial experiment in which the major variables were the force of the reinforced response during training, the sequence of training, and the sex of the subject. The results indicated that responses learned in training transferred to the extinction condition, thus contradicting predictions from a drive-produced frustration theory. The relevance of these findings to theories of frustration is discussed.

A66-82163
EFFECT OF THE STATIC AND DYNAMIC LOAD ON SOME PHYSIOLOGICAL FUNCTIONS OF THE ORGANISM. II. CHANGES OF THE PULSE-RATE AND THEIR RELATIONSHIP TO CHANGES OF RESPIRATION [VPLYV STATICKEHO A DYNAMICKEHO ZATAZENIA NA NIEKTORE FYZIOLOGICKE FUNKCIE ORGANIZMU. II. CAST. ZMENY PULZOVEJ FREKVENCIE A ICH VZTAH K RESPIRACNYM ZMENAM].

Imrich Borský and Miloslav Hubač.

Pracovní lékařství, vol. 18, Jun. 1966, p. 206–211. 11 refs. In Czech.

Pulse-rate and respiration changes were investigated in healthy men aged 20–24 during five minutes of work and 13 minutes of recovery. During the dynamic and combined static-dynamic works the pulse-rate increased significantly only in the first two–three minutes of work and stabilized during the following four–five min. During static load, the pulse-rate increased until the fifth minute of work, even at relatively small loads. By comparison of pulse-rate during various loads with oxygen consumption it was shown that the pulse-rate increases intensively with increased exertion, being more intensive during static than during dynamic loads. During the lowest loads (at consumption of about 0.3 1/oxygen/min.) small differences were observed; however, at the oxygen consumption of 0.5 1. and more the acceleration of the pulse-rate during the static load was considerably higher than during the dynamic work ($P<0.002$). The increase of the pulse-rate was influenced also by the position of the worker during work and the kind of the static load itself.

A66-82164
EFFECT OF THERMAL NEUTRON IRRADIATION ON MITOSIS.

C. U. Rao and S. K. Sen (B. H. U., Coll. of Agr., Plant Genet. Lab., Varanasi, India).

Naturwissenschaften, vol. 53, Jul. 1, 1966, p. 335. 12 refs.

Large doses of thermal neutron irradiation of *Pisum sativum* seeds and growing root tip cells caused the lengthening of a prophase or a delay in the completion of the mitotic cycle. Small doses produced occasional chromosome breakage. It is believed that the disturbance caused by the ionizing radiation is due to inhibition of the deoxyribonucleic acid (DNA) synthesis in the nucleus, enzymatic destruction of protein molecules, and changes in DNA structure. Moderate doses of ionization may produce mutants, while large doses may be lethal.

A66-82165
CONCERNING THE EFFECT OF HELIOPHYSICAL FACTORS ON THE BLOOD CELLULAR COMPOSITION [K VOPROSU O VLIIANII GELIOFIZICHESKIKH FAKTOROV NA KLETOCHNYI SOSTAV KROVI].

B. A. Ryvkin.

Problemy Gematologii i Perelivaniia Krovi, vol. 11, Jan. 1966, p. 24–25. 5 refs. In Russian.

To analyze the effect of solar activity on blood cellular composition the author studied blood from apparently healthy individuals and in patients not suffering from diseases of the blood. During the observation period there were 32 days with frequently occurring leukopenia, 27 of these were days with high solar activity. An increase of the number of persons with leukopenia was observed both at the date of high solar activity and the subsequent two–three days. Comparison of the leukopenia incidence dynamics and of the monthly solar activity indices indicate a statistically significant correlation between them.

A66-82166
TECHNICAL AND BIOLOGICAL PREVENTION OF LEAD POISONING [CONSIDERAZIONI IN TEMA DI PREVENZIONE TECNICA E BIOLOGICA DEL SATURNISMO].

C. De Pedrini, A. Bonzanio, and L. Gatti (Turin U., Dept. of Med. and FIAT Med. Serv., Italy).

Minerva Medica, vol. 57, Jul. 7, 1966, p. 2457–2460. 16 refs. In Italian.

Present views on the prevention of lead poisoning are considered, both from the technical aspect, consisting in the discontinuation of the use of lead, or its uptake and neutralization, and from the biological aspect. In this connection, the routine prophylactic and diagnostic measures are described, and the authors' personal experience of the treatment of subjects exposed to the hazard of lead poisoning with calcium versenate is reported. It was found that this chelating agent, as well as being free of side-effects, is effective in favoring the excretion of lead in acute and chronic lead poisoning, especially when given intravenously. For this reason, the administration of versenate is of diagnostic and prophylactic as well as therapeutic value.

A66-82167
EFFECTS OF EMOTIONAL STRESS ON CUTANEOUS CIRCULATION.

Kurt Boman (Helsinki U., Inst. of Physiol. and Neurol. Clin., Finland).

Annales Academiae Scientiarum Fennicae, Seriea A, V. Medica, 119, 1965, 10 p. 11 refs. Signe och Ane Gyllenbergs Stiftelse supported research.

Simultaneous recordings of the cutaneous vasomotor changes in the finger and the forehead during mental arithmetic were made on 10 healthy subjects. Great variations occurred in the cutaneous circulatory responses. During emotional stress a vasodilatation of the finger skin blood vessels occurred as often as a vasoconstriction. In the forehead skin a vasodilatation was more frequent that a vasoconstriction. During repeated experiments on the same subject a great variability of the skin flow responses was the rule. The results are discussed and a nervous control mechanism is assumed to be responsible for the vasomotor reaction.

A66-82168
CYTOLOGICAL CHANGES IN RENAL URINARY TUBULES UNDER CONDITIONS OF DEHYDRATION, ANTIDIURESIS AND OSMOTIC DIURESIS IN MOUSE [TSITOLOGICHESKIE IZMENENIIA MOCHEVYKH KANAL'TSEV POCHKI MYSHI V USLOVIIAKH DEGIDRATATSII, ANTIDIUREZA I OSMOTICHESKOGO DIUREZA].

V. G. Petrova (Leningrad Sanit.-Hyg. Med. Inst., Dept. of Gen. Biol., USSR).
Arkhiv Anatomii Gistologii i Embriologii, no. 5, 1966, p. 81-88. 49 refs. In Russian.

Some morphological and cytochemical alterations in the epithelial lining of kidney nephrons produced by dehydration, antidiuresis, and osmotic diuresis were studied. The results of the investigation showed an increasing mitotic activity of the epithelial cells in the main divisions and, to a lesser extent, in the intercalated divisions early after administration of pituitrin and during the first 24 hours of dehydration. At the later stages of dehydration the number of binuclear cells decreased. Antidiuresis produced a slight augmentation in the secretory activity of the epithelial cells of the collecting tubules; accumulations of polysaccharides appeared in the interstitial tissue of the medullary layer, papillae, and basal membrane of the collecting tubules. Osmotic diuresis augmented the secretory activity of the epithelial cells in the intercalary divisions.

A66-82169
EFFECT OF OXYGEN DEFICIENCY ON THE CONTENT OF PHOSPHORYLATED MONOSACCHAROSE AND FREE RIBONUCLEOTIDES AND ON CREATINKINASE ACTIVITY IN THE HEART AND SKELETAL MUSCLES [VLIIANIE KISLORODNOI NEDOSTATOCHNOSTI NA SODERZHANIE FOSFORNYKH EFIROV MONOZ, SVOBODNYKH RIBONUKLEOTIDOV I AKTIVNOST' KREATINKINAZY V SERDECHNOI I SKELETNYKH MYSHTSAKH].
A. I. Kolotilova, S. N. Lyzlova, E. P. Glushankov, G. I. Samodanova, and S. B. Chagina (A. A. Zhdanov Leningrad State U., Dept. of Biochem., USSR).
Ukrains'kyi Biokhimichnyi Zhurnal, vol. 38, no. 3, 1966, p. 223-228. 19 refs. In Russian.

The content of phosphorylated pentose, hexose, and free ribonucleotides, as well as adenosine triphosphate (ATP) and adenosine triphosphatase (ATPase) activity were measured in the myocardium and skeletal muscles of albino rats in the state of hypoxia and asphyxia. During oxygen deficiency, the content of pentose phosphates, fructose diphosphate, and glucose 1, phosphate increased while that of glucose 6, phosphate decreased in the skeletal muscles and myocardium. The increase in pentose phosphate was greater in the skeletal muscles than in the myocardium. The total content of free guanine and adenine nucleotides in the myocardium and skeletal muscles was reduced during oxygen deficiency, owing chiefly to changes in ATP content. A sharp decrease in nucleotides was noted in the myocardium. Adenosine monophosphate, found only in the myocardium in the normal state, was observed in the skeletal muscle during hypoxia. During oxygen deficiency, the activity of ATPase did not change substantially, but the activity of creatine kinase fell in the myocardium and increased the skeletal muscle.

A66-82170
ACTIVITY OF BLOOD AND TISSUE TRANSAMINASE DURING MUSCULAR ACTIVITY OF VARIOUS DURATION [AKTIVNOST' TRANSAMINAZ KROVI I TKANEI PRI MYSHECHNOI DEIATEL'NOSTI RAZLICHNOI DLITEL'NOSTI].
N. A. Kulikova (Leningrad Sci.-Res. Inst. of Phys. Culture, USSR).
Ukrains'kyi Biokhimichnyi Zhurnal, vol. 38, no. 3, 1966, p. 247-251. 26 refs. In Russian.

To ascertain the effect of muscular effort on transaminase activity in the blood and tissues, experiments were conducted on albino rats, swimming for 15 min., 1.5, and 10 hours, and with faradic stimulation of the sciatic nerve through the intact skin in rabbits. The results of the experiments showed that swimming during various periods does not evoke changes in the activity of glutamic-oxaloacetic transaminase (GOT) and glutamic-pyruvic transaminase in the blood serum. In the myocardium there was an increase in GOT activity after 15 min., 1, and 10 hours of swimming, while in the skeletal muscles this increase set in only after 10 hours. Faradic stimulation of the sciatic nerve through the intact skin in rabbits produced no change in the transaminase activity of the working muscle after 15 min. or two hours; however, in the latter case the GOT activity increased to an equal extent both in the arterial and venous blood, which is, perhaps, due to nociceptive stimulation.

A66-82171
EFFECT OF NEUTRON IRRADIATION ON THE AMINOTRANSFERASE ACTIVITY OF THE CENTRAL NERVOUS SYSTEM AND SKELETAL MUSCLE [DEISTVIE NEITRONNOGO OBLUCHENIIA NA AKTIVNOST' AMINOTRANSFERAZ TSENTRAL'NOI NERVNOI SISTEMY I SKELETNOI MYSHTSY].
A. T. Pikulev and M. P. Koniaeva (V. I. Lenin Belorussian State U. and Belorussian Acad. of Sci., Inst. of Physiol., Minsk, UkrSSR).
Ukrains'kyi Biokhimichnyi Zhurnal, vol. 38, no. 3, 1966, p. 258-263. In Russian.

Total irradiation of albino rats with neutrons of intermediate energies in doses of 13 rad led to changes in the activity of aspartateaminotransferase and alanineketoacid aminotransferase in the cerebral cortex, cerebellum, spinal cord, and skeletal muscle at the end of the 1st, 3rd, 15th, and 30th days after the ionizing radiation. These changes were characterized not only by a rise or fall in transaminizing enzymes, but also by discoordination in this enzyme system. This is corroborated by the change in the calculated value of K, which expresses the relationship of aspartate-aminotransferase activity to alanine-ketoacid aminotransferase.

A66-82172
EFFECT OF MANGANESE COMPOUNDS ON THE FAT CONTENT IN THE LIVER OF ANIMALS INTOXICATED WITH CARBON TETRACHLORIDE [VPLYV SPOLUK MARHANTSIU NA VMIST ZHYRU V PECHINTSI TVARYN OTRUIENYKH CHOTYRYKHLORYSTYM VUHLETSEM].
O. I. Boinar and V. N. Galakhova (Donets Med. Inst., Dept. of Biochem., UkrSSR).
Ukrains'kyi Biokhimichnyi Zhurnal, vol. 38, no. 3, 1966, p. 294-296. In Ukrainian.

The authors investigated the effect of manganese on total lipids and phospholipids in the liver of animals intoxicated with carbon tetrachloride. An increase in the quantity of total lipids and lipid phosphorus was observed in the liver of albino rats receiving carbon tetrachloride. In animals receiving manganese chloride before being poisoned with carbon tetrachloride a smaller quantity of fat was found in the liver than in rats that did not receive manganese before intoxication. Administration of manganese chloride to animals after intoxication with carbon tetrachloride showed that manganese caused a more rapid vanishing of adipose layers, considerably reduced the fat content and that of phospholipids in the liver.

A66-82173
THE CEREBRO-OCULAR EFFECTS OF CARBON DIOXIDE POISONING.
Arnold Freedman and David Sevel (Inst. of Ophthalmol., London, Great Britain).
Archives of Ophthalmology, vol. 76, Jul. 1966, p. 59–65. 15 refs.

The neurological and ocular changes in two patients who survived asphyxia due to carbon dioxide in a well are described. The most prominent features were: headache, photophobia, abnormalities of ocular movements and accommodation, deficient dark adaptation, and personality change. Although anoxia cannot be excluded in the etiology, these findings differ from those which have been reported after anoxia. It is suggested that carbon dioxide may have a specific histotoxic action on nerve tissue.

A66-82174
GAS PHYSIOLOGY IN SPACE OPERATIONS.
Emanuel M. Roth (Lovelace Found. for Med. Educ. and Res., Dept. of Aerospace Med. and Bioastronautics, Albuquerque, N. Mex.).
New England Journal of Medicine, vol. 275, Jul. 21, 1966, p. 144–154. 78 refs.
NASA Contract NAS-115.

In the selection of atmospheric gas for optimum human physiological function and mechanical requirements in space operations, four significant factors are examined: total pressure; oxygen partial pressure; fire and blast hazards; and biophysical and biochemical properties of inert gases, with a consideration of the hazard of decompression sickness.

A66-82175
EFFECTS OF LIGHT-ADAPTATION ON THE EARLY RECEPTOR POTENTIAL.
G. B. Arden, Hisako Ikeda, and I. M. Siegel (Inst. of Ophthalmol., Dept. of Nuerophysiol., London, Great Britain).
Vision Research, vol. 6, Aug. 1966, p. 357–371. 26 refs. Grant PHS NB 1470-01; Med. Res. Council and Alexander Pigott Wernher supported research.

In the dark-adapted eyes of albino rats, the amplitude of the early receptor potential (ERP) decreased with successive flashes, but did not disappear. Instead it reached an equilibrium level, which was higher in dead eyes, and depended on the intensity of the short wave component in the stimulus flash. After equilibrium to white light was reached, insertion of a filter to absorb blue wavelengths and to slightly reduce the effectiveness of the flash in evoking the ERP caused a progressive decline to a new equilibrium. When the filter was removed, the responses progressively increased. The latter effect was best seen in the dead eye, light-adapted by short exposures to tungsten light. Parallel extractions of dark- and light-adapted retinae showed that the ERP amplitude is related to the quantity of rhodospin in the retinae. The difference spectra of solutions from light-adapted eyes indicate that they contain isorhodopsin. It is concluded that the test flashes used in evoking the ERP cause photoregeneration of pigment, thus preventing complete bleaching and disappearance of the ERP. This in turn implies that in the eye metarhodopsin is relatively stable. The appearance of a new very rapid negative potential is associated with photoregeneration.

A66-82176
VISUAL PERCEPTION OF DIRECTION IN THE DARK: ROLES OF LOCAL SIGN, EYE MOVEMENTS, AND OCULAR PROPRIOCEPTION.
Leonard Matin, Ethel Matin (Columbia U., Dept. of Psychol., New York City, N. Y.), Douglas Pearce (Defence Res. Med. Labs., Toronto, Canada), and George Kibler (Johns Hopkins U., Baltimore, Md.).
Vision Research, vol. 6, Aug. 1966, p. 453–469. 25 refs. Grants NSF G-18120, GB-944, and GB-4263.

Subjects performing monocularly in an otherwise dark room reported the direction at which a flash (6 msec. duration, 3–5 min. visual angle, randomly located along the horizontal in the frontal parallel plane) appeared relative to a fixation target extinguished 3 sec. earlier. Although the subjects attempted to maintain the eye in the same position as during the prior fixation period, large involuntary eye movements (monitored by a contact-lens technique) during the 3 sec. dark interval caused a given flash target to strike the retina to the left of the fovea on some trails, and to the right on others. The report of flash direction depended strongly on the sign and magnitude of this varying retinal signal independently of the physical location of the flash target. The standard deviation of the function relating report of flash direction to the retinal signal was approximately half of the standard deviation of the function relating the report of the physical target location. No evidence was found that proprioceptive signals regarding the eye movements systematically influenced the reports of flash direction. The accuracy of the report of the physical location of the target was thus limited by the subject's ability to maintain his eye close to the original fixation position.

A66-82177
THE GLOW MODULATOR AS A SOURCE FOR RECTANGULAR LIGHT FLASHES.
G. R. Engel and M. R. Howat (Defence Res. Med. Labs., Toronto, Canada).
Vision Research, vol. 6, Aug. 1966, p. 479–481.

Test measurements were made of the light output characteristics of the glow modulator tube, Sylvania R1131C, used to produce rectangular light flashes in vision experiments. The measurements were made for peak currents of 60 mA through the glow tube. Two characteristics of the response to a current pulse were measured: delay between application of current and initiation of a rise in light output, and formative rise time of rectangular flash of light to 95% of its final value. It is concluded that the circuit described for metering current to the glow modulator tube is reliable in operation and that the component values are not critical to the operation of the circuit as a whole. The maintenance of a stable quiescent current at a low value requires good regulation of the power supply.

A66-82178
EFFECT OF FEEDING POLYHYDRIC ALCOHOLS ON TISSUE LIPIDS AND THE RESISTANCE OF RATS TO EXTREME COLD.
G. S. Stoewsand, H. A. Dymsza, S. M. Swift, M. A. Mehlman, and D. G. Therriault (U. S. Army Natick Labs., Food Div., Nutr. Branch and U. S. Army Res. Inst. of Environ. Med., Natick, Mass.).
Journal of Nutrition, vol. 89, Aug. 1966, p. 414–421. 11 refs.

Three polyhydric alcohols, propylene glycol (PG), 1,3-butanediol (BD), and glycerol, were fed to growing rats within

two environments in order to assess their relative calorie potential for growth, and to study comparative responses on epididymal adipose tissue and liver lipids. In addition, resistance to extreme cold (−20°C) was also measured. Weight gain was lower in rats fed BD or PG diets for four weeks, but was similar to that of controls when growth was calculated on a per unit food or calorie intake basis. Epididymal adipose tissue was lower in the groups fed BD and PG. Liver lipids and liver cholesterol increased in the rats fed PG. A lowered resistance to intense cold was exhibited in both BD and PG groups, which may indicate that the lowered fat stores of these animals were a causative factor in this response. Liver cholesterol was reduced by moderate cold exposure (5°C.) only in rats fed PG. The rats fed the glycerol diets did not show any of these metabolic changes observed in the groups fed BD or PG.

A66-82179
CIRCULATORY EFFECTS OF ACUTE EXPANSION OF BLOOD VOLUME: STUDIES DURING MAXIMAL EXERCISE AND AT REST.

Brian F. Robinson, Stepehn E. Epstein, Richard L. Kahler, and Eugene Braunwald (Natl. Heart Inst., Cardiol. Branch, Bethesda, Md.).

Circulation Research, vol. 19, Jul. 1966, p. 26–32. 18 refs.

The maximum cardiac output which can be achieved during exercise might be limited either by extracardiac factors influencing ventricular filling, or by the heart itself. In order to investigate this problem, the effect on the cardiac response to maximum exertion of an acute expansion of blood volume was studied in six men with essentially normal cardiovascular systems. Augmentation of blood volume produced by infusion of 1000 to 1200 ml. of the subject's own blood resulted in a small increase in central venous pressure at rest (avg=+1.9 mm. Hg) and a substantial increase in cardiac output (avg=+1.47 liters/min.). During exercise, however, the expansion of blood volume caused a large increase in central venous pressure (avg=+7.4 mm. Hg), but no significant increase in cardiac output or maximum O_2 uptake. This finding suggests that the maximum cardiac output is not restricted by extracardiac factors and that the upper limit must therefore be determined by the heart itself.

A66-82180
SIMULTANEOUS PRESSURE, FLOW AND DIAMETER OF THE VENA CAVA WITH FRIGHT AND EXERCISE.

Emilio Tafur and Warren G. Guntheroth (Wash. U., School of Med., Div. of Pediat. Cardiol., Seattle).

Circulation Research, vol. 19, Jul. 1966, p. 42–50. 16 refs. Grants TIHE-5281 and HE-03998.

The diameter, distending pressure, and flow in the superior vena cava and aortic flow were recorded simultaneously in unanesthetized dogs. Atrial systole produced a regurgitant flow pulse and an increase in pressure and diameter. Ventricular systole produced a sharp decrease in caval diameter and a large increase in flow. A second flow pulse occurred during ventricular diastole. Inspiration accelerated flow in the cava. During exercise, the caval diameter invariably decreased. Venoconstriction however, was unequivocally demonstrated in only 26% of the treadmill runs. In 88% of 33 recorded treadmill runs, the flow in the vena cava increased before the heart rate increased which, in turn, preceded the increase in aortic stroke volume. Frightening the animal produced a prompt decrease in caval diameter and distending pressure; this gave way to increased pressure, but without a corresponding increase in diameter. Epinephrine and norepinephrine produced a sustained increase in distending pressure and an initial decrease and a more sustained increase in diameter. Isoproterenol produced tachycardia and a decrease in distending pressure and diameter. Acetylcholine caused an initial bradycardia which was associated with an increase in diameter and pressure in the vena cava followed quickly by prolonged tachycardia which was associated with a decrease in pressure and diameter.

A66-82181
THE MOON'S SURFACE.

Jack Green (Douglas Aircraft Corp., Advan. Res. Lab., Huntington Beach, Calif.).

International Science and Technology, no. 57, Sep. 1966, p. 59–67.

Parts of the moon's surface are strong enough to support landing craft and men; the Luna 9 and Surveyor 1 spacecraft proved this. But neither they nor the Ranger photographs, nor analyses of electromagnetic radiation coming from the moon, nor laboratory simulation studies have settled the old controversy over whether the lunar landscape was shaped by meteorite impact or by volcanic activity. This controversy is no longer merely academic. The establishment of permanent bases on the moon may depend on it. If volcanism or its vestiges, in the form of water, heat, and useful minerals and rocks, still remain on the moon's surface, we must find such areas. They are where the survival advantages lie.

A66-82182
REACHING TOWARDS MARS.

William H. Pickering (Jet Propulsion Lab., Pasadena, Calif.).

Discovery, vol. 27, Sep. 1966, p. 35–39.

The atmosphere, ground temperature, and availability of free water on Mars are discussed in an attempted search for living extraterrestrial forms. The orderly, progressive scheme of exploration of Mars has proceeded from Earth-based observations to space probes and fly-by missions (Mariner project). An orbiting laboratory (Voyager project) and a manned expedition are planned. Earth-based and space-acquired information are examined.

A66-82183
A POSSIBLE EXPLANATION FOR THE EFFECT OF MAGNETIC FIELDS ON BIOLOGICAL SYSTEMS.

M. M. Labes (Franklin Inst. Res. Labs., Chem. Div., Philadelphia, Pa.).

Nature, vol. 211, Aug. 27, 1966, p. 698. 10 refs.

An explanation which is thought to be new is presented that appears to offer a consistent and reasoned basis for suggesting that a magnetic field (about 1,000 gauss or more) influences the phenomena of charge transport, both ionic and electronic; mass transport (diffusion rate); and reaction time in a biological medium. The argument is based on the well-documented observations: (1) the rod-like molecules in a liquid crystal can orient themselves in a magnetic field, and (2) liquid crystalline materials have been identified in a host of biological systems.

A66-82184
BINAURAL UNMASKING OF COMPLEX SIGNALS.
J. L. Flanagan and B. J. Watson (Bell Telephone Labs., Inc., Murray Hill, N. J.).
(Acoust. Soc. of Am., 70th Meeting, St. Louis, Mo., Nov. 3–6, 1965).
Journal of the Acoustical Society of America, vol. 40, Aug. 1966, p. 456–468.

Binaural-masked thresholds were measured for periodic 100-sec. rectangular pulses of period T. Signal parameters were pulse rate (10, 50, 100, 250, and 1000 p.p.s.), interaural phase difference (0 and π rad), and interaural time difference (0–5 msec.). Spectral content of the signal was controlled by addition or subtraction of phase-locked harmonic components and by high-pass and low-pass filtering (cut off frequencies 300, 600, 1200, and 2400 c.p.s.). Broad-band, interaurally in-phase, masking noise at 60 db. sensation level was used throughout. The signals were transduced by headphones, and the masked thresholds were determined by a modified Békésy technique. The difference between the threshold for a given test condition and threshold for the signal in-phase condition is defined as the masking-level difference (MLD), or the binaural release from masking. For all pulse rates, maximum release from masking obtained for an interaural time of 1.5 msec. or T/2, whichever was smaller. The greatest binaural unmasking occurred for a pulse rate of 250 p.p.s. and was less at higher and lower rates. For all tonal cases (pulse rates of 250 p.p.s. and higher) the release from masking related primarily to the fundamental component. Elimination of the fundamental substantially reduced the MLD. At the lowest pulse rate, high-pass filtering of the signal also reduced the MLD to a small value. The largest MLD's were found for signal conditions which gave rise to basilar-membrane motion near the 300 c.p.s. place and which led to interaural time differences of about 1.5 msec. in the neural activity originating from these places. The same interaural disparity at higher-frequency places produced substantially smaller MLD's. The MLD therefore appears specific to membrane place as well as to interaural time difference.

A66-82185
TEMPORARY THRESHOLD SHIFT IN MALES AND FEMALES.
W. Dixon Ward (Minn. U., Hearing Res. Lab., Minneapolis).
Journal of the Acoustical Society of America, vol. 40, Aug. 1966, p. 478–485. 18 refs. PHS supported research.

Various measurements of temporary threshold shift (TTS) from high-intensity tones and noises were made on 24 male and 25 female young normal-hearing adults. Significantly more TTS was produced in males by low-frequency stimuli (below 1000 c.p.s.) and significantly less by high-frequency stimuli (above 2800 c.p.s.). No differences between sexes in TTS from low intensities (40 db. SL), in auditory adaptation (perstimulatory fatigue at 1000 c.p.s.), in rate of recovery from a fixed value of TTS, or in TTS produced by impulse noise could be demonstrated. It is suggested that these results all imply that males and females do not differ in intrinsic fragility of sensory structures on the basilar membrane, but that women have more efficient middle-ear muscles than men.

A66-82186
ENZYMIC CONTROL OF NUCLEIC AND SYNTHESIS DURING SYNCHRONOUS GROWTH OF CHLORELLA PYRENOIDOSA II. DEOXYCYTIDINE MONOPHOSPHATE DEAMINASE.
Stella Rei-Chi Shen and Robert R. Schmidt (Va. Polytech. Inst., Dept. of Biochem. and Nutr., Blacksburg).
Archives of Biochemistry and Biophysics, vol. 115, Jul. 1966, p. 13–20.

Dramatic Shifts in the apparent level of deoxycytidine monophosphate (dCMP) deaminase were observed during synchronous growth of *Chlorella pyrenoidosa.* The relationship between the periodism in the cellular level of deoxythmidine monophosphate (dTMP) kinase and deoxyribonucleic acid (DNA), suggested that the enzymes on the deoxythymidine triphosphate (dTTP) biosynthetic pathway might be limiting the rate of DNA synthesis during the cell cycle. Furthermore, since dCMP deaminase and dTTP kinase are separated by one enzymatic step, yet still reflect the same periodism in apparent level during the cell cycle, it seems probable that the structural genes for all enzymes in the dTTP biosynthetic pathway are located within the same operon.

A66-82187
DIURNAL VARIATION IN ORGANISMIC RESPONSE TO VERY WEAK GAMMA RADIATION.
Frank A. Brown, Young H. Park, and Joseph R. Zeno (Northwestern U., Dept. of Biol. Sci., Evanston, Ill.).
Nature, vol. 211, Aug. 20, 1966, p. 830–833. 16 refs. ONR, NIH, and NSF supported research.

The spontaneous activity of mice was monitored quantitatively by actographs during three months under conditions of alternating periods of 1.5 and 8 times the level of natural background gamma-radiation. Each mouse showed its own specific mean 24-hr. pattern of activity, but all showed predominantly nocturnal activity. Hourly differences in activity indicated that the experimental animals were less active than controls (mean period of activity of 0.1714 hr. and 0.1749 hr., respectively). It is suggested that the increase or decrease of activity in response to the presence of higher gamma-radiation field depends on the time of day. The mice showed mean deviations for specific hours of the day ranging from a stimulation of more than 15% to a depression of the same amount. The mean balance between the two over a 24-hr. period suggests that the overall relative stability observed under different levels of radiation exists only within the framework of an orderly mean 24-hr. pattern of variation in responsiveness.

A66-82188
SYNAPTIC DELAY AND CONDUCTION TIME IN BRAIN DURING EXPOSURE TO SIMULATED HIGH ALTITUDES.
Beatriz Williams, Dorothy E. Woolley, and Paola S. Timiras (Calif. U., Dept. of Physiol., Berkeley).
Nature, vol. 211, Aug. 20, 1966, p. 889–890. PHS supported research.

The effect of exposure for three days to simulated altitudes of 3800 m. (475 mm. Hg) and 5490 m. (380 mm. Hg) on conduction time along the lateral olfactory tract and synaptic delay between tract and cortex were investigated in 12 rats with chronically implanted electrodes. Synaptic delay was prolonged 24–32% and conduction time 11–17% at 5490 m.; synaptic delay was increased 15–23% and conduction time 5–9% at 3800 m. The degree of change of total latency was intermediate between changes in synaptic delay and conduction time. After return to sea level from 3800 m., conduction time and synaptic delay returned to normal more rapidly than after 5490 m.

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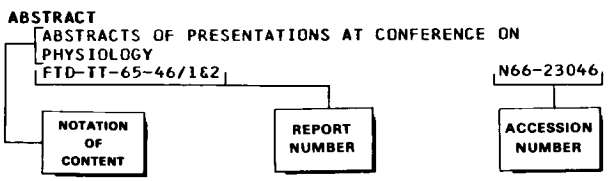

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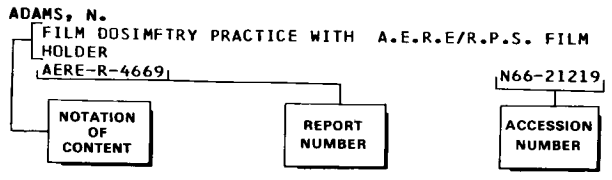

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