AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA SP-7011 (25)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

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

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

a. NASA entries identified by their *STAR* accession numbers (N66-10000 series),
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Many of the abstracts included in this publication have been reproduced from those appearing in *STAR* and *IAA*. This procedure, adopted in the interests of economy and speed, has introduced some variation in size, style, and intensity of type.

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STAR ENTRIES

N66-18505# Purdue Univ., Lafayette, Ind.
INVESTIGATION OF FUSION AND FIXATION DISPARITY LIMITS FOR PHOTOGRAMMETRY Final Technical Report, Jul. 1964–Aug. 1965
Sandor A. Veres [1965] 46 p refs
(Contract DA-44-009-AMC-641(X))
(AD-625217) CFSTI: HC $2.00/MF $0.50

Fixation disparity is a phenomenon associated with normal binocular vision which causes an observer to perceive a fixated point in space in front of or behind its actual location in physical space. Considering the floating mark settings which are fundamental to photogrammetric measurements, any such settings made by an observer when fixation disparity is present will contain errors of a constant nature which will vary with the viewing conditions and with time. Previous studies of the phenomenon have been of a basic nature and, in general, have not been directly related to the needs of photogrammetry. It is the purpose of this project, therefore, to investigate the effects of fixation disparity on floating mark measurements made under photogrammetric conditions using variable measuring marks, variable targets and variable backgrounds. TAB

N66-18516# Army Foreign Science and Technology Center Washington, D. C.
THE ROLE OF ELECTROMAGNETIC FIELDS IN PHYSIOLOGICAL PROCESSES
A. S. Presman Dec. 1965 9 p refs Transl. into ENGLISH from Biofizika (Moscow), no. 1, 1964 p 131–134
(FSTC-381-T65-601; AD-625857) CFSTI: HC $1.00/MF $0.50

An attempt is made to analyze certain data on the specific effect of electromagnetic fields on the nervous system, tissue growth and development, on the state of protein molecules, and on the generation of electromagnetic fields in the tissues of living organisms. TAB

N66-18582# Systems Technology, Inc., Hawthorne, Calif.
EFFECTS OF NONLINEARITIES ON HUMAN OPERATOR TRACKING PERFORMANCE: A REVIEW OF THE LITERATURE Final Report, Sep. 1964–May 1965
Richard J. Wasicko and Raymond E. Magdaleno Wright-Patterson AFB, Ohio AMRL, Oct. 1965 50 p refs
(Contract AF 33(615)-1782)
(AMRL-TR-65-158; AD-626036) CFSTI: HC $2.00/MF $0.50

Available literature on the effects of system nonlinearities on human operator tracking performance is summarized. The reviewed reports include experimental investigations in the technical areas of human engineering and aircraft handling qualities. Pertinent information is presented on experimental details, types of nonlinearities and other experimental variables tested, and primary results; and it is concluded that the general state of knowledge in this area is unsatisfactory. Several nonlinearities (such as actuator rate limiting) important in aircraft manual control systems have not been experimentally investigated, and there is inadequate data on the influence of forcing function characteristics. Author (TAB)

N66-18702# European Atomic Energy Community, Brussels (Belgium).
THE FEASIBILITY OF A NEW PROCEDURE FOR BIOLOGICAL DOSIMETRY
J. F. Whitfield, S. Kellerer, H. Brohee, and T. Youdale 1965 34 p refs
(EUR-2505.e)

The proportion of rat, as well as human, lymphocytes with structureless (or pycnotic) nuclei can serve as a sensitive indicator of absorbed radiation dose (following an acute exposure) provided that the irradiated cells are removed from the blood and maintained in a glucose-phosphate medium. The dosimeter is particularly sensitive to doses between 0 and 100 R. Above 100 R, the slope of the linear dose-effect curve tends to decrease and the dosimeter becomes less sensitive. Author (NSA)

N66-18716# Long Island Jewish Hospital, New Hyde Park, N. Y. Dept. of Labs.
BIOELECTRIC EFFECTS IN CALCIFIED TISSUES Progress Report, 1 Sep. 1964–Jun. 1965
Leroy S. Lavine and Peter Rogatz Jun. 1965 11 p refs
(Contract AT(30-1)-3282)
(NYO-3282-1) CFSTI: HC $1.00/MF $0.50

Progress is reported in the development of methods and equipment for use in making piezoelectric measurements in bone and other materials. Preliminary results indicate that the piezoelectric effect may not be confined to calcified tissues but may be a general property of practically all tissue and may play a vital role as the initiating mechanism in tactile responses. Data are included from piezoelectric measurements on bone, tendon, ivory, and bamboo. A technique was developed for studying the uptake and deposition of ^{45}Ca by clams while portions of their shells are under local stress. NSA

N66-18718# Sandia Corp., Albuquerque, N. Mex.
SAFETY AS A DESIGN FEATURE IN SYSTEMS
A. D. Swain Sep. 1965 14 p refs Presented at the Systems Eng. Conf., Chicago
(Contract AT(29-1)-798)
(SC-R-65-991; CONF-650915-2) CFSTI: HC $1.00/MF $0.50

Designing safety features into systems is a more effective way to reduce accidents than campaigning to make people more careful. Hazards can be drastically and permanently reduced through design action in modifying the hazardous situation, whereas reduction through modifying people is limited and requires continuing reinforcement. Moreover, reinforcement gets exceedingly more difficult to achieve because of the human tendency to "tune out" stimuli a person comes to consider as noise. Safety in systems is a design problem, one to be resolved by objective engineering techniques.
Author (NSA)

N66-18727# Howard Univ., Washington, D. C. Dept. of Biochemistry.
CHEMICAL EFFECTS OF IONIZING RADIATIONS ON THE INDIVIDUAL AMINO ACIDS WITHIN INTACT AND PURE PROTEIN MOLECULES Progress Report
Felix Friedberg 15 Oct. 1965 9 p refs
(Contract AT(30-1)-2735)
(TID-22291) CFSTI: HC $1.00/MF $0.50

Results are reported from studies that show definite indications for structural unfolding of the ribonuclease molecule upon gamma irradiation in the solid state (increase in viscosity and increase in negative optical rotation) concommitant with the loss in enzymatic activity. Disulfide interchange does not occur to any appreciable extent. The data establish that the number average molecular weight of the enzyme is not changed by the irradiation. Author (NSA)

N66-18734# Hanford Atomic Products Operation, Richland, Wash.
FAST NEUTRON EFFECTS ON PRODUCTIVITY OF YOUNG AND OLD FLOUR BEETLES, TRIBOLIUM CASTANEUM HERBST AND ALTERATIONS DUE TO TEMPERATURE AND SEX-EXPOSED
Howard E. Erdman 6 Oct. 1964 16 p refs
(Contract AT(45-1)-1350)
(HW-SA-3537) CFSTI: HC $1.00/MF $0.50

Virgin day-old and three-week old flour beetles, *Tribolium castaneum*, strain Brazil CI, were given approximately 830 and 970 rads, respectively, of fast neutrons of average energy 4.6 Mev. Ten replicates of the mating combinations control, male-exposed, female-exposed, and both-exposed were cultured at 25°C, 29°C and 32°C in 65 to 70% relative humidity. Productivity, measured as adult progeny per reproducing female per day, was scored for 14 days. Decreases in temperature progressively delayed reproductive onset. Additional delay in reproductive onset occurred when young female beetles were irradiated, indicating a greater radiation sensitivity at this stage of oogonial maturation. Thereafter, no other indication of a differential radiosensitivity of germ cells was noted. Productivity of young beetles plateaued during the second week; that of old beetles after the first day. Male- and female-exposed productivities were not significantly different within a temperature but were less than control and greater than both-exposed. Neutron irradiation effects appeared additive in that both-exposed mating combinations had the expected number of progeny compared to those in which one sex only was exposed. Author (NSA)

N66-18737# Padua Univ. (Italy). Inst. of Zoology and Comparative Anatomy.
A QUANTITATIVE EVALUATION OF CELL SURVIVAL AS A FUNCTION OF RADIATION DOSE Final Report, 1959–1962
G. Colombo, A. G. Levis, and G. Marin [1962] 74 p refs
(Contract IAEA-36)
(NP-15149)

Results are reported from a series of studies on the effects of X-radiation on multiplication of guinea pig kidney cells in tissue culture. The effects of doses ranging from 150 to 900 R on growth rate, cell morphology, and survival were studied under various environmental conditions. Results indicated that radiation caused a general depression of mitotic activity and temporarily blocks cells entering mitosis; the radiosensitivity of cells was changed only by extreme changes in environmental conditions; the presence of giant cells appeared to be a morphological expression of lethal damage carried by the clones; and specific genetic loci appear to control radiosensitivity. A comparison was made of the effects of nitrogen mustard and X radiation on growth and morphology of cells in tissue culture. Results indicate that X radiation and nitrogen mustard do not act on a common target in causing reproductive death of cells. A nitrogen mustard-resistant strain of cells was developed and chromosome studies and studies of colony formation after X irradiation indicated no cross-resistance to X radiation in the cells. A list is included of 17 publications that report results of the series. NSA

N66-18741# California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
THE LIPIDS OF RUVETTUS PRETIOSUS MUSCLE AND LIVER
Judd C. Nevenzel, Waldtraut Rodegker, and James F. Mead [1964] 19 p refs
(Contract AT(04-1)-Gen-12)
(UCLA-12-534) CFSTI: HC $1.00/MF $0.50

The muscle of the gempylid fish, *Ruvettus pretiosus*, contains 14.7% (wet weight) of lipid, which is predominantly wax esters of 34 and 36 carbon atoms with one and two double bonds. The liver lipids contain only about 2% wax esters. Contrary to a previous report, the muscle lipid does not contain hydroxy fatty acids. Gas-liquid chromatographic analyses are reported for the fatty acids of several lipid fractions, including the muscle wax esters, for the long-chain alcohols of the muscle wax esters, and for the unhydrolyzed wax esters.
Author (NSA)

N66-18753# Los Alamos Scientific Lab., N. Mex. Biomedical Research Group.
SYNCHRONIZED MAMMALIAN CELLS. II: AN EXPERIMENTAL TEST OF A MODEL FOR SYNCHRONY DECAY
E. C. Anderson and D. F. Petersen [1964] 7 p refs
(Contract W-7405-ENG-36)
(LA-DC-6507) CFSTI: HC $1.00/MF $0.50

A theoretical model is described which can be used to make quantitative predictions for the decay of synchrony in cell cultures on the basis of the assumption that decay is due to a random variability in generation times. A method of obtaining data of sufficient precision to permit accurate analysis of growth rate patterns is described. This was applied in a test of the model and the comparison of the single and double block methods for the induction of synchrony. Chinese hamster ovary cells were grown in tissue culture, synchronized by the thymidine block method, and total cell concentrations were measured at hourly intervals by electronic particle counting. A comparison was made of experimental data and theoretical decay predicted by the model. NSA

N66-18767# Atomic Energy Commission, Washington, D. C. Div. of Biology and Medicine.
TERRESTRIAL AND FRESHWATER RADIOECOLOGY A

Selected Bibliography (Supplement 3)
Alfred W. Klement, Jr. and Vincent Schultz Feb. 1965 119 p refs
(TID-3910, Suppl. 3) CFSTI: HC $2.50/MF $0.75

A list is presented of 1207 publications in the field of radioecology, including the biological aspects of radioactive fallout, waste disposal, terrestrial radioecology, and freshwater radioecology. An attempt was made to reference publications related to the field or laboratory studies of wild species of plants and animals with respect to radiation effects or metabolic studies involving radionuclides. Complete information concerning reference sources and brief content notes are included. NSA

N66-18794# Institute of Public Health, Tokyo (Japan). Dept. of Radiological Health.
DISTRIBUTION STUDIES OF COMMON AND RADIOACTIVE CESIUM IN NATURE AND IN MAN Final Report, 1 Apr. 1962–31 Mar. 1965
Noboru Yamagata 31 Mar 1965 18 p refs
(Contracts IAEA-140/RB; IAEA-140/RI/RB; IAEA-140/R2/RB)
(NP-15179)

The relation between the content of stable Cs and ^{137}Cs in blood and the whole-body was determined by parallel measurements of Cs and ^{137}Cs in whole-body and blood made on human subjects at monthly intervals. Cesium was determined in whole blood after neutron activation. Relatively small monthly fluctuations were found in whole-body values but blood values showed considerable monthly fluctuations. Results suggested the validity of employing a factor of 6 in relating whole-body to blood concentrations in a quasi-equilibrium state between the diet and whole-body content of ^{137}Cs. Comparison of data with measurements of ^{137}Cs content in blood samples obtained from blood banks throughout Japan indicated there may be a slight geographical variation. The data also indicated that women have less Cs in their blood than men have. On the assumption of the Japanese standard man having a body weight of 56 kg, of which one-third by weight is total blood, the whole-body blood Cs content was calculated as 9 μg. The whole-body content of Cs was calculated to be 1.1 mg. Thus 0.8% of the whole-body Cs is in blood. This finding can be applied in the assessment of the whole-body content of ^{137}Cs by analysis of blood. It is concluded that whole-blood analysis for ^{137}Cs may be valuable where whole-body counters are not available. Twenty samples of human rib bone were analyzed for stable Sr and Ca content. The results showed 124 ppm of Sr and 37.3 of Ca on the average, based on ash weight. The Sr/Ca ratio was found to be 3.3×10^{-4}. Rice samples collected throughout Japan were analyzed for Sr and Ca content. The results showed a considerably higher Sr content in polished rice than in unpolished brown rice. The discrimination ratio of Sr/Ca from polished rice to human bone was calculated as 0.13 and from brown rice to human bone as 0.22. The discrimination factor from diet to bone in Japan is 0.17. Mechanisms of the distribution of ^{137}Cs and stable Cs in nature and the role of food chains in the incorporation of ^{137}Cs in man are discussed. Standard diets in Japan and in the U. S. are compared as to content of stable Cs, Mn, and Fe. It is concluded that the radiological protection of a population should be planned on the basis of dietary differences. NSA

N66-18795# Yale Univ., New Haven, Conn.
THE EFFECTS OF RADIATIONS ON BIOLOGICAL MOLECULES AND ON CELLS IN TISSUE CULTURE Progress Report
[1965] 18 p refs
(Contract AT(30-1)-2653)
(TID-22128) CFSTI: HC $1.00/MF $0.50

Progress is reported in studies on the electron spin resonance spectra of X irradiated DNA, the radiosensitivity of mammalian cells in tissue culture, with emphasis on high LET radiations such as accelerated He, Li, B, and C ions, and the identification of a strain of *Bacillus subtilis* DNA that has an uneven distribution of thymine in the two complementary strands. A list is included of papers published during the period covered by this report. NSA

N66-18807# California Univ., Berkeley. Lawrence Radiation Lab.
BIO-ORGANIC CHEMISTRY Annual Report, Dec. 1963–Dec. 1964
9 Feb. 1965 36 p refs
(Contract W-7405-ENG-48)
(UCRL-11948) CFSTI: HC $2.00/MF $0.50

Progress is reported in studies of the photosynthesis of carbon compounds; the biosynthesis of opium and tobacco alkaloids; the structure and chemistry of chloroplasts; problems in biological organization and regulation; the physical chemistry of biological systems; the optical properties of biopolymers; the fate of the radical initiator in the radiolysis of crystalline choline chloride; the origin of biohydrocarbons from a one-billion-year-old sediment; the role of cyanamide in chemical evolution; the photochemistry and radiation chemistry of thymine; biochemical and anatomical changes in the brain of rats induced by experience or environment; and the mechanism of D_2O-induced sterility in mice. Many of the studies involved the interaction of radiation with both chemical and biological systems as well as the use of tracer methods to define the nature of the interactions. A list is included of 39 publications during the period covered by this report. NSA

N66-18830# Union Carbide Nuclear Co., Oak Ridge, Tenn.
Y-12 RADIATION SAFETY MANUAL
P. C. Mc Ree, C. M. West, and J. D. Mc Lendon, ed. 11 May 1965 115 p refs
(Contract W-7405-ENG-26)
(Y-1401, Rev.) CFSTI: HC $4.00/MF $1.00

Procedures and equipment are described that are used for the protection of personnel from exposure to ionizing radiation and radioactive materials, industrial toxicants, and other environmental factors that may cause sickness, impair health and well-being, or cause inefficiency among plant workers. Radiation protection guides for exposure to external or internal radiation are set out, and criteria for environmental and personnel monitoring programs are presented. Equipment described includes a personnel decontamination facility and whole-body radiation counter. NSA

N66-18838# Pavia Univ. (Italy). Inst. of Genetics.
INVESTIGATIONS OF MUTABILITY OF POLYGENES AND ON UTILIZATION OF INDUCED GENETIC VARIABILITY
R. E. Scossiroli 1 Jan. 1965 57 p refs
(Contract IAEA-61/US)
(TID-21649) CFSTI: HC $3.00/MF $1.00

Data are presented from an analysis of radioinduced mutations in wheat. Seeds of *Triticum durum* and a diploid species, *T. monoccum*, were exposed to various doses of x radiation ranging from 1500 to 8000 R and plants from four generations were analyzed for a series of characters, including productivity. The use of radioinduced mutations in plant breeding programs is discussed. NSA

N66-18866# Columbia Univ., New York. Dept. of Ophthalmology.
[TRANSPORT AND METABOLISM OF ISOTOPICALLY LABELED MATERIALS IN THE EYE] Final Report
[1965] 6 p refs
(Contract AT(30-1)-2456)
(NYO-2456-1) CFSTI: HC $1.00/MF $0.50

Tritium-labeled thymidine was used as a tracer of DNA synthesis in the rabbit lens *in vivo*. After small mechanical injuries to the anterior surface of the lens a large number of epithelial cells surrounding the site of injury were shown to be stimulated and to undergo DNA synthesis and mitosis. This stimulation of DNA synthesis and mitosis moved in wave-like fashion slowly outward from the site of the injury starting about 12 hr after injury. X radiation at doses of 200, 500, or 100 R inhibited the development of the reaction to injury. Data are included from studies of DNA synthesis and mitosis in isolated rabbit lens maintained in tissue culture. NSA

N66-18906# California Univ., Berkeley. Lawrence Radiation Lab.
STUDIES ON THE STRUCTURE AND PHOTOCHEMISTRY OF CHLOROPLAST LAMELLAE
John Biggins (Ph.D. Thesis) Jan. 1965 150 p refs
(Contract W-7405-ENG-48)
(VCRL-11863) CFSTI: HC $4.00/MF $1.00

A study was made of the molecular structure of the chloroplast lamellae using biochemical techniques and of the photochemical properties of reactions that occur during photosynthetic electron transport in the lamellae. Emphasis was placed on quantum efficiencies and wavelength dependences of the reactions in order to further characterize the pigment systems responsible for quantum conversion. Results are reported from studies using chloroplast lamellae from *Spinacia oleracea*. NSA

N66-18955# Hanford Atomic Products Operation, Richland, Wash.
REPRODUCTIVE PERFORMANCE OF X-RAYED SINGLE-SPECIES AND MIXED-SPECIES CULTURES OF *TRIBOLIUM CONFUSUM* AND *T. CASTANEUM* REARED AT DIFFERENT TEMPERATURES
Howard E. Erdman [1964] 20 p refs Submitted for Publication
(Contract AT(43-1)-1350)
(HW-SA-3748) CFSTI: HC $1.00/MF $0.50

Adult flour beetles, *T. confusum* and *T. castaneum*, sexed as pupae and maintained separately for three weeks after adult emergence, were given 0, 1575, or 2625 R of X rays. Single- and mixed-species populations were established and incubated at 25, 29, or 32°C at 65 to 70% relative humidity. Productivity was determined during 10 weeks post-irradiation. Reproductive abilities increased with increased temperature and decreased with increased X-ray exposure for a given temperature. The reproductive fitness of *Tribolium castaneum* was superior in all environments except at O R, 32°C. The frequencies of dominant lethals (which included lethality due to coexistence in mixed-species populations) increased with higher X-ray doses, but temperature and cohabitation influenced their expression within a species. Coexistence was responsible for a considerable reduction of productivity, which was also altered by temperature and X radiation. The rigors of coexistence were lessened at 2625 R exposures (undoubtedly due to reduced population density). Interpretations of dose-response curves on the bases of single-hit and multi-hit radiation phenomena were inferred from similar responses of diverse organisms. Most lethality occurred in the early (eggs to young larvae) part of the life cycle for both species. Species proportions in coexistent populations varied with temperature and X radiation but *T. castaneum* was consistently superior compared to *T. confusum*. The greater variability of *T. castaneum* probably makes it more fit in environments featuring different temperatures and X-radiation exposures plus coexistence. Responses to radiation of single-species populations cannot be used to predict those of mixed-species populations. Author (NSA)

N66-18965# Association Claude Bernard, Paris (France).
RESEARCH RELATING TO THE STUDY OF RADIATION EFFECTS ON THE FUNCTIONS AND ENZYMATIC POTENTIAL OF PLATELETS Annual Report, 1963–1964 [RECHERCHE SUR L'ETUDE DES EFFETS DES RADIATIONS SUR LES FONCTIONS ET L'EQUIPEMENT
J. Caen Jun. 1965 20 p refs In FRENCH
(EURATOM-019-63-3 BIOF)
(EUR-2438.f)

After exposure of platelet-rich citrated plasma to X-ray doses varying from 50 to 800 R, the following results were obtained: no change in the number of platelets; a few morphological alterations in 2 to 10% of the cells, even after a 50 R dose; the total adhesion of platelets to the glass was retarded; spontaneous platelet aggregation was increased; in the presence of extrinsic ADP, aggregation of the platelets was reduced; and thrombin-treated irradiated platelets released less ADP than non-irradiated platelets. It was concluded that irradiation activates the platelet ATPases, releases intrinsic ADP, and causes spontaneous hyperaggregability; the cells thus damaged by X-rays are less sensitive to extrinsic ADP; and they are also less sensitive to thrombin, which normally releases intrinsic ADP, which is found to a less extent after irradiation. Author (NSA)

N66-19009# Joint Publications Research Service, Washington, D. C.
VESTNIK OF THE USSR ACADEMY OF MEDICAL SCIENCES, VOLUME XX, NO. 11, 1965
23 Feb. 1966 184 p refs Transl. into ENGLISH of Vestn. Akad. Med. Nauk SSSR (Moscow), v. 20, no. 11, 1965 p 1–103
(JPRS-34244; TT-66-30685) CFSTI: $5.00

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3. COMPARATIVE PHYSIOLOGICAL CHARACTERISTICS OF EXPERIMENTAL NEUROSES IN VERTEBRATES N. I. Lagutina and A. F. Sysoyeva p 29–45 refs
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N66-19010 Joint Publications Research Service, Washington, D. C.

COMPARATIVE CHARACTERISTICS OF RADIATION SICKNESS IN VARIOUS MAMMAL SPECIES, INCLUDING PRIMATES

L. F. Semenov and L. A. Yakoleva *In its* Vestn. of the USSR Acad. of Med. Sci., V. 20, No. 11, 1965 23 Feb. 1966 p 79-93 refs (See N66-19009 09-04) CFSTI: $5.00

This paper cites comparative data on the nature of acute radiation sickness, as well as on the effect produced by higher radiation doses in mammals (mice, rats, guinea pigs, rabbits, dogs, and monkeys). Findings proving general similarity in the development of radiation processes in animals and in man were confirmed. A number of differences marking the manifestation of individual syndromes in diverse mammal species were established, the resemblance of acute radiation sickness in man and in apes being the greatest, as compared to other animals. M.R.W.

N66-19083 Harry Diamond Labs., Washington, D. C.

AN EVALUATION OF A FLUID AMPLIFIER, FACE MASK RESPIRATOR

Henrik H. Straub and James Meyer (Walter Reed Army Inst. of Res.) *In its* Proc. of the Fluid Amplification Symp., Vol. III Oct. 1965 p 309-315 ref (See N66-19069 09-03) CFSTI: HC $7.00/MF $1.75

A fluid amplifier controlled face mask respirator capable of performing complex respiratory functions is evaluated. The respirator can function, for example, as an assistor for those patients needing support or as a controller in the absence of spontaneous respiration. Results of medical and engineering tests indicate that the respirator performs well on both animals and humans. High expiratory resistance, a characteristic of the device, is overcome with the addition of a specially designed breathing valve that can be eliminated, if necessary, for certain types of patients with respiration difficulties requiring higher-than-normal mean lung pressures. The elimination of moving parts in the respirator itself makes this device extremely reliable, easy to operate, and inexpensive to manufacture. M.R.W.

N66-19155# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Departement Protection Sanitaire.

RADIOACTIVE CONTAMINATION LEVELS IN THE ENVIRONMENT AND IN THE FOOD CHAIN [NIVEAUX DE CONTAMINATION RADIOACTIVE DU MILIEU AMBIANT ET DE LA CHAINE ALIMENTAIRE] Annual Report, 1965

Brussels, EURATOM, 1965 32 p refs In FRENCH, ENGLISH summary

(Contract EURATOM-003-63-10 PSAF)

(EUR-2520.f) CFSTI: HC $2.00/MF $0.50

This report describes the main items studied under the EUR-CEA contract of association during 1964. The studies previously initiated on transit in the gastro-intestinal tract and iodine metabolism in children were pushed ahead and some partial results obtained. The gastro-intestinal tract study was rounded off by the elaboration of a new mathematical model. The food chain studies were completed and work was started on the analysis of these data. Partial results concerning average consumption were obtained. The study on the transfer of radioactive contamination from pollution sources to foodstuffs was carried out by means of a progressive method of approach. Author

N66-19168*# Northrop Space Labs., Hawthorne, Calif.

INVESTIGATION OF PEROGNATHUS AS AN EXPERIMENTAL ORGANISM FOR RESEARCH IN SPACE BIOLOGY A Summary of Progress, 1 Jan.-31 Dec. 1965

R. G. Lindberg and J. J. Gambino [1965] 73 p refs

(Contract NASw-812)

(NASA-CR-70871) CFSTI: HC $3.00/MF $0.75 CSCL 06C

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1 PEROGNATHUS AS AN EXPERIMENTAL TOOL IN SPACE RESEARCH 2 p

2 LABORATORY BREEDING OF THE LITTLE POCKET MOUSE, *PEROGNATHUS LONGIMEMBRIS* P. Hayden, J. J. Gambino, and R. G. Lindberg 24 p refs

3. GROWTH AND DEVELOPMENT OF THE LITTLE POCKET MOUSE *PEROGNATHUS LONGIMEMBRIS* P. Hayden and J. J. Gambino 21 p

4. THE RADIOBIOLOGY OF THE POCKET MOUSE J. J. Gambino and R. G. Lindberg 16 p refs

N66-19179# Flying Personnel Research Committee, London (England).

A PRELIMINARY ASSESSMENT OF THE LIGHTWEIGHT PRESSURE JERKIN DESIGNED FOR THE VA/EE TYPE 571 AIRCRAFT (T.S.R.2)

J. Ernsting (Roy. Air Force Inst. of Aviation Med.) Jun. 1964 9 p

(FPRC/Memo-211) CFSTI: HC $1.00/MF $0.50

Evaluation methods are described for determining the physiological acceptability of the pressure jerkin, which is made of terylene containing layers and a chloroprene proof nylon bladder. In the preliminary test, a subject wore the jerkin beneath a torso suit, and over an air ventilated suit. The mobility and comfort of the subject while sitting in an ejector seat were assessed at positive breathing pressures of up to 100 mm Hg, and the pressure-volume characteristics were determined for 3 subjects. The limited results suggest that the counterpressure afforded is acceptable, and that the pressure-volume characteristics are within specifications. N.E.N.

N66-19180# Flying Personnel Research Committee, London (England).

A PRELIMINARY STUDY OF FLIGHT DECK WORK LOADS IN CIVIL AIR TRANSPORT AIRCRAFT

Aug. 1965 50 p refs

(FPRC-1240) CFSTI: HC $2.00/MF $0.50

Sixteen scheduled transatlantic sectors were flown in BOAC Boeing 707 aircraft, each with an observer and a volunteer subject—the aircraft captain. A continuous recording of the captain's heart rate was made on the tape, together with

a simultaneous commentary by the observer. At the same time the captain's total output of urine was collected in individual samples for subsequent biochemical analysis, which included adrenaline and noradrenaline. Cockpit environment and crew activities were also noted, as also was the captain's post flight 'fatigue state'. It was found that the pilots' heart rates showed changes that were associated with particular phases of flight and which varied with the circumstances under which the flights were made. The biochemical measurements reflected the unexceptional nature of the environments and the overall demand upon the pilots in these flights. Author

N66-19191*# Naval School of Aviation Medicine, Pensacola, Fla.
ARCHITECTURE OF THE OTOLITH END ORGAN: WITH SOME FUNCTIONAL CONSIDERATIONS
Makoto Igarashi 8 Dec. 1965 19 p refs Joint report with NASA *Its* Rept.-127
(NASA Order R-93)
(NASA-CR-70597; NAMI-952) CFSTI: HC $1.00/MF $0.50 CSCL 06E

The otolithic membrane is extremely fragile and is easily destroyed by post-mortem changes, tonic change, strong chemicals, et cetera. The routine technique of temporal bone preparation usually includes the use of a strong fixative and decalcifier; therefore, the structural preservation of this structure in histological slides is uncertain. An attempt was made to preserve the otolithic architecture as naturally as possible. In studying squirrel monkey temporal bones the results obtained with three different decalcifiers are compared. The best architectural preservation of the otolithic end organ was obtained after 10% formalin fixation, dehydration, celloidin embedding, and 10% EDTA decalcification. The morphological features of this end organ are discussed from the functional viewpoint. It is confirmed that, except for the otoconia, basically both otolith and semicircular canal end organs have almost similar components. Author

N66-19203# School of Aerospace Medicine, Brooks AFB, Tex.
A UNIFIED APPROACH TO THE ANALYSIS OF HUMAN SERUM LIPIDS FOR CLINICAL INVESTIGATION, 1962–1964
Dorothy F. Wease Sep. 1965 19 p refs
(SAM-TR-65-45; AD-474253)

A method is described by which the organic solvent-soluble components of 1 ml. of serum are extracted and purified. The extract is dried and weighed to determine the total lipid content. The dried extract is then redissolved in petroleum ether and pipetted onto a prepared column of silicic acid from which the four major components (cholesteryl esters, nonesterified cholesterol, glycerides, and phospholipids) are eluted separately and are quantitated by spectrophotometric methods. Detailed procedures are given for each step in the analysis. Author (TAB)

N66-19225*# Texas Univ., Austin. Defense Research Lab.
[STUDIES OF AUDITORY INFORMATION PROCESSING EMPHASIZING THE APPLICATION OF SIGNAL DETECTABILITY THEORY TO THE AUDITORY SENSORY RESPONSES] Semiannual Report, 1 Dec. 1964–31 May 1965 and Quarterly Status Report, 1 Mar.–31 May 1965
Lloyd A. Jeffress and Charles S. Watson 14 Jul. 1965 31 p refs
(NASA Order R-129; Contract Nonr-3579(04))
(NASA-CR-70860) CFSTI: HC $2.00/MF $0.50 CSCL 06B

Status of proposed problems in the psychophysical studies of brightness, signal detection and auditory responses were given. Appended are the results of two specific studies. The first reported the effect of the bandwidth of a noise masker on detection of antiphasic and monaural tonal signals. The signal used was a 500-cps tone with a duration of 150 msec, gated with a rise-fall time of 25 msec. The masker was thermal noise with spectral levels of 50, 45, and 30 dB. The bandwidth masker was varied from 2900 cps to 12.6 cps. The second harmonic of the signal frequency outside the masking noise was detected by subjects when the external bandwidth was narrow. The 1 kc tone was removed from the detection of noise with its spectral level 40 dB down from that of the narrow masker was used. The ability to respond to sensory inputs was reported in the second study. Reaction speed vs accuracy was measured both with and without background noises. It was concluded that when no stress is placed on response time, the observers adopt a strict speed/accuracy strategy, delaying responses only as they become more difficult. H.S.W.

N66-19266*# National Aeronautics and Space Administration, Washington, D. C.
PROBLEMS OF SPACE BIOLOGY, VOLUME 4
N. M. Sisakyan, ed Mar. 1966 686 p refs Transl. into ENGLISH of the book "Problemy Kosmicheskoy Biologii, Tom IV", Moscow, Izd.-Vo Akad. Nauk SSSR, 1965
(NASA-TT-F-368) CFSTI: HC $6.50/MF $3.25

A collection of journal articles on medical and biological investigations under terrestrial conditions, results of experiments conducted on orbital spacecraft, results of test stand and laboratory tests on animals, and general problems of space biology and methodology are presented. For individual titles see N66-19267–N66-19344.

N66-19267* National Aeronautics and Space Administration, Washington, D. C.
TRAINING DEVICES FOR PREPARING COSMONAUTS FOR OCCUPATIONAL ACTIVITY IN CONTROLLING SPACECRAFT AND THEIR SYSTEMS
N. N. Gurovskiy, V. G. Denisov, A. A. Kuz'minov, and M. M. Sil'vestrov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 1–7 ref (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Complex, specialized, and functional simulators are considered necessary for effective training of cosmonauts and to carry out experiments dealing with spacecraft systems and equipment. A complex simulator is defined as one which permits training all crew members on a given type of space vehicle during all stages of flight, whereas a specialized simulator is designed to develop skills in a whole complex of specific work operations necessary to execute special tasks during space flight. A functional simulator is designed to develop skill in performing work operations involving one type of activity, or to increase the functional capacity of the human operator in performing a specific task. Simulators which can accomplish all three jobs are not considered feasible at the present time. Extended space flights, it is concluded, will require onboard simulation for training the crew to perform vital operations during the prolonged flight. M.W.R.

N66-19268* National Aeronautics and Space Administration, Washington, D. C.
BASIC PRINCIPLES OF SPECIAL COSMONAUT TRAINING
N. N. Gurovskiy, M. D. Yemel'yanov, and Ye. A. Karpov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 8–11 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Cosmonaut training is based on several groups of factors, including (1) an understanding of space as an environment which man cannot enter without special protection, (2) building up resistance to the dynamics of space flight caused by rotary and rolling movements, (3) adapting both physically and mentally to the environment of the capsule, and (4) landing procedures. Stressed in relation to cosmonaut training is the use of special psychological methods to determine individual resistance and peculiarities; and the determination of vestibular sensitivity is also considered. M.W.R.

N66-19269* National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL PSYCHOLOGICAL INVESTIGATION OF COSMONAUT TEAMS
F. D. Gorbov and M. A. Novikov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 12–21 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Space psychology must be concerned with studies related to the emotional stability of the individual space traveller, ability to cooperate during interdependent activity, and the psychological aspects of living in close proximity with other individuals during periods of protracted "group isolation." The accomplishment of integrated tasks in an experimental situation is discussed, and factors of flight activity are presented to define the job of the cosmonaut. Various tests which simulate flight activities are considered for determining the neuropsychiatric stability of cosmonauts. M.W.R.

N66-19270* National Aeronautics and Space Administration, Washington, D. C.
EFFECTS OF EIGHT-HOUR ISOLATION AND HYPOKINESIA ON SEVERAL PHYSIOLOGICAL AND BIOCHEMICAL INDICES IN MAN
V. S. Georgiyevskiy, L. I. Kazurin, A. N. Kalinina, B. S. Katkovskiy, V. V. Kustov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 22–25 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Experiments with 10 healthy young men indicate that eight hours isolation and hypokinesia do not induce functional changes in man. Results do show a statistically significant decrease in blood carboxyhemoglobin content and serum cholinsterase activity. Blood catalase index increased following isolation and hypokinesia. There was a tendency for urine ammonia and urea to decrease. With regard to the cardiovascular system, there was a 16% decrease in pulse rate, a 23% increase in peripheral resistance, and no changes in EKG except for a tendency to bradycardia. Changes in external respiratory functions were within normal physiological limits, except for a tendency toward slowing in the rate of forced inhalation. M.W.R.

N66-19271* National Aeronautics and Space Administration, Washington, D. C.
EFFECT ON THE HUMAN ORGANISM OF PROLONGED CONFINEMENT IN A SMALL HERMETICALLY SEALED CHAMBER
N. A. Agadzhanyan, Yu. P. Bizin, G. P. Doronin, Ye. A. Il'in, A. G. Kuznetsov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 26–37 refs (See N66-19266 09-04) CFSTI: HC $.50/MF $3.25

Literature from the United States and the U.S.S.R. is surveyed for information dealing with the confinement of men in pressure chambers, and it is concluded that individuals respond differently to the monotony caused by prolonged isolation in small sealed areas. The need to create a stimulating atmosphere is stressed. Results of one experiment indicate that work capability can be maintained during 30 days of confinement, even though many physiological reactions are noted. Experiments also show that prolonged restricted mobility and decreased flow of external strimuli markedly reduce the lability of nerve cells of the cerbral cortex and change the relations between fundamental nervous processes in the firection of inhibition. Functional tests inoicate a considerable decrease in adaptability of body mechanisms to physical exertion, and a sharp increase in excitability of the blood circulatory apparatus. In an investigation of gas exchange during an isolation period, oxygen consumption decreased 32% while carbon dioxide exhalation decreased 26%. M.W.R.

N66-19272* National Aeronautics and Space Administration, Washington, D. C.
REACTION OF THE HUMAN ORGANISM TO IMPACT ACCELERATION STRESS ACTING IN VARIOUS DIRECTIONS
G. P. Mirolyubov *In its* Probl. of Space Bioo., Vol. 4 Mar. 1966 p 38–47 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Investigations indicate that the human organism can tolerate an impact acceleration of braking of considerable intensity without impairment to his working capability or the occurrence of pathological changes. A specially equipped ground-based apparatus was used, and impact acceleration stress was created by braking the cabin with different kinds of shock absorbers. Statements by the subjects involved in the experiment indicate that longitudinal shocks were felt more severely than lateral ones. Impact acceleration exerted on the subjects' heads was greater than that recorded for the chair. There were no significant deviations in the functioning of individual organs or systems 15 to 20 minutes after landing. It is noted that arterial pressure takes longer to return to normal than does pulse rate. M.W.R.

N66-19273* National Aeronautics and Space Administration, Washington, D. C.
THE PROBLEM OF FUNCTIONAL CHARACTERISTICS AND INTERACTION OF THE OTOLITHIC AND CUPULAR PORTIONS OF THE VESTIBULAR APPARATUS UNDER CONDITIONS OF ALTERED GRAVITY
Ye. M. Yuganov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 48–63 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Special features of the vestibular apparatus were studied during conditions of altered gravity in order to investigate excitability during increased and lowered weight conditions. Investigations of the otoliths indicate that the duration of postrotational nystagmus decreases during weightlessness. All the subjects stated that rotation was easier to undergo during weightlessness than on the ground. Analysis of data indicates that excitation threshold of the vestibular apparatus is greater during weightlessness than on the ground. When a caloric test was conducted 20 minutes before rotation and during the third minute of acceleration, the duration of caloric nystagmus during acceleration increased considerably over those values recorded prior to the test. It is concluded that weightlessness does not produce a functional disconnection in the otolithic apparatus and that centrifugal forces induce nystagmic reaction. The strength and character of this reaction are determined not only by the magnitude of acceleration but also the type of changes which occur. It is shown that stimulation of the otoliths can produce both inhibition and activation of the nystagmic reaction. M.W.R.

N66-19274* National Aeronautics and Space Administration, Washington, D. C.
THE PROBLEM OF HUMAN RESISTANCE TO SHORT-TERM ANGULAR ACCELERATIONS OF LARGE MAGNITUDES
V. M. Tardov, B. V. Ustyushin, and S. F. Orlov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 64–67 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

The effect of angular accelerations of short duration and large magnitudes is studied on six healthy male subjects rotated about the longitudinal axes of their bodies. No nystagmus resulted from ±30 to ±90 units/sec^2, but more prolonged accelerations of 0.3 to 0.5 units-sec^2 at 17 to 32 sec produced nystagmus in every instance. Immediately after the rotating chair stopped, subjects exhibited a higher rate of cardiac contraction. Both systolic and diastolic pressures increased, although pulse pressure hardly changed. In about 20 to 30 min, systolic pressure returned to normal, while diastolic pressure, although declining, was above the pre-acceleration rate. There is an increase in respiratory rate immediately after short-duration angular acceleration, but this rate quickly returns to normal. On the basis of EEGs, it is shown that there is excitation in the central nervous system immediately after acceleration. It is concluded that the human responses to short-term angular acceleration are mixed in with psychological reactions. It was found that when subjects were prepared for rotation but not actually subjected to the acceleration, physiological changes of the same kind but less pronounced than for true rotation occurred. M.W.R.

N66-19275* National Aeronautics and Space Administration, Washington, D. C.

CHANGES IN SEVERAL PHYSIOLOGICAL AND BIOCHEMICAL INDICES IN MAN AFTER EXPOSURE TO SMALL CONCENTRATIONS OF CARBON MONOXIDE

V. V. Kustov, V. I. Mikhaylov, Z. I Pilipyuk, Yu. N. Tokarev, V. S. Georgiyevskiy et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 68–74 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

While minimum physiological shifts were observed in healthy young males subjected to carbon monoxide concentration of 0.011 to 0.012 mg/liter during an 8-hour experiment in a hermetically sealed chamber, there are indications that the effects were not due entirely to CO hypoxemia. Tissue effect of CO is considered a prime factor. Blood carboxyhemoglobin content was found to be only 1.5% following exposure in contrast to 0.66% before. Serum cholinesterase activity rose from 100 to 107% after CO exposure, and catalase index from 3.70 to 3.73. Prior to exposure, the eight subjects made an average of two mistakes during 10 minutes ... after exposure this rose to 5.87 errors. Efficiency of work was lowered following the exposure test M.W.R.

N66-19276* National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF ACCLIMATIZATION TO HIGH-MOUNTAIN CONDITIONS ON HUMAN RESISTANCE TO HYPOXIA

Ya. N. Salatsinskaya *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 75–81 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Thirty-eight mountain climbers were observed during a study to determine the difference between resistance of acclimatized and nonacclimatized individuals to hypoxia at high altitudes (1650 m). Amplitude and rate of respiration were recorded on a kymograph; and testing was carried out in a Krogh apparatus filled with air, with soda lime absorbing the carbon dioxide. Handwriting samples of the subjects were checked at the same time they were describing their reactions. Testing was stopped with the onset of marked cyanosis or tremor, although these phenomena did not appear in several subjects. For these, change in handwriting was the signal to stop. Climbing produced a more unfavorable reaction to hypoxia in the nonacclimatized subjects than those who were acclimatized. Resistance to hypoxia after 20 days in the mountains was found to increase in both groups by about the same amount. Change in oxygen saturation of the blood was determined by oxyhemography and showed lower saturation for the acclimatized subjects prior to ascent; during the ascent, however, both groups had equal drops. Handwriting changes during the hypoxic testing were almost identical for both groups. It is considered likely that this is due to the previous athletic training of all the subjects rather than acclimatization to mountain climbing.

N66-19277* National Aeronautics and Space Administration, Washington, D. C.

INVESTIGATION OF THE TRANSMISSION CAPACITY OF THE HUMAN VISUAL SYSTEM

A. A. Nevskaya *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 82–95 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Information transmission capacity (ITC) of the visual system was determined by the rate at which a human being perceives images whose information content is known, with the evaluation confined to the shape of silhouetted objects and geometric designs. With short display times, subjects did not always identify patterns correctly. When subjects were trained to recognize a limited collection of patterns, identification time diminished. When viewing time was long, it was found that observers recognized all patterns without error. Results indicate that pattern recognition is determined not only by the properties of a concrete given object, but also by the entire combination of visual models comprising the group. The ITC concept is found to be inapplicable to some systems, as in the case of recognition of very simple configurations. The ITC of the visual system is found to drop with decrease in dimensions of the patterns shown, but most of this is attributed to a corresponding decrease in line thickness. Up to a certain threshold, brightness and screening do not affect ITC; there is a sharp drop in both when the threshold is reached. M.W.R.

N66-19278* National Aeronautics and Space Administration, Washington, D. C.

PECULIARITIES OF HUMAN AUDITORY SENSITIVITY UNDER CONDITIONS OF CONTINUOUS AND PROLONGED MEDIUM INTENSITY NOISE

Yu V. Krylov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 96–100 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Results of auditory sensitivity tests are presented for eight subjects exposed to noise in a free acoustic field while they remained in a small sealed chamber for between 27 and 60 days. Maximum noise intensity was 60 to 65 db at frequencies of 800 to 1800 cps, and auditory thresholds were investigated at frequencies from 125 to 8000 cps. Threshold changes are divided into three stages, with the maximum increase in auditory threshold occurring during the first stage, particularly on the first day of the experiment. In the next four or five days there is a threshold drop. The second stage, which encompasses the major part of the experiment, or 23 to 24 days in the 30-day tests, is characterized by considerable stability of auditory sensitivity. During the last days of the experiment, termed the third stage, there is a lowering of auditory thresholds, which may be related to the subjects' anticipating the end of the experiment. Restoration of auditory sensitivity occurs 15 to 20 minutes following cessation of noise, and repeated testing for several months following the experiment showed the subjects to have fully regained their auditory functions. M.W.R.

N66-19279* National Aeronautics and Space Administration, Washington, D. C.

SOME DATA ON THE ANIMAL LINK IN A CLOSED ECOLOGICAL SYSTEM

I. A. Abakumova, K. S. Akhlebininskiy, V. P. Bychkov, N. G. Demochkina, Yu. I. Kondrat'yev et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 101–112 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Chickens and ducks are considered to be the most suitable animals for inclusion in space flights because of the ease in incubating eggs, relative weight of offspring, good supply of

protein which will result, and general feeding problems inherent to a closed ecological system. Various tables summarize data related to the turnover of flocks of chickens and ducks in terms of animal protein supply for a cosmonaut, as well as oxygen requirements and carbon dioxide release for various age fowl. Calculations indicate that while chickens require less feed to produce similar quantities of nutrients, they require more oxygen and release more carbon dioxide than ducks. Ducks can eat a large quantity of green fodder, such as chlorella and haulm, and they mature more quickly than chickens.
M.W.R.

N66-19280* National Aeronautics and Space Administration, Washington, D. C.
PROSPECTS FOR PHARMACOLOGICAL PROTECTION FROM RADIATION INJURY DURING SPACEFLIGHT
P. P. Saksonov, V. V. Antipov, N. N. Dobrov, V. S. Shashkov, V. A. Kozlov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 113–120 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

A general review is presented of possibilities for pharmacological protection from radiation injury during space flights. The possibility of increasing the resistance of biological objects to the injurious effects of ionizing radiation has been demonstrated in principle, and experiments are now necessary to study chemical radioprotective properties under conditions which simulate the hazards of flight. M.W.R.

N66-19281* National Aeronautics and Space Administration, Washington, D. C.
BIOLOGICAL EVALUATION OF RADIATION CONDITIONS ON AN EARTH–MOON TRAJECTORY
Yu. M. Volynkin, V. V. Antipov, V. A. Guda, M. D. Nikitin, and P. P. Saksonov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 121–132 refs Presented at the 15th Intern. Astronautic Congr., Warsaw, 7–12 Oct. 1964 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

An examination is made of the radiation picture in peri-terrestrial space to determine the danger from ionizing particles which man might encounter in his flight trajectory from Earth to Moon. Primary cosmic rays are considered, and the daily dose of these rays in outer space is tabulated for different groups of particles. Total dosages received by Soviet cosmonauts during Vostok flights are also given. Ionizing irradiations of the Earth's radiation belts are considered, as are chromospheric flares on the sun. On the basis of measurements of radiations, it is concluded that a protection of 1–2 g/cm^2 would be adequate for space crew members for a two-week flight during a period of quiet solar activity. With the threat from protons of solar flares it would be desirable to increase physical protection to 3 g/cm^2. M.W.R.

N66-19282* National Aeronautics and Space Administration, Washington, D. C.
ANTIRADIATION PROTECTION IN CONNECTION WITH THE PROBLEM OF THE RELATIVE BIOLOGICAL EFFECTIVENESS OF RADIATIONS WITH LOW SPECIFIC IONIZATIONS
S. P. Yarmonenko and A. G. Konoplyannikov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 133–162 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

The relative biological effectiveness (RBE) of hard radiations of electromagnetic nature is discussed, and a table summarizes data for X-rays and gamma radiations. Standard and comparable radiation are given, with the type of rays and linear energy loss (LEL) for each. Analysis of these findings indicates a decrease in RBE occurring with a decrease in LEL. The RBEs are also tabulated for protons, deuterons, and high energy alpha particles with a low LEL; and the same general patterns are found as for radiations with low specific ionization. Aminothiol and indolyl alkylamine derivatives are shown to be the most effective protectors against proton, gamma, and X-rays. Results of experiments involving the use of modifying agents at the cellular and organismic levels confirm the fact that LEL value plays an important part in the radiobiological effects of ionizing radiations, regardless of their physical nature. Effectiveness of protection against irradiation of haploid and diploid yeast cells is tabulated for a great many agents, and comparative effectiveness is shown in experiments with mice. M.W.R.

N66-19283* National Aeronautics and Space Administration, Washington, D. C.
NEW ASPECTS OF PERSONAL HYGIENE
V. V. Levashov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 163–165 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Hygienic maintenance of the body during space flight conditions is discussed in general terms, and the need for more scientific research to develop definitive procedures is stressed. Development of personal hygiene measures should include a variety of maintenance and precautionary procedures. M.W.R.

N66-19284* National Aeronautics and Space Administration, Washington, D. C.
SOME ASPECTS OF HUMAN ECOLOGY IN CLOSED SYSTEMS WITH RECIRCULATION OF SUBSTANCES
Ye. Ya. Shepelev *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 166–175 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Consideration is given to some of the problems that are inherent to the maintenace of heman activity in closed systems with biological recirculation of substances. Examples are cited which show that human ecology in closed systems can be successfully developed as a general biological discipline only through coordinated efforts which consider each part of the system. Traditional approaches are considered inadequate, and it is suggested that lengthening the daily activity cycle of man be considered for space flights. M.W.R.

N66-19285* National Aeronautics and Space Administration, Washington, D. C.
HYGIENIC INVESTIGATIONS OF COSMONAUT CLOTHING DESIGNED FOR WEAR IN SMALL-SIZED CABIN UNDER SHIRT-SLEEVE MICROCLIMATE CONDITIONS
I. G. Popov, V. I. Krichagin, V. V. Borshchenko, and F. K. Savinich *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 176–184 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Experiments reveal that clothing worn for as long as 30 days without any hygienic treatment has no appreciable effect on the skin. The observed disorders, such as rashes and thin-layer sloughing of the skin on the feet, did not interfere with the efficiency of the subjects or prevent them from carrying out a testing program. Distribution of chlorides between skin and clothing was determined following exposure for 10 and30 days in a heat chamber. Contamination of skin and clothing was relatively small, and determined to a large extent by individual peculiarities of perspiration. The tested clothing showed a high capacity for absorbing chlorides and organic substances; a fabric of 75% cotton-25% rayon showed the highest absorption, while wool showed the least. Wool clothing was shown to have the most unfavorable effects in terms of skin irritation, perspiration, and heat sensation when subjects were exposed to heat. Some attention was given to clothing design. M.W.R.

N66-19286* National Aeronautics and Space Administration, Washington, D. C.

THEORETICAL BASIS FOR THE MICROATMOSPHERE OF INTERPLANETARY SPACECRAFT CABINS AND PROSPECTS OF USING HELIUM-OXYGEN MIXTURES FOR THIS PURPOSE

B. M. Savin *In its* Probl. of Space Biol., Vol. 4 May 1966 p 185–191 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Helium is shown to be a suitable replacement for nitrogen in the microatmosphere of spacecraft cabins. This change does not produce any deliterious effect on the organism or cause any marked changes in physiological processes, although the zone of temperature comfort is about 3–3.5° higher than in ordinary air. It is felt that the low specific gravity of helium should promote a smaller energy expenditure when breathing as well as reduce the amount of energy consumed in circulating the gas mixture through the air conditioning system. The other obvious advantages of helium is that it is more inert and does not form any toxic compounds, it should help reduce the time in going through the airlocks in emerging through space, and it has more heat conductivity than nitrogen. Experimental findings are presented for chicks, mice, and a dog. M.W.R.

N66-19287* National Aeronautics and Space Administration, Washington, D. C.

CYBERNETICS AND SPACE BIOLOGY

N. A. Chekhonadskiy *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 192–200 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Mathematical simulation, biological control, and statistical dynamics are considered in connection with the applications of cybernetics to space biology and medicine. A model for the otolith apparatus, which explains functions of the organ as well as processes of information conversion in the neurons of the reticular formation, is discussed. A problem is described to explain the process which takes place in the human organism due to a radial G-force, and resulting values of permissible G-force action time correlate well with experimental values. Applications of automatic control theory to space biology and medicine are discussed, and the degree of dynamic stability of a spacecraft system is considered in terms of controlling the vegetative functions of man. M.W.R.

N66-19288* National Aeronautics and Space Administration, Washington, D. C.

APPLICATION OF SOME OF THE CONCEPTS OF INFORMATION THEORY TO THE ANALYSIS OF PHYSIOLOGICAL DATA OBTAINED DURING SPACEFLIGHTS

A. D. Yegorov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 201–212 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Cardiac contraction, respiration, and pulse rates obtained during space flights are analyzed in terms of information theory concepts. Since the physiological systems of the organism contain some degree of indeterminacy, a quantitative determination is made. The degree of indeterminacy is shown to be dependent upon the number of possible intervals within which the physiological indicators can lie and on the probability with which they appear in any of these intervals. Entropy is the measure of indeterminancy in information theory; and the physiological interpretation of entropy as a measure of indeterminacy is shown to be very similar to dispersion as a measure of unsteadiness. By information theory it is shown that the entropy of a combined system of random quantities is equal to the entropy of one of its component parts plus the apparent entropy of the second part with respect to the first. Interrelation between random quantities and the zero hypothesis is also discussed. M.W.R.

N66-19289* National Aeronautics and Space Administration, Washington, D. C.

THE POSSIBILITY OF UTILIZING ELECTRONIC LOGIC CIRCUITS FOR AUTOMATIC MEDICAL MONITORING

V. Ya. Kostikova, R. M. Bayevskiy, A. P. Kalinovskiy, and B. A. Soshin *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 213–221 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Technical aspects of the use of electronic logic circuits are considered for automatic monitoring in space biology and medicine. Block designs are presented for a system for analyzing discrete indicators and another for continuously flowing indicators. Details of the analyzer for continuous indicators are shown. A logic circuit consisting of a diode matrix is diagramed, as is an electronic logic circuit for automatic medical control. M.W.R.

N66-19290* National Aeronautics and Space Administration, Washington, D. C.

SOME PHYSIOLOGICAL DATA FOR EVALUATING THE CONDITION AND WORK CAPACITY OF COSMONAUTS IN ORBITAL FLIGHT

A. D. Voskresenskiy, O. G. Gazenko, G. V. Izosimov, V. I. Kopanev, D. G. Maksimov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 222–230 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Data from electroencephapalograms, galvanocutaneous reactions, and electrooculographs are found to reflect the physical and psychoemotional condition of cosmonauts subjected to prolonged space flights. Both EEG changes and the sharp reduction in oculomotor activity serve as warnings of approaching fatigue, but it is emphasized that such changes observed during space travel are not accompanied by subjective feelings of approaching fatigue, vestibular system impairment, or noticeable decrease in work capability. Sample EEG recordings and average number of galvanocutaneous reactions are given for cosmonauts Bykovskiy and Tereshkova, and nystagmic ocular movements are illustrated for the latter. M.W.R.

N66-19291* National Aeronautics and Space Administration, Washington, D. C.

SOME RESULTS OF BIOMEDICAL INVESTIGATIONS CONDUCTED DURING THE TRAINING PERIOD AND FLIGHTS OF V. F. BYKOVSKIY AND V. V. TERESHKOVA

V. I. Yazdovskiy, M. D. Yemel'yanov, P. V. Vasil'yev, and V. I. Kopanev *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 231–238 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Results are presented for physiological investigations conducted during the training and actual flight of Cosmonauts Bykovskiy and Tereskova. Increase in the pulse and respiratory rates and shortening of the intervals of the EKG and seismogram are reported for the prelaunch period, when the spacecraft went into orbit, and during descent to Earth. During the orbital portion, Bykovskiy exhibited gradual normalization of the pulse and respiratory rates, lengthening of the EKG, and intensified bioelectric activity of the cerebral cortex; and low frequency oscillations were noted for Tereshkova. Work capacity during weightlessness is considered to have remained at a fairly high level. Biomedical methods and tests used during investigations on Earth, in aircraft, and in spacecraft are discussed; along with radiation safety, microclimate in the spacecraft cabin, and training and feeding of cosmonauts. M.W.R.

N66-19292* National Aeronautics and Space Administration, Washington, D. C.

RESULTS OF BIOLOGICAL INVESTIGATIONS CONDUCTED DURING FLIGHTS OF "VOSTOK" TYPE VEHICLES WITH THE PARTICIPATION OF COSMONAUTS A. G. NIKOLAYEV, P. R. POPOVICH, AND V. F. BYKOVSKIY

V. V. Antipov, N. L. Delone, G. P. Parfenov, and V. G. Vysotskiy *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 239–251 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Results are presented for experiments dealing with the reproductive processes in Drosophila melanogaster under conditions of weightlessness, and the study of space flight factors which affect the hereditary structure in Tradescantia paludosa. The hypothesis is advanced that chromosome rearrangements result from dynamic factors occurring during lift-off and descent of the spacecraft, and that weightlessness does not cause such rearrangements. The data do not eliminate, however, the possibility that weightlessness may cause disruptions of the mitotic mechanism. Also observed were the formation of excrescences in cells, giant cells, and disrupted synchrony of microspore development, but the individual flight factors causing these cannot be determined. Experiments with the flies indicated that breeding time was increased from the usual nine to 15 days for eggs laid during weightlessness. More females were hatched than males, and several ideas are advanced to explain this, including space travel affects the y-chromosomes' utility, a loss of y-chromosomes during meiosis, or that the female larvae were more fit. M.W.R.

N66-19293* National Aeronautics and Space Administration, Washington, D. C.

RESULTS OF MICROBIOLOGICAL AND CYTOLOGICAL INVESTIGATIONS CONDUCTED DURING THE FLIGHTS OF "VOSTOK" TYPE VEHICLES

N. N. Zhukov-Verezhnikov, N. I. Rybakov, V. A. Kozlov, P. P. Saksonov, N. N. Dobrov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 252–259 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

The combined action of irradiation and vibration appears to have had a genetic effect on lysogenic bacteria exposed during Vostok space flights. Vibration seems to increase the sensitivity of these bacteria to cosmic radiation. Weightlessness, in combination with ionizing radiation, may be another source of genetic change. Experiments indicate that the number of phage-producing cells in Escherichia coli increases with exposure to factors peculiar to space flights. It was also found that reexposed human cell cultures of HeLa strains on Vostoks 4 and 6 had a longer latent period for restoration of growth capability than did cells exposed to one space flight or those used as laboratory controls. M.W.R.

N66-19294* National Aeronautics and Space Administration, Washington, D. C.

REACTIONS OF COSMONAUTS TO WEIGHTLESSNESS

I. I. Kas'yan, V. I. Kopanev, and V. I. Yazdovskiy *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 260–277 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Physiological reactions of five cosmonauts are analyzed following brief exposure to weightlessness during aircraft flights along Kepler's parabola as well as after the prolonged weightlessness experienced during Vostok flights. Insignificant differences were noted between motor activity performance during the brief exposures and on Earth. Pulse rates generally increased and cardiac rates decreased, although there was much individual difference noted. Arterial pressure increased during horizontal flight and decreased during weightlessness. Respiratory rate remained almost unchanged in three of the cosmonauts, and increased slightly in the other two. During the actual spaceflights, results obtained appear to be due to both nervous-emotional strain and to weightlessness. The experimental data suggest that there is no significant impairment from weightlessness of between three and five days, except for decrease in cardiac rate, greater variability in physiological indices, and slow return of some of these indices to original values following exposure to weightlessness. M.W.R.

N66-19295* National Aeronautics and Space Administration, Washington, D. C.

SOME NATURAL IMMUNITY FACTORS AND COSMONAUT AUTOFLORA DURING THE TRAINING PERIOD AND FOLLOWING THE FLIGHTS OF "VOSTOK," "VOSTOK 2," "VOSTOK 3," AND "VOSTOK 4"

O. G. Alekseyeva *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 278–289 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Three groups of immunological tests were undertaken to determine the antimicrobial functions of the body and the nature of cosmonaut autoflora during training and Vostok flights. Studies were made of the bactericidal properties of the saliva, skin, and plasma; phagocytic functions of the neutrophils *in vitro* and oral mucosa *in vivo*; and the microflora of the pharynx and of the surface and deep layers of skin. Most of the experiments were conducted in the morning. Immunological changes were found to be transient and, for all practical purposes, insignificant because there was no indication of weakening the cosmonauts' resistance to microbes. Changes were much less pronounced for the cosmonauts undergoing the longer flights of three to four days, indicating an adaptation to flight conditions. Illustrations are included and graphs summarize the findings of the various tests. M.W.R.

N66-19296* National Aeronautics and Space Administration, Washington, D. C.

UTILIZATION OF HIGHER PLANTS AS INDICATORS OF THE EFFECTS OF ORBITAL SPACEEFLIGHT FACTORS ON THE LIVING CELL

N. L. Delone *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 290–293 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

A cytological approach was followed in studying chromosomal aberrations, changes in mitosis, and impairment of growth processes in the cells of higher plants during orbital space flights. The development of point mutations in plants such as peas, tomatoes, corn, and barley was investigated genetically by noting offspring changes in the phenotypes. Such methods are discussed in terms of their utilization as effective biodosimeters during space flights. M.W.R.

N66-19297* National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF PARTIAL RESTRAINT OF MOTOR ACTIVITIES ON BASIC PHYSIOLOGICAL PROCESSES IN MONKEYS

I. D. Bogina, N. A. Rokotova, Ye. S. Rogovenko, and R. L. Sheykin *In its* Probl. of Space Biol., Vol. 4 Mar. 1965 p 294–300 refs (see N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Stability of the basic physiological processes is observed in monkeys a few hours after they are subjected to partial restraint from a belt and a collar, both fastened to vertical bars clamped on a common base. Monkeys can move their extremities freely and easily change positions; and during prolonged fixation there is no evidence of abdominal muscle weakness or edema of the posterior extremities. Amount of food consumed during these partial restraint periods of between 10 days and four months remained high, and weight gains were observed toward the end of the experiments. Daily checks uncovered no pathological deviations. Data indicate that under conditions of partial restraint the respiration, heart beat, and brain activity of monkeys remained within normal limits. M.W.R.

N66-19298* National Aeronautics and Space Administration, Washington, D. C.

EFFECTS OF PROLONGED OPTOKINETIC STIMULATION ON THE ORGANISM

V. P. Neverov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 301–306 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Optokinetic stimulation was applied to five rabbits fixed in a special holder in a rotating cylinder with 22 black stripes, each 5 cm in width, on its inner surface. Electrooculography, based on recording changes in the corneoretinal potential (CRP) while the eyeball is in motion, was used to record eye movement. All rabbits exhibited differences in optokinetic nystagmus (OKN) amplitude and frequency. Judging from nystagmograms, OKN rhythm slowed because of nystagmic movements to groups of stripes rather than to single stripes. Further testing indicated that after prolonged optokinetic stimulation, the central nervous system, in the presence of stationary objects, conserves traces of the stimuli for a considerable time; and sometimes these traces appear in the form of delayed reverse postoptokinetic nystagmus (RPN). It is speculated that there are common nervous mechanisms for optokinetic and vestibular nystagmus. The RPN is considered tied to the prolonged circulation of a stimulus in the nerve structures in the absence of an exogenic optokinetic stimulus. M.W.R.

N66-19299* National Aeronautics and Space Administration, Washington, D. C.

THE EFFECTS OF TRANSVERSE ACCELERATIONS ON THE ORGANISM OF FEMALE MONKEYS

A. R. Kotovskaya, P. V. Vasil'yev, B. A. Lapin, S. F. Simpura, V. A. Shakhlamov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 307–316 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Studies were conducted to determine the effect of transverse accelerations on the cardiovascular, respiratory, and reproductive systems of 16 female monkeys between five and eight years of age. Vaginal smears and changes in genital epithelium were examined to determine ovarian-menstrual cycles, and accelerations were applied during the proliferative, secretory, menstruation, and ovulation periods. Fourteen monkeys were sacrificed after rotation; four intact monkeys served as controls, with one sacrificed after each acceleration stage. Breathing and pulse rate increased markedly at the beginning of rotation; and cardiac and respiratory functions became normal in most cases within 10 to 20 minutes after the centrifuge stopped. Autopsies performed on the 14 monkeys revealed gross evidence of venous plethora in the ovaries, uterus, and oviducts. Gross studies indicated morphological deviations to be dependent on the phase of the menstrual cycle, with the most traumatic effects occurring during ovulation. Changes were minimal and rare during the proliferative stage; but it is emphasized that changes were always greatest on the third day of rotation. One of the two monkeys saved later had a normal pregnancy. M.W.R.

N66-19300* National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF PROLONGED HYPOKINESIS ON HUMAN RESISTANCE TO ACCELERATIONS

A. R. Kotovskaya, L. I. Kakurin, N. I. Konnova, S. F. Simpura, and I. S. Grishina *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 317–324 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Following hypokinesis for three days (two men) and 20 days (three men), five physically fit males were transferred to a centrifuge while they were still in horizontal positions. No significant differences in ability to undergo 7-unit acceleration were noted before and after the 3-day hypokinesis. After the 20-day period, the three subjects were pale, nervous, and tense; they bore up well under 4-unit, 30-sec accelerations, but visual disorders such as blackout occurred after 7-unit acceleration. None of the 20-day men would undergo 8-unit acceleration, stating as their reasons fear of rotation and general poor feeling. In all cases the intensity of shifts in physiological reactions was noticeably greater in the 20-day men. In two cases maximum tolerance time to acceleration dropped sharply, whereas in one case it remained unaltered. There is evidence of greater stress on the compensatory adaptive mechanisms when accelerations follow prolonged hypokinesis. M.W.R.

N66-19301* National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF SMALL CORIOLIS ACCELERATIONS ON THE FUNCTIONAL STATE OF THE HUMAN HEART

R. A. Vartbaronov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 325–329 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Experimental data indicate high adaptability of the human heart to the action of vestibular stimuli in the form of prolonged exposure to small Coriolis accelerations. Changes in heart activity during cumulative Coriolis accelerations fall within normal physiological limits. For a rotation speed of 10.6°/sec, the principal effects were sympathetic in nature; while at 21.6°/sec, changes were largely parasympathetic. During functional tests at the latter rotation, the effect became sympathetic; and this is attributed to a reduction in functional capability of the heart as a result of extracardiac factors. Very small physiological deviations are observed for cardiac activity, even in the cases of clearly articulated motion sickness. The possibility of cardiac adaptation is considered in the case of prolonged exposure to small Coriolis accelerations. M.W.R.

N66-19302* National Aeronautics and Space Administration, Washington, D. C.

CHARACTER OF EEG AND WORK CAPACITY IN MAN DURING EXPOSURE TO BACK-CHEST ACCELERATIONS

A. S. Barer and V. B. Zubavin *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 330–340 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

In order to investigate human compensatory reactions to traverse accelerations, a study was made of the character of EEG alterations and the level of work capacity during exposure to back-chest accelerations. Eighteen subjects were tested on a large radius centrifuge at angles of 65, 78, and 90° to the longitudinal axis of the body. Tests were made from six to 12 G. During 65° back-chest accelerations, EEG changes appear to be of two varieties. At six and eight G, there is increased activity of fast components during the plateau period, a return of EEG to its initial level, and a relative increase of the slow components against a general rise of all EEG components. The 10 G acceleration appears to be a transition zone between the first group and the group containing 12 G accelerations and higher, where at the beginning of the plateau period there is a selective relative increase in slow rhythms against an increase in all EEG components. In the after-effect period, the slow rhythms continue to rise. The appearance of slow EEG rhythms is related to recombination shifts which lead to hindrance of blood circulation in the brain. M.W.R.

N66-19303* National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF ROTATION ON THE HUMAN ORGANISM WITH THE TRUNK INCLINED AT VARIOUS ANGLES

A. R. Mansurov and S. S. Markaryan *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 341–345 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Effects of angular accelerations on the human organism were studied at various rotation speeds and torso-inclination angles. Generally, pulse rate and respiration increased with rotation speed buildup and these rates went back to normal or below during acceleration plateaus. Systolic blood pressure usually increased, and diastole decreased. Displacement of internal organs, compression of the larynx, and difficulty in swallowing were experienced during rotations at 65, 80, and 90°. Repeated rotations in the vertical sitting position resulted in changes in X-rays of the chest, mostly evidenced by greater transparency of the lower lungs and intensification of lung shadows at or near the radix. There were enlargements of the heart and major vessels, but these and the lung shadows disappeared between five and seven days after testing. Persons who are less resistive to the effects of angular accelerations experience considerable changes in the contractive function of the heart following rotation; and this is accompanied by heart enlargement and slowed pulse rate. There is a good deal of variation among individuals from exposure to angular accelerations. M.W.R.

N66-19304* National Aeronautics and Space Administration, Washington, D. C.

THE NATURE OF THE BIOLOGICAL EFFECT OF VIBRATION

S. N. Romanov, R. A. Romanova, and Z. I. Monastyrshina *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 346–350 refs (See N66-19266 09-04) CFSTI: HC $6.00/MF $3.25

Both *in situ* and *in vitro* tests were conducted on white mice exposed to 30-minute period of vibration at a 2-mm amplitude. The *in situ* tests were at frequencies from 25 to 75 cps, with the tissues stained by an intravenous solution of neutral red prior to vibration. For the *in vitro* tests at 25 cps frequency, organs were stained after their removal from the mice. For both types of tests, the various organs display different degrees of sensitivity to vibration. The extent of reactive changes in the cells appears to be related to the various vibration parameters, especially frequency. It is concluded that all cells in the organism are capable of sensing vibration effects. M.W.R.

N66-19305* National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF COMBINED EXPOSURE TO ACCELERATION, VIBRATION AND RADIATION ON BONE MARROW CELL NUCLEI IN MICE

M. A. Arsen'yeva, L. A. Belyayeva, and A. V. Golovkina *In its* Probl. of Space Bioo., Vol. 4 Mar. 1966 p 351–367 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Bone marrow cell nuclei in white and hybrid mice were studied following exposure to accelerations of various duration and strength and to radiation, combined with centrifugation and vibration. Accelerations of five minutes at 20 G showed a lower mitotic activity, chromosome adhesion, and increase in chromosome rearrangement frequency than 5-minute acceleration at eight G. At 15-minute accelerations, similar changes are created at both strengths, with a sharper drop in mitotic activity at 20 G. Sixty minutes after irradiation with acceleration mitotic activity of bone marrow cells is low, but a rise follows which is substantially less for the combined tests than for X-irradiation by itself. Reduced radiation effects are evidenced when the mice are subjected to prior centrifugation or vibration, caused by a reduction of true chromosome-rearrangement frequency. It is considered possible that chromosome adhesion in some way induces healing of ruptures created by radiation. At any rate, it is indicated that various physiological changes, produced by the action of acceleration or vibration, bring about aberrations in cell division which give rise to a protective effect against radiation. M.W.R.

N66-19306* National Aeronautics and Space Administration, Washington, D. C.

ADAPTATIONAL READJUSTMENTS IN THE ORGANISM OF MICE DURING AND AFTER EXPOSURE TO ELEVATED CO_2 CONCENTRATIONS

A. I. Koreshkin *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 368–377 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Various experiments are reviewed relating to the exposure of mice to narcotic concentrations of carbon dioxide. Data on changes in the reaction of the respiratory system and motor apparatus in the course of 48-hour exposure to CO_2 showed a marked increase in breathing throughout as well as reduction in motor activity. While gas exchange experiments did not produce statistically significant results, there was a tendency to increase respiration in the first hours following exposure to 7.5% CO_2. This was followed by a drop in both oxygen consumption and CO_2 excretion. It is concluded mice adapt to the new environment as they build up increased resistance and decreased susceptibility to CO_2 during the first two days of exposure. A weakening of the adaptive condition occurs several days after exposure cessation. The present findings are considered in keeping with other studies which indicate that reorganization of the enzyme system and compensation for disturbances in acid–alkali equilibrium require long periods of time. M.W.R.

N66-19307* National Aeronautics and Space Administration, Washington, D. C.

INJURIOUS EFFECT OF 660 AND 120 MeV PROTONS AND THE EFFICACY OF PHARMACOLOGICAL AND CHEMICAL PROTECTION

V. S. Shashkov and V. S. Morozov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 378–387 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Agents which provide protection against gamma radiation and X-rays retain their effectiveness against high energy proton radiation. Relative biological effectiveness (RBE) for mice exposed to 120 and 660 MeV protons is no greater than one when compared with electromagnetic radiation. Data are presented for the following preparations, introduced intra-abdominally 10 to 15 minutes prior to radiation: cysteamine, AET, serotonin, 5-methoxytryptamine, tryptamine, and 5-oxytryptophan. While survival in the control group was 1.7% for 660 MeV protons and 3.3% for 120 MeV protons, survival rates 30 days after exposure were as high as 81.2% with pharmacochemical protection. Although the results obtained are not consistent, they do indicate the need for further search on chemical protective agents. M.W.R.

N66-19308* National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF SCREENING INDIVIDUAL PARTS OF THE BODY OF ANIMALS ON CHANGES IN RADIATION REACTION AND EXPOSURE TO GAMMA RAYS AND HIGH-ENERGY PROTONS

B. L. Razgovorov, V. S. Morozov, V. S. Shashkov, V. V. Antipov, N. N. Dobrov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 388–404 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Data are presented concerning the influence of shielding various sectors of the body during total body irradiation of white desexed rats by gamma rays and 120 MeV protons. With 800 to 1,050 rad dose, rate of survival was not increased by head shielding whereas abdomen shielding gave increased survival by 50%. Caution is suggested in interpreting these results which do not agree with previously obtained data. For gamma rays at 930 rad, increases in survival of 30, 44.8 and 88.3%, respectively, were noted from shielding the head, both

haunches, and abdomen. In other experiments, shielding the abdomen with an organic glass block 6 cm wide during 800 to 1,050 rad proton irradiation raised the survival rate of rats to 86.4% as compared to 19.4% in the control group. A 4 cm block lowered survival to 77.8%, and a 2 cm block gave a survival rate of only 50%. Similar results were attributed to shield widths tested for 1,100 to 1,300 rad proton doses and 930, 1,100, and 1,400 rad gamma rays. Abdominal shielding is found to decrease weight losses in the animals. M.W.R.

N66-19309* National Aeronautics and Space Administration, Washington, D. C.

MORPHOLOGICAL CHANGES IN THE HEMATOPOIETIC ORGANS OF MICE IRRADIATED WITH HIGH-ENERGY PROTONS

N. A. Gaydamakin, V. G. Petrukhin, V. S. Shashkov, V. V. Antipov, and P. P. Saksonov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 405–411 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Three groups of adult male mice, with 30 in each, were studied to determine pathomorphological changes in the spleen and thymus following exposure to protons and gamma rays as compared to a control group which received no radiation. A statistically significant decrease in weight coefficients of the spleen and thymus is evidenced on the third day in proton-irradiated mice; for the spleen there is a continued decrease evidenced on the 7th day, but an increase follows so that at 60 days the weight coefficient is greater than in the control group. A more gradual increase is noted for the thymus, and again the weight coefficient on the 60th day is greater for the proton-irradiated group than the control animals. Differences between weight coefficients for the proton and gamma groups are considered statistically insignificant, but all changes were less pronounced following 830 rad proton dosages than after the 650 r gamma ray exposures. Although less pronounced than after gamma irradiation, the initial destruction of bone marrow in the proton-irradiated animals does not show clear signs of restoration until the 7th day. At this point, restoration signs in the gamma-irradiated animals are barely visible. M.W.R.

N66-19310* National Aeronautics and Space Administration, Washington, D. C.

RESISTANCE OF RATS TO SEVERE OXYGEN DEFICIENCY DURING RADIATION SICKNESS

S. V. Gasteva, K. P. Ivanov, and D. A. Chetverikov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 412–418 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Acute radiation sickness, manifested by marked gastrointestinal disturbances, resulted three days after male white rats weighing 200 to 250 g were subjected to whole body X-irradiation with 750 r. By the end of the fourth day only 30% of the 178 irradiated animals were alive. Rat resistance to acute hypoxia increased within six hours after irradiation. Peak resistance occurred 72 hours after exposure, apparently due to the decrease in intensity of the metabolic processes of the sick organisms as well as to slight hypothermia and the diminishing rate of gas exchange in the animals. Resistance to hypoxia decreased 96 hours after exposure, and is attributed to impairment in all vital functions and general weakening of the animals. At the earlier stages of radiation sickness, hypoxia resistance may possibly be caused by increased resistance to the ionizing radiation. It is concluded that ionizing radiations of the doses used in this experiment do not injure the tissue oxidative systems, since a comparatively constant rate of gas exchange and body temperature was found for the irradiated animals throughout the experiment. M.W.R.

N66-19311* National Aeronautics and Space Administration, Washington, D.C.

NEW WAYS OF STUDYING CHEMICAL PROTECTION AGAINST GENETIC CHANGES

N. N. Zhukov-Verezhnikov, M. N. Volkov, N. I. Rybakov, P. P. Saksonov, V. A. Kozlov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 419–424 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Chemical compounds of the aminothiol group and analogs of pyrimidine bases were analyzed for prophylactic properties against genetic damage to lysogenic bacteria caused by X-irradiation. An evaluation was made of the induced phage particle formation in irradiated specimens of Escherichia coli treated with the various chemicals in contrast to phage production in an untreated specimen. Beta-mercaptopropylamine was found to be most effective in inhibiting phage growth; it was found that phage production was 119 times greater in the control specimen. It is suggested that additional protection could be obtained from this compound by use of other acids to form salt compounds. Compounds in which the first hydrosulfide group occupies a more extreme position seem to possess less effectiveness. Absence of antigenetic action was found in 3-beta-aminoethylisothiuronium hydrobromide. M.W.R.

N66-19312* National Aeronautics and Space Administration, Washington, D.C.

SIGNIFICANCE OF THE PROCESS OF POSTRADIATION REGENERATION OF GENETIC STRUCTURES FOR THE RADIOSENSITIVITY OF CELLS. COMMUNICATION 1: QUANTITATIVE LAWS OF POST RADIATION RESTORATION OF YEAST CELLS

V. S. Barsukov, O. V. Malinovskiy, and N. M. Mityushova *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 425–433 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

In order to investigate genetic injuries due to radiation and the degree to which radiation damage to cytoplasm affects the chromosome restoration process, experiments were conducted on a tetraploid strain of Saccharomyces cerevisiae. A three-day yeast culture was irradiated with Cobalt 60 at a dose power of 1300 rad/min, with temperature held at 4° F to prevent regeneration during irradiation. The experiments indicate that radiation-genetic injuries to yeast cells of the dominant lethal type are largely reversible and are eliminated by the massive participation of cytoplasm. Restoration of genetic structures is accomplished by the entire cell functioning as a system, and the degree of radiation damage to the cytoplasm is determined by the regeneration rate of these structures. M.W.R.

N66-19313* National Aeronautics and Space Administration, Washington, D.C.

SIGNIFICANCE OF THE PROCESS OF POSTRADIATION REGENERATION OF GENETIC STRUCTURES FOR THE RADIOSENSITIVITY OF CELLS. COMMUNICATION 2: RADIOSENSITIVITY OF YEAST CELLS OF VARIOUS PLOIDY

V. S. Barsukov, O. V. Malinovskiy, and N. M. Mityushova *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 434–441 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Diploid and tetroploid strains of Saccharomyces cerevisiae yeast of two series were studied to determine if differences in the radiosensitivity of yeasts of various ploidy were due to differences in the regeneration processes. A three-day yeast culture was irradiated with Cobalt 60 at a dose power of 1300 rad/min, with temperature held at 4° F to prevent regeneration during irradiation. Tetraploid cells of the Ef series were found to be more stable than tetraploid cells of the M series, indicating that there is no immediate relationship between radiosensitivity and ploidy. Survival rate appears to be practically independent of ploidy and the number of primary cells injuries. The intensity of the regeneration process appears to depend

chiefly on the degree of radiation damage to the cytoplasm which promotes the restoration. The present data, along with those obtained for mammalian cells, indicate that the fate of an irradiated organism is determined mainly by regenerated cells rather than cells which have avoided radiation. M.W.R.

N66-19314* National Aeronautics and Space Administration, Washington, D. C.

ELIMINATION OF INJURIOUS EFFECTS OF BETA RADIATION ON SEEDS OF CULTIVATED PLANTS BY MEANS OF PHYSIOLOGICALLY ACTIVE COMPOUNDS

Yu. I. Shaydarov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 442–446 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Various protective agents were used on irradiated samples of corn, lupine, turnips, and winter wheat to determine if effects from large doses of beta radiation of phosphorus 32 could be eliminated from the seeds produced by the exposed plants. Experimental data indicate harmful results in the second generation for winter wheat, with an 18% decrease in weight of the grain. When compound P-46 (a pyridyl-naphthoquinone-sulfanilamide) was used in combination with P^{32}, this weight decrease was eliminated. Treating corn seeds with radioactive phosphorus reduces the weight of the foliage, but this is increased with the addition of P-46, as well as by 4,4-di-trichloro-acetyl-diaminophenyl sulfone, 2-ketononanoic acid, and a cultural fluid of antibiotics. Soaking seeds with these compounds without P^{32} exposure generally yields higher foliage than when the seeds are treated in water solution. Lupine was found to be less responsive than corn to both the ionizing radiation and the chemical compounds. Treatment of turnip seeds had virtually no effect on the yield of roots and tops. M.W.R.

N66-19315* National Aeronautics and Space Administration, Washington, D. C.

ULTRAVIOLET IRRADIATION OF PLANTS AS A PROBLEM IN SPACE PHOTOPHYSIOLOGY

A. A. Shakhov, S. V. Shishchenko, S. A. Stanko, V. S. Shaydurov, and B. M. Golubkova *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 447–458 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

An investigation was made of the effects of ultraviolet radiation on photosynthesis as related to space physiology of plants in a closed ecological system. Data are tabulated for pigment content in leaves, following radiation exposure of about 10 $\mu V/cm^2$, of samples of fodder cabbage, beet, turnip, pea, bean, and barley. Chlorophyll content as well as carotin, lutein, violaxanthin, and carotenoid totals are presented. Spectral properties of various plants and photosynthesis measurements are also included. Data indicate that the chloroplasts and pigments in some plants are quite resistant to ultraviolet dosages, and that short wave ultraviolet at certain levels stimulates biosynthesis of pigments. Measurements in wild plants growing at 5000 m above sea level indicate that photosynthesis proceeds within the usual normal limits for certain plants and is higher for others. M.W.R.

N66-19316* National Aeronautics and Space Administration, Washington, D. C.

VOLUNTARY CHOICE BY ANIMALS OF GAS MEDIA WITH VARIOUS OXYGEN CONTENTS UNDER NORMAL CONDITIONS AND AFTER EXPOSURE TO A HYPEROXIC ATMOSPHERE

I. S. Breslav *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 459–463 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Preferences of mice for atmospheres containing various amounts of oxygen were investigated following their exposure to a hyperoxic medium for from six to 10 days, and a comparison was made of choices of mice taken for a normal atmosphere. The previously unexposed mice showed a negative preference for a 60% oxygen atmosphere and even less preference for a 90% atmosphere. Preferences were determined by the relative positions of the mice in the chambers with increased oxygen. The animals previously exposed for six to eight days showed a definite preference for the higher oxygen content, whereas after 10 days in a 60% oxygen medium the mice showed a weak negative response to the increased oxygen. Three days after the mice were transferred to an air environment, there was evidence that the exposed group required less oxygen than the control group. It is concluded that while these findings may be related to metabolic changes or to a decrease in excitability of central nervous system functions, further investigations are needed. M.W.R.

N66-19317* National Aeronautics and Space Administration, Washington, D. C.

EFFECTS OF INCREASED PARTIAL PRESSURE OF OXYGEN ON THE MORPHOLOGICAL COMPOSITION OF THE PERIPHERAL BLOOD IN ANIMALS

I. S. Breslav and A. M. Shmeleva *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 464–473 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Peripheral blood morphology was investigated in mice exposed for varying periods of time to environments with increased partial pressure of oxygen. Following exposure for 1.5 hours in pure oxygen at 2.5 atm, there was an increase in number of erythrocytes and a lesser increase in hemoglobin concentration. Three days after the experiment there was a sharp drop in hemoglobin as well as color index and reticulocyte content, but a return to normal was noted on the seventh day. Immediately after 36 hours exposure to 60% oxygen there was a slight decrease in hemoglobin and an elevation in erythrocyte count. The original values were restored in three days, but both indices decreased considerably on the seventh day. After 36-hour exposures to 90% oxygen, there was a sharp decrease in erythrocyte count, particularly reticulocytes. Hemoglobin concentration was unchanged at first, decreased three days after the exposure, and by the seventh day red cells tended to return to normal. During 10-day exposure to 60% oxygen an initial increase in indices was noted, but this was followed by a steady decrease in both erythrocyte and reticulocyte counts. By the sixth day of the experiment both hemoglobin concentration and color index increased, but the counts continued to decrease. M.W.R.

N66-19318* National Aeronautics and Space Administration, Washington, D. C.

ADAPTATION TO DIFFERENT FORMS OF HYPOXIA. COMMUNICATION 1: EFFECT OF GRADUAL AND SUDDEN HYPOXIA

V. A. Konstantinov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 474–482 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

While distinct adaptation reactions appeared in cats subjected to gradual decrease in oxygen content, a sudden change to breathing an air mixture of five to seven percent oxygen caused transient motor restlessness, respiratory disorders, and a rapid drop in blood pressure. Sudden inhalation of a gas mixture containing eight percent oxygen did not result in a respiratory standstill, but a second exposure within 15 to 25 minutes killed the animals. Experimental results indicate that sensitivity to gradual hypoxia may decrease because of sluggish compensatory mechanisms or the activation of certain emergency defense mechanisms. This adaptation appears to be unrelated to body temperature. M.W.R.

N66-19319* National Aeronautics and Space Administration, Washington, D. C.

ADAPTATION TO DIFFERENT FORMS OF HYPOXIA. COMMUNICATION 2: CHARACTERISTICS OF THE COURSE OF EXTREME HYPOXIA

V. A. Konstantinov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 483–488 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Superacute or extreme oxygen deficiency that develops immediately was investigated by giving pure nitrogen under normal pressure to 35 anesthetized cats. Following respiratory standstill, oxygen was given and artificial respiration was started. Duration of hypoxia is considered to be the interval between supplying nitrogen and starting artificial respiration. It was found that repeated oxygen deficiency occurred in a similar fashion in each of the animals, and hypoxia duration appeared to be unrelated to body temperature. Repeated exposures indicated respiratory changes and restoration periods occurring at precisely the same times in succeeding hypoxias. Changes in arterial pressure and oxygen saturation of the blood were similar. Substitution of nitrous oxide for inert nitrogen failed to change either the nature or duration of extreme hypoxia. These experiments indicate the duration of extreme hypoxia to be related to both the compensatory physiological mechanisms and the biological properties of hemoglobin and tissues capable of retaining and releasing a definite amount of oxygen. M.W.R.

N66-19320* National Aeronautics and Space Administration, Washington, D. C.

EFFECT ON CERTAIN PHYSIOLOGICAL FUNCTIONS OF PROLONGED EXPOSURE OF ANIMALS TO CONDITIONS OF AN OXYGEN-ENRICHED AIR MEDIUM

A. G. Zhironkin, I. S. Breslav, E. A. Konza, A. L. Il'nitskiy, A. D. Nozdrachev et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 489–502 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Changes in some fundamental functions in mice placed in hermetic chambers for periods of up to 10 days, were investigated in relation to the duration of exposure to an oxygen-enriched air medium and to abrupt changes in the composition of the atmospheric environment. Respiratory rhythm of mice kept in the hyperoxic environment was perceptibly slower than that of control animals; when the exposed animals were returned to an air environment, respiration accelerated but did not reach the levels of the unexposed mice. By the end of the fifth day of hyperoxic exposure, gas exchange rate for the mice began to decrease; the decrease was more marked when these mice were placed in an air environment. Histological examination indicated lowered functioning of the thyroid and decreased follicular epithelium, along with increase in resistance to hypoxia and decrease in excitability of nerve centers. These experiments indicated that breathing 63% oxygen atmospheres for 10-day periods was relatively harmless, but toward the end of exposure there were initial manifestations of pathological action of oxygen in the lungs and blood. M.W.R.

N66-19321* National Aeronautics and Space Administration, Washington, D. C.

AMMONIA AS ONE OF THE COMPONENTS OF THE AIR MEDIUM IN CLOSED COMPARTMENTS

V. I. Mikhaylov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 503–506 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

When 170 male mice were subjected to lethal concentrations of ammonia they assumed positions which would assist their breathing; exhibited body tremors, disturbed motor coordination, and clinical tonic spasms; and eventually died. Autopsy revealed pulmonary edema in a number of cases, lungs were discolored, livers became enlarged, and stomachs and intestines were distended and filled with a frothy substance. Absolute lethal concentrations of ammonia after two-hour exposure was 4.51 mg/liter, and evidence indicated that ammonia had a cumulative effect. In addition to the increase in organ weights and earlier deaths, mice exposed to high doses of ammonia exhibited decreased oxygen consumption and weight lags as compared to animals used as controls. M.W.R.

N66-19322* National Aeronautics and Space Administration, Washington, D. C.

THE PROBLEM OF THE EXCITATORY STATE OF THE EMETIC CENTER IN MOTION SICKNESS

I. D. Pestov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 507–513 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Excitability of the emetic centers of dogs at rest and at different intervals during the experimental production of motion sickness was determined by the minimal doses of apomorphine capable of inducing vomiting. Three delabyrinthed dogs failed to show external signs of motion sickness, and exhibited no patterns for changes in EKG, respiration, arterial pressure, and skin temperature. As rotational angular force and duration increased, the five dogs with intact labyrinths required decreasing doses of apomorphine to produce vomiting, although individual differences existed among the dogs. Excitation of the emetic center is accompanied by deeper breathing and acceleration of cardiac contractions. During severe vomiting EKG shows signs of myocardial hypoxia. Tachycardia is renewed and breathing becomes normal with the cessation of vomiting. In cases where vomiting is induced, pulse rate increased more than in cases where the administration of apomorphine did not induce vomiting. A temporary period of bradycardia during a sudden attack of acute tachycardia is considered symptomatic of oncoming vomiting. M.W.R.

N66-19323* National Aeronautics and Space Administration, Washington, D. C.

AN ELEMENTARY MODEL OF THE VESTIBULAR APPARATUS

O. G. Gazenko, N. A. Chekhonadskiy, A. N. Razumeyev, and B. B. Yegorov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 514–525 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

A simple model of the vestibular apparatus is developed to determine the effects of a variable gravitational field on an organism. Receptor characteristics of the otolith part of the vestibular apparatus can be determined by the model. An investigation is made of the reaction of a system consisting of a receptor and a neuron to a G-force which is a step function of time, and graphic representations of the results are presented. The presence of receptor-neuron system canals in the otolithic part of the vestibular apparatus can be explained by the model. Basic feature of this model is a summation device which compares signals arriving from the left and right utricle and from the saccule. This summator explains the nature of motion by animals and birds whose otoliths have been removed. M.W.R.

N66-19324* National Aeronautics and Space Administration, Washington, D. C.

SEMICONDUCTOR COOLER FOR SMALL ANIMALS

Yu. N. Logunov and Yu. S. Alyukhin *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 526–529 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

A semiconductor cooler to induce hypothermia in small animals employs a thermoelectric battery, a system to remove heat, and a working chamber of copper or aluminum. A selenium rectifier provides the 24 W power required by the cooler which has a working current of 25 A and a voltage drop through the battery of 0.4 V. In a series of tests on rats anesthetized at room temperature, the average cooling rate was 0.15°C per min until a rectal temperature of 27°C was reached. When hexenal in doses of 0.2 to 0.7 mg/g body weight was given the rats, cooling rate averaged 0.17°C per min. When rats were

placed in the cooler immediately after a hexenal injection of 0.9 mg/g body weight, average cooling rate increased to 0.39°C per min. In this last series, adymia was more complete and less shivering was evidenced. Since the principal obstacle to increasing the cooling rate is the persistence of thermoregulatory reactions in anesthetized animals, two experiments were conducted by cooling rats immediately after their deaths. In one case cooling rate averaged 0.39°C per min for cooling to 27°C; in the other average rate was 0.48°C per min to reach 24°C.
M.W.R.

N66-19325* National Aeronautics and Space Administration, Washington, D. C.
ELECTRICAL METHOD OF RECORDING TONGUE MOVEMENTS DURING ARTICULATION OF COSMONAUTS
Yu. I. Kuz'min *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 530–541 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

A sensor, developed to record contact between tongue and palate, was used to test responses of six human subjects during articulation of consonants. Referred to as dynamic palatography, the method was used to study speech formation mechanisms and the reception of speech by making continuous recordings of the position of the tongue. Since the noise level of the experimental recording sessions was quite low, the signals were detected automatically with considerable reliability. The application of the method had no effect on the intelligibility of the speech recorded, and the results obtained corresponded to definite articulation positions. It is considered that the significant results from such a method are not the signal combinations produced but rather the sequence of the signals. A detailed investigation of the time structure of speech signals is necessary to establish methods for automatic perception of speech.
M.W.R.

N66-19326* National Aeronautics and Space Administration, Washington, D. C.
AUTOMATIC APPARATUS FOR PRODUCING REVERSIBLE AND REGULATED HYPOTHERMIA FOR POSSIBLE USE UNDER SPACEFLIGHT CONDITIONS
Ye. V. Maystrakh, G. N. Il'yutkin, V. A. Konstantinov, I. V. Yeremenko, S. A. Krasil'nikov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 542–549 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Equipment to automatically induce and regulate hypothermia is described which uses solid state transistors and germanium diodes, and standard logic circuits of the AND, OR, NOT variety. In effect, it is shown that under conditions of hypothermia with anesthesia, control of functions by the organism is replaced to a certain extent by automatic machine control to maintain functions within assigned safe limits. Experiments conducted with 16 dogs indicated the stability of the automatic equipment. Body temperatures were cooled to assigned levels, hypothermia and narcosis were maintained for specified periods of time up to 24 hours, and the animals were automatically returned to normal. Further details of the experiment are not included.
M.W.R.

N66-19327* National Aeronautics and Space Administration, Washington, D. C.
METHOD OF RECORDING ACTION CURRENTS IN AUTOMATIC NERVES UNDER CHRONIC (CONTINUOUS) EXPERIMENTAL CONDITIONS
A. D. Nozdrachev *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 550–555 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

In order to record action currents in different parts of the autonomic nervous system for long periods of time, a method was developed to implant electrodes into the splanchnic and sinus nerves of the pre- and postganglionic branches of the caudal mesenteric ganglion. Construction of the platinum electrodes and the implantation process are detailed. The method was verified by conducting experiments with oscillograph recordings of the same nerve formations, which gave the comparable results for short-term recordings and the long-term implantations. Action currents are illustrated for a dog ten months after the implantation.
M.W.R.

N66-19328* National Aeronautics and Space Administration, Washington, D. C.
METHOD FOR RECORDING VENOUS OUTFLOW IN CEREBRAL VESSELS OF ANIMALS DURING EXPOSURE TO ACCELERATION
V. Ya. Klimovitskiy and V. F. Nikolayev *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 556–561 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

A method is developed to record the blood flow rate in large surface cerebral veins of experimental animals under conditions that simulate space flight. Heat exchange takes place through the blood vessel and one-stage heating is employed. The device consists of an audio generator, a bridge with a thermistor, and an amplifier. Heaters are connected by means of a time relay unit with two thyratrons. Experiments were conducted on rabbits under G conditions of five at the head, eight at the thorax, and 10 at the abdomen. During the first day there were four rotation periods of 30 sec each, at intervals of 20 to 30 min. Increase of venous outflow was clearly evidenced during the period of thermal cycle which took place for each rotation during the first runs of the centrifuge. Some decrease in outflow and cerebral temperature occurred during the next runs, and there were even greater drops in subsequent runs. On the second and third days of the experiment, when the rotation load was increased to 1–1.5 min, only a decrease in venous outflow was recorded. These changes are attributed to a gradual depletion of compensatory mechanisms.
M.W.R.

N66-19329* National Aeronautics and Space Administration, Washington, D. C.
COURSE AND SEQUELAE OF BODY COOLING BY CONTROLLED HYPOTHERMIA
G. N. Il'yutkin *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 562–566 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Thirteen dogs were used for a series of experiments involving manual and automatic control of hypothermia. Observations made over a period of a year following cooling, except for one dog who was subjected to six cooling exposures during a two-year period, indicated no sharp variations in body weights and temperature or peripheral blood picture. Leukocytosis and flabbiness were observed in some of the animals, but such deviations usually disappeared three to five days after hypothermia.
M.W.R.

N66-19330* National Aeronautics and Space Administration, Washington, D. C.
PROCESSING HUMAN EXCREMENT BY MEANS OF NATURALLY OCCURRING ALGAL AND BACTERIAL POPULATIONS
M. S. Rerberg, T. I. Vorob'yeva, R. I. Kuz'mina, and I. M. Barkhatova *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 567–573 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

In order to develop a method for biological treatment of human excretions to reclaim water, a preliminary study was made with a culture of protococcoid algae, chlorella vulgaris, and bacteria. There was no deterioration of the algobacterial system after extensive cultivation on human excretions for a 10-month period. Major disadvantage of the method was the

length of time required to treat a daily portion of excreta and the 1.5–2 months required to regenerate the water; and efforts were made to speed these up. These experiments were followed by 5-month investigations in a water-closed system to determine what irreversible changes accumulate and what destructive factors exist in a closed algobacterial system. It was found that mineral salts reached a saturation point, which led to pH fluctuation of the medium. Many humus-type organic substances were accumulated; while the insoluble ones could be removed, the soluble ones were responsible for the eventual destruction of the system. Physicochemical methods are suggested for the removal of such substances. Water regeneration was shown to be feasible, although additional study is necessary to make the water acceptable for drinking. M.W.R.

N66-19331* National Aeronautics and Space Administration, Washington, D. C.

PHYSIOLOGICAL INVESTIGATIONS OF SPEECH PROCESSES IN CONNECTION WITH THE PROBLEMS OF ESTABLISHING MAN–MACHINE COMMUNICATION BASED ON SPEECH

V. A. Kozhevnikov and L. A. Chistovich *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 574–582 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Development of a speech communication system between man and machine is discussed in terms of inherent problems that exist and possible approaches that can be taken. Use of palatography, the recording contacts between tongue and palate when various sounds are made, is considered as a method to study the articulation phenomenon. An artificial palate sensor is mentioned, as are speech time dynamics and recording methods. Electronic logic circuits can be used to simplify the automatic time variations in the articulation dynamics of speech. M.W.R.

N66-19332* National Aeronautics and Space Administration, Washington, D. C.

SOME METHODS FOR RECORDING AND PROCESSING INFORMATION IN INVESTIGATING THE ARTICULATORY INDICES OF SPEECH

V. S. Shuplvakov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 583–587 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Electric signals were generated by sensors developed for recording a series of functions performed by a sound-producing apparatus with a sufficient degree of accuracy. The basic device in the series of sensors was a 16 channel pen recorder. A meticulous graphical processing of the recordings was made to establish accurate amplitude-time relationships between signals arriving from different elements of the speech-producing tract, and the reception of various statistical data. A combination of articulation parameters was compared with the acoustic picture of speech pronounced during this time. Automatic time measurements were carried out, and the initial data was processed logically; thereby obtaining complex signals reflecting a whole series of speech properties, and making it possible to study the segmentation of continuously flowing speech sounds based on different combinations of articulation parameters. L.S.

N66-19333* National Aeronautics and Space Administration, Washington, D. C.

THE ROLE OF VISIBLE ARTICULATION IN SPEECH RECOGNITION

V. V. Alyakrinskiy *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 588–598 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Tests were conducted with six senior class students who had lost their hearing between the ages of 5 and 9 (i.e., when they already had command of speech). The test subjects carefully followed the articulation movements of a single speaker who pronounced 250 meaningless syllables designed to take into account all the possible sound combinations in the Russian language. In addition, in order to clarify the difference in the recognition of accented and unaccented vowels, 200 words and sound combinations consisting of two open syllables were pronounced. In half the sound combinations, the accent was on the first syllable, while in the other half it was on the second syllable. The written answers of the test subjects were used to prepare matrices which reflected the nature of the visual recognition of vowels and consonants, and the matrices were used in turn to determine the intelligibility, the amount of transmitted and received information, and the analysis of error distribution. Analysis of the results indicates that the visual recognition of speech from the observable manifestations of articulation is determined primarily by the supply of words, and their grammatic combinations which are stored in a persons memory and which are necessary for comparison with external signals. L.S.

N66-19334* National Aeronautics and Space Administration, Washington, D. C.

THE PROBLEM OF METHODS IN THE FORMATION OF MOTOR HABIT SEQUENCES BY MAN

N. A. Rokotova *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 599–608 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Experiments were conducted in which test subjects of both sexes in the age group 17 to 25 (college students) were given instructions for extinguishing a signal lamp through the correct sequence order of operating keys to a panel. The purpose of the experiment was to study the formation of habit sequences by humans. The results of the teaching experiment are tabulated and discussed. All 15 test subjects learned to reproduce the program without error. The program consisted of 20 transmissions from key to key, and on the average required 34 repetitions of the sequence. Curves showing the probability for the selection of valid and invalid combinations during the initial training period are presented. Other similar motor experiments were conducted, and the results are also discussed. L.S.

N66-19335* National Aeronautics and Space Administration, Washington, D. C.

AUTOMATIC ANALYSIS OF DIURNAL PERIODIC CHANGES IN HUMAN ELECTROENCEPHALOGRAM

D. I. Ivanov, V. B. Malkin, V. L. Popkov, Ye. O. Popova, and I. N. Chernyakov *In its* Probl. in Space Biol., Vol. 4 Mar. 1966 p 609–612 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Electroencephalogram EEG tracings were made four times daily on six healthy men between the ages of 20 and 23 (10 a.m., 5 p.m., 1 a.m., and 5 a.m.) for periods ranging from 10 to 30 days during both sleeping and non-sleeping hrs. Simultaneous recordings were made of the EKG, pneumogram, and arterial blood pressure. Frequency analyses were made of the Δ, Θ, α, and β_H rhythms (14 to 20 cps). A periodometer determined the frequency characteristics of each EEG wave, which were used to establish the number of oscillations of a specific frequency per unit of time. The distribution of waves according to frequency was used to detect frequency variations within each physiological rhythm of the EEG. The composite bioelectric intensity (EMS) of the EEG, as well as the EMS of individual biocurrent rhythms were calculated on an integrator. A total of 295 frequency spectrograms of the EEG were studied and 467 computations of EMS were made. The results are discussed further. L.S.

N66-19336* National Aeronautics and Space Administration, Washington, D. C.

EXPERIMENTAL CONFINEMENT OF FISH IN HERMETICALLY SEALED AQUARIUMS WITH AND WITHOUT CHLORELLA

L. M. Antsyshkina, N. S. Kirilenko, V. Ya. Mamontov, G. B. Mel'nikov, and F. P. Ryabov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 613–620 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Experiments in a closed ecological system consisting of Chlorella algae and fish in a hermetically sealed aquarium were conducted. Chlorella was considered solely as a source of oxygen. The aquariums were filled with fixed amounts of tap water, Chlorella in the required concentration, and previously weighed fish. The water was tested for oxygen and carbon dioxide content and the initial concentration of Chlorella, and then sealed hermetically. Throughout the course of the experiment the temperature was taken and the behavior of the fish was observed three times daily. The length of each experiment was determined by how long the fish lived. The final concentrations of oxygen, carbon dioxide and Chlorella were measured after the fish died without disturbing the hermetic seal of the aquariums. Two series of experiments were carried out. In the first series the aquarium had two compartments, one in which the fish was kept and the other in which the Chlorella was kept. Both compartments had a common air cushion through which diffusion of gases operated in both directions. The fish were thus supplied with oxygen produced by Chlorella (by photosynthesis), but were not allowed to feed on the Chlorella. In the second series of experiments the fish were kept together with Chlorella and the air cushion was absent. The algae cells provided the fish with oxygen and also served as food for them. Control aquariums were also set up. The results of the data from the investigations are presented in tables and are discussed in detail. L.S.

N66-19337* National Aeronautics and Space Administration, Washington, D. C.

VARIANT METHOD FOR DETERMINING MAXIMUM CHLORELLA PHOTOSYNTHESIS

Ye. A. Ivanov *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 621–623 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

The results of Chlorella photosynthesis experiments are processed using a value called the cell growth tempo T_p. The value is expressed by an analogy with Shmal'gauzens formula $T_p = 1/n \cdot dn/dt$, where n is the density of the cell culture (the number of cells per unit of suspension volume), and t is the time. Integration was performed to obtain the expression for the current value of the culture density, and a value q is introduced to indicate the volume of oxygen released by each cell during the time of its growth. The expression for the amount of oxygen Q produced by the suspension during time t is given in terms of cell culture density at the moment in time $t=0$, q, and V, where V is the volume of the algae suspension. The rate of release of oxygen is determined. On the basis of experimental data supplied, the value for T_p was calculated to be $3 \times 10^{-5} sec^{-1}$. The data show that in principle only one liter of Chlorella suspension is sufficient to provide a person with oxygen (560 liters per day are required). In order to attain such high productivity with a dense culture, it is necessary and sufficient to duplicate the conditions for culturing algae by making them conform to those that exist in diluted suspensions. L.S.

N66-19338* National Aeronautics and Space Administration, Washington, D. C.

SENSORS FOR AUTOMATIC MONITORING OF THE REGULATION OF PHYSIOLOGICAL PROCESSES OF PLANTS IN CLOSED SYSTEMS

V. I. Rozhdestvenskiy and V. G. Chuchkin *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 624–636 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Design schemes for sensors that automatically measure the intensity of physiological plant processes in closed systems are presented. Illustrations are given for schemes for measuring the concentration of CO_2 when computing the intensity of photosynthesis in (1) a closed volume, (2) a vessel with air flowing through it, and (3) in a vessel with controlled CO_2 concentration. In addition, a diagram is depicted for a sensor method of measuring the concentrations of K^+ ion in a food solution during the computation of its absorption intensity by the roots of the plant when the concentration of potassium ion is controlled (by varying therate at which the concentrated solution of K^+ is supplied). Other systems for automatically controlling the potassium concentration in feeding solutions with simultaneous recording of the intensity with which the ion and water are absorbed by the plant are also depicted. L.S.

N66-19339* National Aeronautics and Space Administration, Washington, D. C.

SPECIAL FEATURES OF PLANT FEEDING UNDER CONDITIONS OF AEROPONIC CULTIVATION FOR A CLOSED SYSTEM

I. V. Tsvetkova, Yu. I. Shaydarov, and V. M. Abramova *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 637–642 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

The absorption of elements in mineral plant food (from solutions consisting of mineralized human metabolites) by a plant system was studied. Also investigated is the effect on the rate of absorption of chlorine and sodium ions when the concentration of chlorides in the nutrient solution is increased. A nutrient solution was periodically and automatically sprayed in the area of a Chinese cabbage plant's root system (30 sec every 20 min) kept in a closed air space saturated with water vapors. The concentration of sodium chloride in the mineral mixture was increased from 0.02% to 2.0% (by chlorine-ion count). A control experiment where the plants were cultivated on a mineral mixture without salinization; and an experiment where the plants were raised on solutions of human waste products, adjusted for shortage of mineral nutrients were also run. Analyses of the basic mineral nutrients absorbed by the cabbage plants were made, and the tabulated data indicate that mineralized human metabolites can be used for the cultivation of higher plants, with appropriate adjustments for the shortage of mineral nutrient elements. L.S.

N66-19340* National Aeronautics and Space Administration, Washington, D. C.

CONDITIONS OF CARBON NUTRITION OF CHLORELLA IN INTENSIVE CULTURES

G. I. Meleshko and L. M. Krasotchenko *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 643–649 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Curves depicting the relationship between photosynthesis intensity in chlorella culture medium and carbon dioxide concentration in air, at several different suspension densities are presented. The experimental data and the conditions of carbon nutrition are discussed and compared with similar experiments reported in the literature on the photosynthetic saturation of chlorella in air. L.S.

N66-19341* National Aeronautics and Space Administration, Washington, D. C.

DENSE CONTINUOUS CULTIVATION OF CHLORELLA UNDER VARIOUS ILLUMINATION CONDITIONS

V. A. Batov, V. N. Belyanin, I. I. Gitel'zon, B. G. Kovrov, F. Ya. Sid'ko et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 650–653 (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

The optical illumination of chlorella algae suspensions with a high concentration of cells in a continuous intensive cultivation was determined. The tests were made with suspensions of a thermophilic strain of algae having densities of 2×10^9, 3×10^9, and 4×10^9 cells per milliliter, or 20, 30, and 40 g of dry biological mass per liter of suspension, respectively. Air with high CO_2 was blown through the culture suspension. Temperature was maintained at 35.5°C; pH=7.35 layer thickness=5 mm; and CO_2 content in air was 5%. The data were plotted. The curves show that an increase in illumination is at first followed by a rapid productivity growth of the culture medium. A point is reached where at a certain intensity of illumination the growth become insignificant, indicating that further increase in illumination is no longer conducive to a marked accretion of productivity. Distinctly different illumination levels facilitating maximum productivity were achieved for the cultivation conditions outlined above. L.S.

N66-19342* National Aeronautics and Space Administration, Washington, D. C.

UTILIZATION OF ELEMENTS OF MINERAL NUTRITION BY CHLORELLA CELLS IN INTENSIVE CULTIVATION

Ye. K. Lebedeva, G. I. Meleshko, and A. N. Shakhova *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 654–661 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Chlorella was cultivated in a Tamiy medium prepared with distilled water with 5 g KNO_3, 2.5 g $MgSO_4 \cdot 7H_2O$, and 1.25 g KH_2PO_4 per liter, 1.2 mg Fe^{+2}, and microelements which can be stabilized by the addition of 37 mg ethylenediaminetetraacetate. The chlorella suspension was cultivated in an enclosed airspace at 39°C to 40°C and with a 3% to 5% carbon dioxide concentration, and was illuminated around the clock. The increment of the biological mass by dry weight, the optical density of the suspension, the pH, and concentration of the elements in the medium were periodically determined. Nitrogen, phosphorus, magnesium, sulfur, potassium, and iron determinations were made for the chlorella biological mass. The tabulated composition data facilitated an approximate calculation of the culture medium; and indicate the manner in which the mineral nutrition elements are utilized by chlorella cells during intensive cultivation. L.S.

N66-19343* National Aeronautics and Space Administration, Washington, D. C.

CHANGES IN HEMATOCRIT INDICES AND GAS COMPOSITION OF ARTERIAL BLOOD IN WHITE RATS DURING ARTIFICIAL HYPOTHERMIA

G. D. Glod *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 662–668 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

The effectiveness of several methods of inducing artificial hypothermia in white rats of both sexes in connection with their respiration were evaluated. The oxygen and carbon dioxide composition of arterial blood samples under various degrees of hypothermia were determined; and the samples were hematocritically tested. Curves showing the change in hematocrit index, and oxygen content (with respect to body temperature) in the rats as produced by artificial hypothermia are given. The results of the investigation are discussed, and indicate that the methods used should be considered for use. The method of hypothermia under conditions of growing hypoxia was found to be most effective. L.S.

N66-19344* National Aeronautics and Space Administration, Washington, D. C.

MODEL OF RADIATION CONDITIONS ON A CIRCUMLUNAR TRAJECTORY DURING A SOLAR FLARE

Y. S. Morozov, V. S. Shashkov, B. I. Davydov, V. V. Antipov, P. P. Saksonov et al *In its* Probl. of Space Biol., Vol. 4 Mar. 1966 p 669–675 refs (See N66-19266 09-04) CFSTI: HC $6.50/MF $3.25

Model experiments were conducted on 278 white mice in a special biological unit to evaluate the biological effects of radiation produced by solar flares during spaceflight. A gamma-cobalt installation was used as the source of ionizing radiation. The exposure dosage was varied to a preset program for both solar flare and flight to moon schemes. Dose strengths vs time are shown. Under the flight to moon scheme, the animals were subjected to an acceleration effect of 20 g for 5 min before the irradiation and at the end of it. Radioprotective drug preparations were introduced into the animals before the solar flare under the flight to moon scheme, and the resulting experimental data are presented in tabular form. The tables show the survivability and lifespan of the irradiated mice under the solar flare scheme; and the protective effect of the chemicals against the irradiation under the flight to the moon scheme. L.S.

N66-19346*# California Univ., Berkeley. Lawrence Radiation Lab.

BIOLOGY AND MEDICINE, SPRING 1965 Semiannual Report

John H. Lawrence, ed. and Tove Neville [1965] 204 p refs (NASA Order R-104; Contract W-7405-ENG-48) (NASA-CR-70522, UCRL-16246) CFSTI: HC $5.00/MF $1.25 CSCL 06R

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N66-19347* California Univ., Berkeley. Lawrence Radiation Lab.

ORGAN VISUALIZATION WITH SCINTILLATION-CAMERA TECHNIQUES

Leonard R. Schaer and Hal O. Anger *In its* Biol. and Med., Spring 1965 [1965] p 36–50 refs (See N66-19346 09-04) CFSTI: HC $5.00/MF $1.25

The use of radioactive isotopes in clinical medicine has become widespread. One application is obtaining pictures of organs wherein gamma-ray- or positron-emitting isotopes have concentrated. These pictures enable one to outline functional parts of the organ, and observe anatomical irregularities that can be interpreted in the light of clinical symptoms. Described in this report is a scintillation camera. With this camera, photographs of radioactive substances can be taken *in vivo* with short exposure times compared to those necessary with conventional radioisotope scanners. Oblique and other projections of organs can be easily taken. Motion pictures can be made of dynamic processes where indicated. Representative studies of various organs, i.e., brain, thyroid, liver, kidney, bone, and bone marrow, are presented. M.R.W.

N66-19348* California Univ., Berkeley. Lawrence Radiation Lab.

RADIOSENSITIVITY OF THE VESTIBULAR APPARATUS OF THE RABBIT

Larry W. Mc Donald, Gerald A. King, and Cornelius A. Tobias *In its* Biol. and Med., Spring 1965 [1965] p 74–83 refs (See N66-19346 09-04) CFSTI: HC $5.00/MF $1.25

A method of radiating the inner ear of the rabbit with an alpha-particle beam without significant exposure of the brain was devised. Long lasting changes in semicircular-canal function of the rabbit were demonstrated with doses of 500 rads. The approaches used to determine the threshold of radiosensitivity of the semicircular-canal function and the radiosensitivity of the macula utriculi are described. Structural changes are discussed which may account for the functional alterations observed. Work being undertaken to study the structural changes is described. Author

N66-19351* California Univ., Berkeley. Lawrence Radiation Lab.

EFFECTS OF SIMULATED ALTITUDE ON IODINE METABOLISM. I: ACUTE EFFECTS ON SERUM AND THYROID TURNOVER

Gilles LaRoche and Clarence L. Johnson *In its* Biol. and Med., Spring 1965 [1965] p 126–137 refs (See N66-19346 09-04) CFSTI: HC $5.00/MF $1.25

This report shows that simulated altitude (395 mm Hg for a period of up to 15 days) induces a significant change in iodine turnover, as observed through combined I^{125} and I^{127} studies in rats. Experimental procedures and results are summarized. M.R.W.

N66-19352* California Univ., Berkeley. Lawrence Radiation Lab.

ULTRACENTRIFUGE ROTOR TEMPERATURE AND SPEED MEASUREMENT BY RADIO TELEMETRY

Stephen J. Fabricant and Frank T. Lindgren *In its* Biol. and Med., Spring 1965 [1965] p 168–175 refs (See N66-19346 09-04) CFSTI: HC $5.00/MF $1.25

(Grant PHS-G-HE-02029-10)

The principles of radio telemetry were applied in achieving a unique solution to the problem of analytic ultracentrifuge rotor temperature measurement, eliminating the necessity for a direct electrical connection to the rotor. A small transmitter operating in the standard FM band and powered by batteries is mounted in a fixture that is bolted to the rotor. The frequency of the transmitter is a function of rotor temperature, and the amplitude of the received carrier is dependent on the angular relationship of the transmitter to a pickup loop mounted several inches below the rotor. This composite AM and FM signal is detected by an ordinary FM tuner. The output of the FM detector is read on a voltmeter or a recorder as temperature; the AM signal is counted by an electronic counter to display rotor speed in digital form. This system is capable of repeatable temperature measurements accurate to $\pm 0.05°C$ after appropriate calibration. Also, the system has been used in conjunction with a heater in a feedback loop to provide accurate temperature control of the rotor during the analytical run. Author

N66-19353# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

GUIDED AERIAL NAVIGATION IN THE ANIMAL KINGDOM

Shih Wen, Wei Peng, and Yuan Hang 6 Jan. 1966 13 p Transl. into ENGLISH from Hang K'ung Chih Shih (Communist China), no. 4, 1964 p 10–13

(FTD-TT-65-711/1+2+3+4; AD-626952) CFSTI: HC $1.00/MF $0.50

A discussion of processes and mechanisms in animals that provide knowledge or satisfactory explanations of infrared, inertial, echo and guided, geomagnetic, and celestial navigation principles is presented. Discussed are such subjects as missiles equipped with infrared scanning-and-guidance systems named the "Sidewinder" after a snake that possesses a special sense for infrared waves; and the navigation principles and processes of the bat, electric eel, fish, insect, and bird. M.R.W.

N66-19354*# California Univ., Berkeley. Lawrence Radiation Lab.

BIOLOGY AND MEDICINE, FALL 1965 Semiannual Report

John H. Lawrence, ed. and Tove Neville [1966] 115 p refs

(NASA Order R-104; Contract W-7405-ENG-48)

(NASA-CR-70521; UCRL-16613) CFSTI: HC $4.00/MF $1.00 CSCL 06R

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1. RADIATION DOSES ON MANNED SPACE MISSIONS S. B. Curtis p 1–5 refs (See N66-19355 09-04)

2. HEAVY-PARTICLE STUDIES WITH SILICON DETECTORS M. R. Raju p 6–14 refs (See N66-19356 09-24)

N66-19355*# California Univ., Berkeley. Lawrence Radiation Lab.

RADIATION DOSES ON MANNED SPACE MISSIONS

Stanley B. Curtis *In its* Biol. and Med., Fall 1965 [1966] p 1-5 refs (See N66-19354 09-04) CFSTI: HC $4.00/MF $1.00

Two of the important factors determining the radiation doses our astronauts will encounter on space missions to be undertaken in the next few years are orbit or trajectory location and spacecraft shielding thickness. In general, earth-orbiters with orbital inclinations up to 30° and altitudes in the 100 to 500 nautical mile range will be free from dangerous levels of radiation. This situation changes as the altitude or orbital inclination increases. On the mission to the moon, the Apollo mission, the danger will come almost entirely from the large solar flares that eject high fluxes of protons and alpha particles capable of penetrating the walls of a lightly shielded vehicle. This paper reviews several consequences of varying the spacecraft trajectory and indicates what dose rates are expected on missions planned in the next few years.

Author

N66-19357* California Univ., Berkeley. Lawrence Radiation Lab.

RECOVERY OF YEAST AFTER EXPOSURE TO DENSELY IONIZING RADIATION

John T. Lyman and Robert H. Haynes *In its* Biol. and Med., Fall 1965 [1966] p 39-46 refs (See N66-19354 09-04) CFSTI: HC $4.00/MF $1.00

A great enhancement of viability is observed if nonnutritive suspensions of diploid yeast, which have been irradiated with X rays or heavy ions (^4He, ^{12}C, ^{20}Ne), are stored at 30° C in the dark for four or more hours prior to plating. Maximum recovery is usually observed after 24 to 48 hr; the survival curves obtained upon delayed plating are related to those for immediate plating by a constant dose-modifying factor. Several lines of evidence indicate that recovery is based upon enzymic postirradiation processes unrelated to the initial physicochemical reactions associated with absorption of the radiation. The magnitude of recovery is independent of such radiobiological modifiers as oxygen or glycerol, or track ion density. All these modifiers are thought to act by affecting the nature and distribution of the products of the initial radiochemical reactions. Thus, the recovery appears to be substantially independent of the precise chemical nature of the radiation-induced lesions. Very severe macromolecular damage is likely to be produced by the densely ionizing radiations. The ability of diploid yeast to recover after such irradiation suggests that a "bypass" rather than a direct repair mechanism is involved. Segregation of the damage by sporulation would appear to be, *a priori*, a suitable bypass mechanism, but this hypothesis is ruled out by the results cited in this paper. Author

N66-19358* California Univ., Berkeley. Lawrence Radiation Lab.

UV-INDUCED DOMINANT LETHALITY: EVIDENCE FOR DIFFERENT LETHAL SYSTEMS BETWEEN UV AND X IRRADIATION IN SACCHAROMYCES

Robert L. Wiskocil (Cholate School) *In its* Biol. and Med., Fall 1965 [1966] p 51-55 refs (See N66-19354 09-04) CFSTI: HC $4.00/MF $1.00

Presented are results of a comparative study between UV and X-ray-induced dominant lethality in yeast. Haploid cells from cultures of the yeast *Saccharomyces cerevisiae* were used in the experiment. After irradiation the survival of haploid budding and nonbudding cells was obtained by microscopic single-cell isolation on YEPD slabs. It was concluded that dominant lethals are produced in comparatively greater numbers by UV than by X-irradiation. This difference in the production of dominant lethals gives a basis for assuming that the lethal lesions associated with the two radiations are also different. The fact that UV inactivates a relatively greater number of budding cells than does X-ray substantiates the greater efficiency of UV light in producing dominant lethals. Diploid bud elongations as well as a zygote formation inhibition effect were found to be caused only by UV irradiation. Although the damage is not necessarily lethal, these effects illustrate further differences between ultraviolet- and X-ray induced damage. Experimental procedures, methods, and materials are described.

M.R.W.

N66-19397# AVCO-Everett Research Lab., Everett, Mass.

MOTIONS OF A LIQUID IN A PULSATING BULB WITH APPLICATION TO PROBLEMS OF BLOOD FLOW

Robert T. Jones Dec. 1965 20 p refs

(Contract Nonr-4881(00))

(RR-237; AD-626006) CFSTI: HC $1.00/MF $0.50

Potential flows of the form $\phi=(ax^2+by^2+cz^2)f(t)$ may be utilized to represent motions produced in pulsating bulbs. While the inital bulb shape may be arbitrary, sequential shapes are related by affine transformations. Two components appear in the distribution of pressure, one dependent on the instantaneous velocity and the other on the acceleration. Since the flows have stationary streamlines their inertial impedance

is that of a simple mass, and is proportional to the first moment of the actual mass of fluid contained with the bulb. Examples treated are: (1) expanding and collapsing circular cylinders and (2) elliptical cylinders in which the periometer is held constant. The thickness of the pulsatile laminar boundary layer is found to be approximately one millimeter for conditions in the vicinity of the heart. Conditions for separation and turbulence probably differ from those in steady flow. TAB

N66-19412# State Univ. of New York Research Foundation, Albany.
OXIDATION OF THE S-METHYL GROUP BY TISSUE PREPARATIONS Final Report, 1 Jun. 1961–15 Oct. 1965
Edward J. Kuchinskas 17 Jan. 1966 10 p refs
(Contract Nonr-1349(04))
(AD-626855) CFSTI: HC $1.00/MF $0.50

An enzymic activity was detected in tissue homogenates capable of oxidizing the methyl group of methionine and other S-methyl compounds, completely to carbon dioxide. The activity is present in the highest concentrations in liver and kidney; smaller concentrations are found in brain, heart, skeletal muscle, and erythrocytes. Stable semipurified preparations were prepared from rat liver. Experiments with crystalline beef liver catalase and the rat liver enzyme preparations clearly demonstrated the involvement of catalase in the S-methyl group oxidation process. Various hydrogen peroxide generating systems, both enzymic and chemical, can propagate the peroxidation of the S-methyl groups by catalase. Highly purified rat liver catalase was isolated and was shown to possess similar peroxidation properties as does beef liver catalase. Addition of soluble fractions from rat liver markedly stimulates the peroxidation of S-methyl groups by the rat liver catalase. The involvement of catalase in the oxidation of S-methyl groups to carbon dioxide in vivo was demonstrated by experiments with 3-amino-1,2,4-triazole. This compound inhibits both the catalatic and methyl oxidizing activities of rat liver in a generally proportional manner. Author (TAB)

N66-19421# Aerospace Medical Div. Aerospace Research Lab. (6571st), Holloman AFB, N. Mex.
MONTHLY WEIGHT INCREASES IN GROWING RHESUS MONKEYS
Charles M. Hurst Dec. 1965 22 p refs
(ARL-TR-65-24; AD-626148) CFSTI: HC $1.00/MF $0.50

Weight increase rate profiles were developed for 13 males and 8 female *Macaca mulatta* based on weights recorded within the stereotaxic acceptability weight range of 2.5 to 4.5 kilograms. It was concluded that adolescent female rhesus have a greater weight increase rate than male rhesus with more extreme weights occurring in the individual female samples.
Author (TAB)

N66-19491*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SOME OBSERVATIONS ON THE STIMULATION OF THE VESTIBULAR SYSTEM OF MAN IN A ROTATING ENVIRONMENT
Ralph W. Stone, Jr. and William Letko [1965] 34 p refs Presented at the Symp. on the Role of the Vestibular Organs in the Exploration of Space, Pensacola, Fla., 20–22 Jan. 1965
(NASA-TM-X-56102) CFSTI: HC $2.00/MF $0.50 CSCL 06S

A review of previous studies and some initial studies are presented in determining the undesirable effects of rotation using a rotating vehicle simulator. The results indicate that the effects of rotation are best evaluated by orienting subjects in earth bound simulators with their long body axis perpendicular to the axis of rotation of the vehicle. The studies also indicate a considerable variation in the stimulation of the various semicircular canals possible among people with normal vestibular functions. The tolerance was generally 10 rpm for most subjects, with no essential effect of radius of rotation on the subjects performance and tolerance to rotation. It is concluded that a movement of the head back from the normal upright position when oriented with the long body axis perpendicular to the axis of rotation may cause some subjects to be less tolerant of nodding motions than if the head was not nodded back. C.T.C.

N66-19493*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WATER CONSUMPTION BY MAN IN A WARM ENVIRONMENT: A STATISTICAL ANALYSIS
John E. Greenleaf, Eugene G. Averkin, and Frederick Sargent, II (Illinois Univ.) [1965] 23 p refs Submitted for Publication
(NASA-TM-X-56118) CFSTI: HC $1.00/MF $0.50 CSCL 06P

A statistical analysis was made of the relationships between 22 selected metabolic variables and the mean daily water consumption in 87 young men. The variables and function tests are given along with details of the testing methods and conditions. A discussion of the results is presented, and it is shown that the following six variables were the most important: mean daily urinary volume, serum osmolarity, lying pulse rate, mean daily urinary Cl, mean daily urinary K, and rate of sweating. C.T.C.

N66-19553# Yokohama Municipal Univ. (Japan). Faculty of Medicine.
THE EFFECT OF COBALT-60 GAMMA RADIATION ON THE CENTRAL NERVOUS SYSTEM Semiannual Report, 4 Aug. 1964–3 Feb. 1965
Akira Tsuya [1965] 10 p refs
(Grant DA-CRD-AG-S-92-544-64-G-24)
(ARDG-FEJ-223; AD-625949) CFSTI: HC $1.00/MF $0.50

Different sensitivity to the ionizing radiation on the various parts of the brain were studied, electroencephalographically. Between the frontal cortex and the hippocampus, different transition of the sleepy stage was demonstrated, suggesting dissociated response in these regions, by irradiation over 1000r. Subcortical structure is remained to be studied for future investigation. Author (TAB)

N66-19569# Illinois Univ., Urbana. Dept. of Psychology
BINOCULAR RIVALRY: INDIVIDUAL DIFFERENCES IN ITS FUNCTIONAL RELATIONSHIP TO LUMINANCE AND INSTRUCTIONAL CONDITIONS
Connie Wong Meredith Sep. 1965 51 p refs
(Contract Nonr-1834(39))
(AD-624900) CFSTI: HC $3.00/MF $0.50

Thirty male and thirty female Ss experienced the binocular rivalry phenomenon by viewing stimuli in a modified Wheatstone stereoscope. Principal axis factor analysis indicated that binocular rivalry rate is a single-factor function of the two independent variables, luminance and instructional conditions. An analysis of variance indicated that the effects of both independent variables were significant but that there was no significant interaction. The results were discussed with respect to an S-R model and a neurophysiological model.
Author (TAB)

N66-19585*# Melpar, Inc., Falls Church, Va.
HUMAN PERFORMANCE CONTROL MONITORING SYSTEM Interim Report No. 1, 21 Dec. 1964–30 Sep. 1965

[1965] 120 p refs
(Contract NASw-1085)
(NASA-CR-70708) CFSTI: HC $4.00/MF $0.75 CSCL 06D

Presented are theoretical studies on the development of a mathematical model of a performance control and monitoring system and, development of techniques for prediction and estimation. Applications of trainable logic were developed in the areas of computation and control. In the area of computation, Monte Carlo type methods and the solution of simultaneous equations were investigated using statistical switch techniques. Three application problems are presented, emphasizing slightly different aspects of performance control systems. H.S.W.

N66-19599*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CRITERIA FOR THERMAL REGULATION FOR MANNED SPACECRAFT CABINS
Robert W. Johnson Washington, NASA, Mar. 1966 23 p refs
(NASA-TN-D-3349) CFSTI: HC $1.00/MF $0.50 CSCL 06K

Use of man in space for observational, analytical, and experimental missions requires that a comfortable and as nearly stress-free environment as possible be provided. By use of results of engineering and physiological investigation, conditions are proposed for thermal comfort in spacecraft shirt-sleeve environments. Air, cabin-wall, and skin temperatures are investigated for a range of clothing and interrelated to obtain essentially sweat-free conditions. This criterion establishes a basis for minimum individual stress and efficient design of atmospheric subsystems. Design methods are recommended in order to apply the minimal sweat condition to a wide range of work and rest levels. Measurements are discussed that may be used to evaluate comfort conditions, taking into account airflow rate and temperature, surface temperature, and metabolic rates. Author

N66-19635*# Hahnemann Medical Coll. and Hospital, Philadelphia, Pa. Dept. of Medicine.
EXTERNAL BIOELECTRODES: A BATTERY SUBSTITUTE FOR BIOLOGICAL TELEMETRY SYSTEMS Final Report, Period Ending 28 Feb. 1966
Frank C. Tye and Luther W. Reynolds [1966] 28 p refs
(Grant NGR-39-021-002)
(NASA-CR-70924) CFSTI: HC $2.00/MF $0.50 CSCL 06B

The power output of various electrode pairs, in saline and on the skin, have been reported. Probable reasons for variations in the power output have been included. A basic minimal power output for the Mg–Ag electrode pair has been established and found to be more than adequate for telemetry systems. Electrodes have proved to be reliable over long periods of time without special maintenance. Author

N66-19642*# 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. 1, 1 Jul.-31 Dec. 1965
Robert E. Johnson and Frederick Sargent [1966] 17 p refs
(Grant NGR-14-005-050)
(NASA-CR-71199) CFSTI: HC $1.00/MF $0.50 CSCL 06S

The chemical and physical properties of human sweat produced by a combination of heat exposure and exercise on a motor driven treadmill were investigated. Skin preparation and collection of the sweat are described. A comparison was made between the chemical composition of the sweat and its osmotic pressure from the sum of urea, ammonia, sodium, potassium, chloride, and lactate. The cause may lie in the undetermined residual nitrogen fraction. Titration curves were plotted and three pH inflection points identified with ammonia, lactate, and carbonate. Dissociation curves showed the sweat behaves like water. Capillary tube viscosity studies revealed variations from specimen to specimen and implied that the sweat spread on the skin must also vary. The viscosity is higher than that of water at the same temperature. E.A.O.

N66-19667# Liege Univ. (Belgium). Laboratoires de Radiobiologie.
CHEMICAL RADIOPROTECTORS Annual Report, 1 Apr. 1964–1 Apr. 1965 [RADIOPROTECTEURS CHIMIQUES Rapport Annuel, 1 Avr. 1964–1 Avr. 1965]
Brussels, EURATOM, Dec. 1965 12 p In FRENCH; ENGLISH summary
(Contract EURATOM-046-64-3 BIOB)
(EUR-2548.f) CFSTI: HC $1.00/MF $0.50

The importance of the biochemical effects of sulfur containing chemical protectors was confirmed by: (1) inhibition of carbohydrate metabolism; (2) latent period between injection of radioprotector and appearance of decreased response of rats and mice to high dose rate X-irradiation; (3) appearance of early lesions of mitochondria and Golgi apparatus in spleen and lymphoid cells after injection of sulfurous radioprotectors; and (4) alterations of unspecified detoxication hepatic enzyme system. Detailed study was terminated on the action of various protectors on hair growth in normal and irradiated animals. Certain curious anomalies in the chemical protection phenomena are discussed. In the study of salt protective action on barley seeds, the importance of the nature of the anion and cation, of the concentration, of the time interval between application and irradiation, and of the water content of seeds was also established. The mechanism of these protection reactions are also given. E.E.B.

N66-19674# Illinois Univ., Urbana. Electrical Engineering Research Lab.
A STUDY OF A FAMILY OF COMPLEX SYSTEMS, AN APPROACH TO THE INVESTIGATION OF ORGANISMS' BEHAVIOR
Crayton C. Walker Jun. 1965 271 p refs *Its* Tech. Rept.-5
(Grants AF-AFOSR-7-64; NSF GP-700)
(AFOSR-65-1713; AD-624864) CFSTI: HC $6.00/MF $1.50

A family of complex systems is examined which is defined with reference only to theoretically basic characteristics of the systems' parts and their interrelationship. The systems considered are intricate structures built up of simple electrical devices called elements which interact with one another. Each element has two possible element states, with its present state determined from states of other elements and from its previous state by a fixed transformation. Given a particular transformation, a system is constructed by taking 100 elements embodying that transformation and joining them at random. The system's behavior is studied by examining its cycles under operation. Then a different system is built using the same elements and the sampling of behavior repeated. Systems are compared, and it is found that for many transformations, details of structure are evidently unimportant in the occurrence of certain types of behavior. Author (TAB)

N66-19675# Naval Radiological Defense Lab., San Francisco, Calif.
THE SEQUENCE OF EVENTS IN RADIATION CARCINOGENESIS: A UNIFYING FORMULATION

Leonard J. Cole and Peter C. Nowell (Pennsylvania Univ.) 2 Nov. 1965 30 p refs
(USNRDL-TR-930; AD-624917) CFSTI: HC $2.00/MF $0.50

First, one or more specific mutations are produced in the target cell, either directly or through an indirect mechanism, viral or otherwise. Tumor development begins when the altered cell, having survived the mutating event, is brought into mitosis by a specific or nonspecific proliferative stimulus. Subsequent tumor progression results from repeated additional mutations in the tumor cells with sequential clonal selection from the altered population. Considerations of radiation carcinogenesis in experimental animals, and presumably in man as well, must include the effects of total dose, dose rate and quality of radiation on mutagenesis, and on the survival of mutated cells; and the effects and interactions of both mutagenic and nonmutagenic agents (including viruses, hormones, other environmental factors, and radiation itself) on subsequent tumor development. It is concluded that the complex interplay of many factors and mechanisms—indirect as well as direct—in radiation carcinogenesis makes a simple dose-response relationship untenable. Author (TAB)

N66-19679*# Miami Univ., Coral Gables, Fla. Inst. of Molecular Evolution.
[MOLECULAR EVOLUTION]—FIRST ANNUAL REPORT
1 Jun. 1965 105 p refs
(Grant NsG-689)
(NASA-CR-71033) CFSTI: HC $4.00/MF $0.75 CSCL 06A

The subject of molecular evolution is defined, personnel at the Institute are identified, and progress and accomplishments of the Institute are summarized. Publications from the Institute are also included. Among the principal accomplishments was the laboratory demonstration of how the protein molecules of which living cells are composed could first have come into existence without cells to produce them. Also, the demonstration of how various attributes of biocells could arise spontaneously, how selective membranes can arise spontaneously from amino acids, how most of the eighteen amino acids common to protein might arise from volcanic reactions in the presence of silica, and how mononucleotides might be polymerized under geologically plausible conditions are among the many listed accomplishments of the Institute. E.E.B.

N66-19789# Royal Aircraft Establishment, Farnborough (England).
THE PROBLEM OF THE MAGNITUDE OF THE REST POTENTIAL IN AMOEBA PROTEUS [K VOPROSU O VELICHINE POTENTSIALA POKOYA U AMOEBA PROTEUS]
V. Batueva Sep. 1965 17 p refs Transl. into ENGLISH from Tsitologiya (Leningrad), V. 6, 1964 p 209–212
(RAE-LIB-TRANS-1129) CFSTI: HC $1.00/MF $0.50

The measurement of the RP in amoeba proteus has been performed by introducing electrodes to varying depths into the pseudopod, centre part of the body and the "tail" of the body during its movement. In conformity with the data in the literature large variations in the RP magnitudes (between −5 and −50 mV) have been found. On the basis of the material obtained it is impossible to agree with the earlier assumptions that the variability of the RP magnitudes in amoebae are the result of random errors of measurement, since according to our data there are two sets of RP measurements: "low" RP (between −5 and −20 mV), recorded when the micro-electrode was introduced into the region of the "tail" and into the central part of the body to a depth of 5-10 microns, and "high" RP values (between −35 and −50 mV), recorded when the electrode was inserted into the central part of the body to a depth of more than 10 microns. Additional data are required in order to solve the problem whether there really exist two RP values in amoeba proteus or whether the true magnitude should be considered solely the "high" RP values. Author

N66-19790 Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.
THE POSSIBILITY OF A TWO DIMENSIONAL INFORMATION-BEARING MATRIX IN LIVING SYSTEMS [POSSIBILITA DI UNA MATRICE D'INFORMAZIONE BIDIMENSIONALE NEI SISTEMI VIVENTI]
M. Ageno 15 Nov. 1965 28 p refs
(ISS-65/43) CFSTI: HC $2.00/MF $0.50

The evidence for the existence in living systems of an important pool of hereditary information which is not stored in the DNA is discussed. This information does not seem to be related to protein synthesis, but to the physical organization of the cell, to cell differentiation and to the fundamental morphological traits of the organism. Information-bearing matrices are then examined in details, and it is shown that a linear (unidimensional) matrix, which is to be read by pieces, cannot contain topographic information. The impossibility that the source of topographic information be a fixed time sequence of events in the cell is also shown. On this ground, a new hypothesis is proposed, according to which information should be contained in some cytoplasmic membranes, the surface of which is covered by a pattern of globular protein molecules. Author

N66-19828 Radio Corp. of America, Princeton, N. J. Astro-Electronics Div.
A PROPOSED SATELLITE FOR TV OBSERVATION OF ZERO-G EFFECTS ON DEVELOPMENT OF THE OPOSSUM FETUS
S. H. Fairweather and J. E. Mortimer *In its* Space Electron. [1965] p 2–7 refs (See N66-19827 10-31)

The biological effects on mammalian tissue resulting from extended periods of weightlessness is of great interest to those concerned with life-support equipment and systems for space travel. This paper describes an experiment in which opossum embryos are orbited in a spacecraft and observed during development with TV-camera system. (The opossum is uniquely suited because of rapid maturation and the large amount of clinical data available on them.) This experiment is designed to establish benchmarks for measuring the effects of weightlessness on human tissue. Author

N66-19829 Radio Corp. of America, Princeton, N. J. Radiation Physics Group.
LIFE BEYOND THE ATMOSPHERE—ORIGINS, DETECTION, AND SUPPORT
A. G. Holmes-Siedle *In its* Space Electron. [1965] p 7–13 refs (See N66-19827 10-31)

This paper discusses the existence and detection of life forms in the universe (with emphasis on our planetary system), and the support of life in manned space travel. It is shown that while we have several good ideas as to the origin of life, much sophisticated research awaits before we arrive even at a good set of hypotheses of how life occurred. Likewise, while we can detect many forms of life chemically, much more sophisticated sensors are needed for space missions to help decide whether a certain observed phenomenon may constitute "life." Finally, although we have demonstrated short-term life-support outside the atmosphere, the present crude automatic control of a few gases and fluids will have to be refined greatly before we can, for example, establish a colony on the Moon. The advanced electronics for each of these pursuits offers engineers one of the greatest practical challenges of an already challenging technology. Author

N66-19832 Radio Corp. of America, Camden, N. J. Applied Research.
THERMOELECTRIC WATER RECLAMATION FOR MANNED SPACE VEHICLES
P. E. Wright *In its* Space Electron. [1965] p 21–23 refs (See N66-19827 10-31)

One of the life-support problems for manned satellites and rocket trips through space is drinking water storage and handling. Discussed herein is a practical method for reclamation of drinking water from urine by use of thermoelectrics, including both theory of operation and data from working models. Author

N66-19846# Cekmece Nuclear Research Center, Istanbul (Turkey).
THE EFFECT OF TRITIATED THYMIDINE AND GAMMA IRRADIATION ON THE MORTALITY OF ADULT *DROSOPHILA MELANOGASTER* LARVAE II
Esin Kent Bolukbasi Nov. 1965 20 p refs
(CNAEM-32) CFSTI: HC $1.00/MF $0.50

Several factors that might affect the increase in mortality rate of adult Drosophila melanogaster larvae when exposed to ionizing radiations have been studied. The application of H^3TDR (tritiated thymidine) and gamma (CO^{60}) irradiation at different times to the same larvae caused a high but an additive mortality effect. The application of both irradiating agents to the larvae simultaneously caused a higher mortality rate which was even more than an additive one. Irradiated H^3TDR containing nutrient was found to be harmful for the larvae and seemed to be responsible for the increase in death amount when both factors were applied to the larvae simultaneously. Author

N66-19864# United Kingdom Atomic Energy Authority, Windscale (England). Health Physics and Safety Dept.
THE EFFECT OF SODIUM ALGINATE IN INHIBITING UPTAKE OF RADIOSTRONTIUM FROM THE HUMAN GASTROINTESTINAL TRACT
R. Hesp and B. Ramsbottom 1965 20 p refs Presented at the 1st Intern. Conf. on Med. Phys., Harrogate, England, Sep. 1965
(PG-686(W)) HMSO: 2s 6d

An experiment performed with the cooperation of a normal healthy adult male volunteer has shown that sodium alginate reduced uptake of radiostrontium from the gastrointestinal tract by a factor of about 9. In the first stage of the experiment, 0.36 μc Sr^{85} was administered orally 20 minutes after an oral administration of 10 g sodium alginate. Twenty-six days later 0.48 μc Sr^{85} was administered orally. In both stages of the experiment samples of excreta and blood were collected, and body retention of Sr^{85} was measured by means of the Windscale Whole Body Counter. The degrees of inhibition of uptake of radiostrontium affected by sodium alginate, as assessed from urine, blood plasma and body retention respectively were approximately 9.2, 9.1, and 8.8. Author

N66-19878# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
A HEATED MANIKIN FOR STUDIES ON AIR VENTILATED CLOTHING
D. Mc K. Kerslake Nov. 1964 20 p refs
(FPRC/MEMO-214) CFSTI: HC $1.00/MF $0.50

Described is the design and construction of a heated manikin for the investigation of the thermal insulation of clothing assemblies. The manikin is divided into 18 sections, each containing a heater and temperature sensing devices stuck to the inner surface of the shell. Heat output for each section is controlled by varying the duty cycle of the heater in accordance with a reference potential which cyclically scans the operating temperature of its section. The proportion of the scanning cycle, and therefore of the total time, during which the heater is switched on is a linear function of the local skin temperature. Where the design curve consists of more than one straight line two control systems are ulitized. Numerical values for different sections of the figure are presented in a table. G.G.

N66-19909# Air Force Systems Command, Wright-Patterson AFB, Ohio. Aerospace Medical Div.
MOBILITY OF PRESSURE-SUITED SUBJECTS UNDER WEIGHTLESS AND LUNAR GRAVITY CONDITIONS Final Report, Jun. 1961–Jun. 1962
John C. Simons, Dieter E. Walk, and Charles W. Sears Aug. 1965 96 p refs
(AMRL-TR-65-65; AD-626979) CFSTI: HC $1.00/MF $0.50

Problems of moving through hatchways under zero and lunar gravity conditions, and related design problems of hatch size and shape, were investigated in flight. Subjects were timed and photographed as they accomplished various motions during weightless and lunar-gravity maneuvers of a large cabin aircraft. Performance data are presented for various combinations of clothing, gravity and body-position conditions. Time and contact data are presented for the egress motion as it is influenced by changes in the exit area. Orientation problems and maneuvering techniques, as influenced by area and volume restrictions, are discussed. Motions of pressure-suited subjects generally required 30% more time than corresponding motions of unsuited subjects. Most motions required 35% more time during zero G than during lunar G. No significant differences in egress times were found among four body-positions. Compared with 1 inch of exit clearance, 5 inches of clearance improved egress time by approximately 6%. Accuracy, rather than time of motion, appeared to be a more sensitive measure of operator performance for the egress task. A 95th percentile shoulder plane with a 19.4-inch major axis is proposed as a basic egress reference.
Author (TAB)

N66-19944# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
AN ESTIMATE OF THE PREFERRED SKIN TEMPERATURE DISTRIBUTION IN MAN
D. Mc K. Kerslake London, Flying Personnel Res. Comm., Oct. 1964 9 p refs
(FPRC/MEMO-213) CFSTI: HC $1.00/MF $0.50

Skin temperature and heat loss for various body regions of humans, seated and engaged in light activity at 33°C, were studied. Tables are given with regional data for the head, trunk, hands, forearms, arms, feet, calves, and thighs. Results of the findings are discussed, with reference to the effects of normal indoor clothing. N.E.N.

N66-19988# Radio Corp. of America, Camden, N. J. Defense Electronic Products.
LIFE SCIENCES
1965 53 p refs
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N66-19989# Radio Corp. of America, New York.
BIOMEDICAL ENGINEERING
Alfred N. Goldsmith *In its* Life Sci. 1965 p 2-7 (See N66-19988 10-05)

The growing importance of biomedical engineering is emphasized, and this recent addition to the technological professions is defined as a cross-disciplinary branch of engineering, applying the skills and capabilities of modern electronics to the fields of biology, medicine, and surgery. The problems involved are assessed, and the role of sophisticated electronic devices in studying and sustaining life is examined. Instrumentation for measuring blood flow, blood velocity, respiration rates and the carbon dioxide cycle in breathing, eye movement, and body cavity pressures are discussed. Data on laser applications, patient supervision, prosthetics, computer applications for biomedical research, genetic studies and selective breeding, and biomedical instruction are reviewed, and the contributions of biology to engineering are summarized. M.G.J.

N66-19990# Radio Corp. of America, Princeton, N. J. Astro-Electronics Applied Research Lab.
ELECTRONICS TECHNOLOGY IN MEDICINE—A STATE OF THE ART REVIEW
Leslie E. Flory *In its* Life Sci. 1965 p 8-12 refs (See N66-19988 10-05)

Reviewed herein is the state-of-the-art of medical electronics, including the techniques and instruments now in use in areas of medicine that can be classified as heart engineering, nerve-system engineering, physiological monitoring, prosthetic devices, and medical repairs. In addition to present capability, some current problems and limitations are pointed out that need the attention of electronics engineers. A reference bibliography to some of the extensive literature in the field is included. Author

N66-19991# Radio Corp. of America, Princeton, N. J. Astro-Electronics Applied Research Lab.
MICROCIRCUIT-MICROWATT DESIGN TECHNIQUES FOR NEW INTERNAL MEDICAL SENSORS
Fred L. Hatke and Leslie E. Flory *In its* Life Sci. 1965 p 13-15 refs (See N66-19988 10-05)

Improved techniques for measuring physiological functions are discussed. Particular emphasis is given to the development of microcircuit-microwatt internal sensors, in which a small but relatively insensitive transducer is combined with some electronic gain inside the body to achieve overall system sensitivity. Details are given on a passive telemetering system, and schematics are included on a transistorized 2 Mc passive capsule system, a passive biological potential capsule, and a simplified passive biological potential capsule. Pressure and temperature sensors are discussed, and the operation of a voltage sensor is described. M.G.J.

N66-19992 Radio Corp. of America, Camden, N. J. Broadcast and Communications Products Div.
DEVELOPMENT OF ELECTRON MICROSCOPY IN THE LIFE SCIENCES
J. H. Reisner *In its* Life Sci. 1965 p 16-19 (See N66-19988 10-05)

The historical development of the electron microscope is reviewed, and its capabilities for providing information about the size, shape, and density of biological entities, and about their structural relationships, are discussed. The problems of applying electron microscopy in the life sciences are examined, and major developments in specimen preparation are listed. Instrument improvements, necessitated by improved specimen techniques, are discussed, along with the engineering developments which have resulted in simplified operation. The microscopist's functions are defined, and the need for adequate personnel training is stressed. The potential is assessed, with the application of television techniques to the microscope image identified as being particularly promising. M.G.J.

N66-19993# Radio Corp. of America, Camden, N. J. Broadcast and Communications Products Div.
ELUCIDATION OF ULTRASTRUCTURE WITH THE ELECTRON MICROSCOPE
John W. Coleman *In its* Life Sci. 1965 p 20-23 refs (See N66-19988 10-05)

Some examples of research in ultrastructure are given, with ultrastructure defined as the probable three-dimensional molecular arrangement of biomatter in a functional thermodynamic system. The use of the electron microscope as a practical observation tool is discussed, and it is pointed out that this instrument can, in principle, resolve macromolecular geometry even to the level of the primary structure. The problems of preparing specimens with ultrastructure intact are stressed, and some representative studies are cited. These include research on cellular substances, biological membranes, parts of cells, the total cell, and viruses. Summarized data are also presented on an investigation of the ultrastructure of T6 bacteriophage, using the electron microscope and selected area electron diffraction. M.G.J.

N66-19994# Radio Corp. of America, Princeton, N. J. RCA Labs.
ADAPTATION THEORY. A TUTORIAL INTRODUCTION TO CURRENT RESEARCH
Jack Sklansky *In its* Life Sci. 1965 p 24-30 refs (See N66-19988 10-05)
(Contracts AF 33(657)-11336; AF 33(615)-1764)

This paper introduces the concepts of adaptation theory, and then discusses the particular class of adaptive process on which work has concentrated—that of the threshold learning process and Markov chains, and the specific mathematical techniques associated with it. Included are some results on learning waves, feedback-adaptivity relationships, and learning times, as well as mention of some as-yet-unexplained phenomena. Some directions of future work are discussed, and a reference bibliography is included. Author

N66-19995# Radio Corp. of America, New York. Systems Lab.
NEURAL, THRESHOLD, MAJORITY, AND BOOLEAN LOGIC TECHNIQUES. A COMPARATIVE SURVEY

Charles R. Atzenbeck and Daniel Hampel *In its* Life Sci. 1965 p 31-35 refs (See N66-19988 10-05)

This paper presents the basic characteristics and relative merits of the four types of logic classified (in decreasing order of complexity) as neural, threshold, majority, and Boolean, and considers combinational switching functions, logic configurations and synthesis, and factors in circuit realization. Although the mathematics of synthesis and component choice for neural logic are not today as well defined as for Boolean or threshold logic, present work indicates that future neural network systems should be not only feasible but also competitive with Boolean or threshold logic. Author

N66-19996# Radio Corp. of America, Camden, N. J.
SPEECH RECOGNITION USING ARTIFICIAL NEURONS
M. B. Herscher and T. B. Martin *In its* Life Sci. 1965 p 36-41 refs Sponsored by AF (See N66-19988 10-05)

This paper describes basic speech analysis techniques, and presents results for consonants in the fricative, liquid, semivowel, and nasal class. Also described is the acoustic analyzer built with analog-threshold-logic networks of direct-current neurons (as opposed to pulse-type neurons). While results correspond closely to previous speech studies, a significant deviation was in the features utilized for recognition of individual phonemes—primarily spectral regions of increasing and decreasing energy, found relatively invariant and machine recognizable. Future goals include recognition of continuous speech through higher-level neural logic based on linguistics and context. Author

N66-20017# Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg (West Germany). Institut fuer Flugmedizin.
CHANGE IN THE UNSPECIFIC REACTION OF THE ORGANISM DURING ADAPTATION TO HEAT [DIE ANDERUNG DER UNSPEZIFISCHEN REAKTION DES ORGANISMUS UNTER HITZEANPASSUNG]
D. Schwarz (Ph.D. Thesis—Bonn Univ.) Nov. 1965 78 p refs In GERMAN; ENGLISH summary
(DLR-FB-65-53; DVL-441) CFSTI: HC $3.00/MF $0.75

Under extreme surrounding conditions such as occur in aviation or mining, man is subject to different kinds of stress Adaptation to each individual type of stress involved is often not possible or, at least, very difficult. The study attempts to prove that adaptation to one special type of stress (heat) will increase resistance to other types of stress (hypoxia, work, cold). Author

N66-20043# Academy of Sciences (USSR), Moscow.
RESULTS OF BIOLOGICAL EXPERIMENTS CARRIED OUT UNDER CONDITIONS OF FLIGHT IN SHIPS VOSTOK WITH PARTICIPATION OF COSMONAUTS A. G. NIKOLAYEV, P. R. POPVICH, AND V. F. BYKOVSKY
V. V. Antipov, N. L. Delone, G. P. Parfyonov, and V. G. Vystoky [1965] 15 p refs Presented at the COSPAR Symp., Florence, May, 1964 CFSTI: HC $1.00/MF $0.50

Reproduction processes in Drosophila melanogaster and the hereditary structures of Tradescantia paludosa were studied under conditions of cosmic radiation and weightlessness. The following results are reported, along with descriptions of experimental procedures and conditions. The speed of laying eggs, and the viability of embryos and larvae were shown to be approximately the same under weightlessness and normal conditions. Several explanations are given for an excess of female issue; it is suggested that the most valid of these is a relative increase in the competitive capability of the female larvae under the experimental conditions. The following apparently nonhereditary anomalies were observed in the offspring: (1) an absence of 1/2 the thorax; (2) a one-sided absence of macrochetes; (3) a decrease and roughening of one eye; and (4) a shortening and incorrect nervation of one wing. It is noted that only 1/2 of the body is affected in each case. Cytological analysis of Tradescantia microspores revealed rearrangements of chromosomes, and violations of the mitosis mechanism and growth processes. It is hypothesized that the chromosome rearrangements are caused by dynamic factors appearing at the ascent and descent of the ship. D.T.

N66-20050*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
[STUDY OF FEED BACK CONTROL SYSTEMS IN THE DEVELOPMENT OF MANIPULATORS AND REMOTE TOUCH SENSORS] Progress Report, 1 Apr.–30 Sep. 1965
28 Jan. 1966 12 p refs
(Grant NsG-107-61)
(NASA-CR-70782; SA-9991-4) CFSTI: HC $1.00/MF $0.50 CSCL 06D

Progress is reported on studies in the following categories: development of a spatially continuous remote touch sensor; force feedback with delay; simulation study of supervisory control of a manipulator using entirely computer simulated task for the human operator; simulation study of supervisory control of a manipulator using an actual manipulator and mechanical environment, and dynamic programming model of preview control. M.R.W.

N66-20057# Argentina. Comision Nacional de Energia Atomica, Buenos Aires.
TIME OF DUPLICATION OF SPLENIC CELLS OF MICE DURING THE LATENT AND LOGARITHMIC PHASES OF THE PRINCIPAL RESPONSE OF AN ANTIBODY [TIEMPO DE DUPLICACION DE CELULAS ESPLENICAS DE RATON DURANTE LAS FASES LATENTE Y LOGARITHMICA DE LA RESPUESTA PRIMARIA DE ANTICUERPO]
Elmo E. Capalbo and T. Makinodan (Oak Ridge Natl. Lab.) 1965 19 p In SPANISH *Its* Informe No. 15
CFSTI: HC $1.00/MF $0.50

Cellular development was studied during the latent and logarithmic phases of the primary antibody response by means of a spleen cell culture in diffusion chambers with a porosity of 0.1 microns. Results show that the reduction in growth rate of all cells and the increase in the number of mitotic cells after the antigen stimulation are principally reflections of proliferative activities of blastic and plasmatic cells. Estimates of the relation of DNA synthesis to generation time indicate that after the antigen stimulation, a significant increase between immature plasmatic and lymphatic cells was detected. This indicates that the period of DNA synthesis is prolonged or that the generation time is decreased. These results indicate that there are at least three variables to consider in intermediate cellular division from a differentiation process in an immune response, or from the variable cellular cycle depending on the stimulus and the incoming and outgoing rate. It can be concluded that the terminal plasmatic cells are the final state of differentiation from reticular-blastic cells, suggesting that if other somatic cells can give origin to terminal plasmatic cells, they should be able to assist in primary cellular division. Transl. by R.N.A.

N66-20066*# Melpar, Inc., Falls Church, Va.
HUMAN PERFORMANCE CONTROL MONITORING SYSTEMS Interim Report No. 2
J. M. Gervinski and R. E. Mirabelli 15 Jan. 1966 28 p
(Contract NASw-1085)
(NASA-CR-71036) CFSTI: HC $2.00/MF $0.50 CSCL 06B

The basic features of a computer program for a human performance and monitoring system are described. This program provides the option of being in the automatic or manual control mode at any time; it simulates a second-order servo plant and incorporates a controller made from adaptive logic elements. Preliminary results indicate the systems dynamics are working correctly and the controller is trainable. G.G.

N66-20071*# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
RESEARCH ON NEW TECHNIQUES FOR THE ANALYSIS OF MANUAL CONTROL SYSTEMS Progress Report, Jun. 15–Dec. 15, 1965
George A. Bekey [1965] 23 p refs
(Grant NGR-05-018-022)
(NASA-CR-71196) CFSTI: HC $1.00/MF $0.50 CSCL 05H

Fabrication and acquisition of experimental equipment for analytical studies of manual control systems are reported, and details of simulation cockpit and data processing components are given together with outlines of four analytical and computer investigations. Studied were: (1) Random parameter models of human controllers, (2) development of finite state machines as models for manual tracking, (3) identification procedures for unknown sampling frequency in sampled-data models of human operators, and (4) development of software for models of manual on-off control. G.G.

N66-20131*# California Univ., Berkeley. Space Sciences Lab.
BIOCHEMICAL ACTIVITIES OF TERRESTRIAL MICROORGANISMS IN SIMULATED PLANETARY ENVIRONMENTS Final Report
[1964] 14 p refs
(Grant NsG-126-61)
(NASA-CR-71195) CFSTI: HC $1.00/MF $0.50 CSCL 06C

The major effort of this research program was directed toward environmental conditions that might serve as constraints upon the evolution or development of microorganisms on the surface of anaerobic planets such as Mars. Studies on low temperature freezing and thawing of microorganisms, on alternatives for atmospheric oxygen, and on ultraviolet radiation as an environmental constraint are discussed. R.N.A.

N66-20132*# Texas Univ., Austin. Defense Research Lab.
[CONDUCT STUDIES OF AUDITORY INFORMATION PROCESSING EMPHASIZING THE APPLICATION OF SIGNAL DETECTABILITY THEORY TO THE AUDITORY SENSORY RESPONSES] Semiannual Report (Sixth Quarterly Status Report), 1 Jun.–30 Nov. 1965
L. A. Jeffress and C. S. Watson 11 Feb. 1966 9 p
(NASA Order R-129; Contract Nonr-3579(04))
(NASA-CR-70926) CFSTI: HC $1.00/MF $0.50 CSCL 05H

Progress is reported on auditory information processing studies emphasizing the application of signal detectability theory to the auditory sensory responses. A new facility for studying auditory detection and its autonomic concomitants was completed. A new psychophysical method was developed to analyze vigilance performance in terms of the signal detectability theory. The data collection phase of initial experiments concerning adaptation effect on the brightness of flashed incremental and decremental stimuli is complete. A set of low pass and high pass filters were mounted for use. They permit generating band pass filters with high and low frequency cutoffs at various locations relative to the signal frequency. The signal detectability theory has not so far developed a mathematical model to account for the relative invariance of the measure of detectability, d', with signal duration when signal energy is kept constant. Experiments with an electrical model using a narrow filter followed by an envelope filter and detector showed preference for signal duration which is the receptrocal of the filter bandwidth. R.N.A.

N66-20163# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF IONIZING RADIATION ON THE HEART. REACTION OF THE HEART IN NORMAL CONDITIONS TO RADIATION
S. G. Antonyan 20 Dec. 1965 22 p refs Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR, Biol. Nauki (Erevan), v. 17, no. 7, 1964 p 45–54
(FTD-TT-65-1082/1+4, AD-627069) CFSTI: HC $1.00/MF $0.50

Research dealing with the morphological and functional effects of ionizing radiation on the heart is reviewed. Although many reports indicate a low sensitivity of cardiac muscle, many other reports relate considerable morphological, biochemical, and functional displacements in the myocardium in response to the action of ionizing radiation. Opinions about the degree of sensitivity of the myocardium to various doses of radiation are contradictory. The results of electrocardiographic studies after radiation doses are given. The functional changes are of a very complex nature and include displacements in the nervous and endrocrine regulation of the heart. Heart changes after irradiation during physical activity, and the effects of hypoxia and drugs are discussed. E.A.O.

N66-20165# Argentina. Comision Nacional de Energia Atomica, Buenos Aires.
LABELING INSULIN WITH I^{131} AND ITS USE IN "IN-VIVO E IN-VITRO" METHODS [MARCACION DE INSULINA CON I-131 Y SU USO EN TECNICA "IN-VIVO E IN-VITRO"]
Aldo E. A. Mitta and Hernan Juarez Penalva 1965 13 p refs In SPANISH
(CNEA-185) CFSTI: HC $1.00/MF $0.50

This paper briefly describes a technique for labelling insulin with iodine-131 and at the same time presents the results obtained with its use in an in vivo study of hepatic turnover in diabetic and non-diabetic patients; and in an in vitro study to determine the capacity of serum globulin to combine with insulin-iodine-131. The techniques and controls used and a discussion of the results, which are presented in graphical form, are included. R.N.A.

N66-20174# RAND Corp., Santa Monica, Calif.
WEIGHTS OF ENVIRONMENTAL-CONTROL SYSTEMS
Stephen H. Dole Jan. 1966 7 p Presented at the 4th Ann. Meeting of the Working Group on Extraterrest. Resources, Colorado Springs, 1 Dec. 1965
(P-3297; AD-626680) CFSTI: HC $1.00/MF $0.50

Generalized relationships are presented that can be used for estimating the weights of environmental-control equipment and expendables required for supporting human beings on space missions. Dry weight was defined as including breathing-gas supply, carbon dioxide removal, humidity control, trace contaminants removal, fresh water supply, thermal control, and waste management. The equation derived for dry weight (W_D) was $W_D = 117\ N^{0.58} T^{0.33} N^{0.11}$), where N is the number of men in the crew and T is the unresupplied duration of the mission in days. The expression produced dry weights within ±20% of those obtained from 23 contractors' reports in all but 2 instances. Total weights were estimated by adding weights of expendables to dry weights. The total weight (W_T) expression was $W_T = W_D + N(19T^{1/2} + 2T)$. The total weight estimates were generally within ±40% of those obtained from contractors' supports. TAB

N66-20187# Academy of Sciences (USSR), Moscow.
A FEW PROBLEMS OF PHYSIOLOGY OF CIRCULATION DURING WEIGHTLESSNESS

R. M. Bayevsky and O. G. Gazenko [1963] 32 p refs
CFSTI: HC $2.00/MF $0.50

Data obtained on the circulatory system during weightlessness are presented. Biomedical investigations were carried out in satellites and in Vostok spaceships, employing electrocardiography, phonocardiography, seismocardiography, kinetocardiography, sphygmography, and arterial oscillography. The experimental data from dogs and cosmonauts are discussed and summarized in tabular form. Special attention was given to the pulse rate and the phasic nature of cardiac response to weightlessness. Three phases were distinguished: the transition phase involving after-effects of acceleration, the incomplete adaptation which lasts for 10 to 12 hours, and the relatively stable adaptation. Particular mention was made of the auriculo-ventricular conduction time, intraventricular conduction, electric and mechanical systole durations, electromechanical delay, contractile ability of myocardium, and cardiac contraction coordination. N.E.N.

N66-20201# Osterreichische Studiengesellschaft für Atomenergie G.m.b.H., Seibersdorf (Austria).
CHARGE TRANSFER: A FACTOR OF RADIORESISTANCE
H. Altmann 1965 13 p refs Presented at the IAEA Conf. "Panel on Coord. of Res. in Radiation Sensitization of Microorganisms in Food-Preservation," Wien, Austria, 5 Jul. 1965 Submitted for Publication
(SGAE-BL-16/1965) CFSTI: HC $1.00/MF $0.50

The contribution of charge and energy migration to inactivation processes by irradiation was studied. The removal of trace elements from nucleic acids of yeast was determined between 0 and 24,000 rads of Co^{60} irradiation, but diffusion of trace elements through the cell walls owing to changes on permeability was observed. Metal ions liberated from nucleic acids caused a diminution of the biological activity of the macromolecules and some slight damage to the cell by operating as inhibitors or stimulators of enzyme systems; however, the main chain of nucleic acids remained protected. It was concluded that the conductivity of nucleic acids arises by the metal ion which acts as sink for elements that are split off. Introduction of bromodeoxyuridine (BdU) into Chlorella DNA and subsequent irradiation with 5,000, 10,000, and 20,000 rad in phosphate buffer suggested a charge transfer in DNA to BdU, with Br partly split off. G.G.

N66-20206# Oak Ridge National Lab., Tenn.
THE JOINT NATIONAL INSTITUTES OF HEALTH-ATOMIC ENERGY COMMISSION ZONAL CENTRIFUGE DEVELOPMENT PROGRAM Semiannual Report, Jan. 1-Jun. 30, 1964
W. D. Fisher, et al Mar. 1965 66 p refs
(Contract W-7405-ENG-26)
(ORNL-3752) CFSTI: HC $3.00/MF $0.75

Work done under the Zonal Centrifuge Development Program on the application to difficult biophysical separation problems of techniques and instruments developed by the AEC is described. Work on zonal centrifuge systems designed to separate particles ranging in size from whole cells to small molecules has progressed with the development of several new rotor systems. The B-IV rotor has been shown to effectively separate quantities of macroglobulin from rat and other animal sera, thereby extending the usefulness of this instrument down to 20S. By application of the two-dimensional S-ρ separation system previously described, a clear spectrum of rat liver glycogen particles has been obtained, and the molecular structure revealed by negative staining is under investigation. Virus-like particles have been recovered from a human breast tumor with the same technique. Further studies on centrifugal fast freezing show that a high percentage of yeast cells survive freezing, but that the lethal damage is done during warming, which must be done rapidly if a high survival rate is to be obtained. Theoretical studies on the particle capacity of gradients in zonal centrifuges are being carried to the point that experimental studies may be designed to examine anomalous sedimentation behavior and band spreading. The low-speed A-IX rotor has been redesigned and strengthened and is now designated A-XII. Scanning systems that would make this rotor an analytical centrifuge have been completed. Continuous-flow rotors in which the sediment particles are banded in a gradient during the continuous-flow process (rotor B-VIII) have been built and successfully tested. A completely enclosed virus separation facility has been designed for large-scale virus separation. In addition to centrifuges, new countercurrent systems for liquid–liquid extractions and the flame ionization detector for nonvolatile samples are under development. A prototype automated system for carbohydrate analysis has been completed and tested with a variety of sugar-containing samples. With an experimental high-pressure capillary column nucleotide analyzer, it has been demonstrated that rapid analysis of very small samples can be performed with micro ion exchange beads, warm columns, a high flow rate, and columns of very small bore. Author (NSA)

N66-20218# Rochester Univ., N. Y.
MITOCHONDRIA AND RADIATION SENSITIVITY OF CELLS
E. Tsinga and G. W. Casarett 19 Jul. 1965 76 p refs
(Contract W-7401-ENG-49)
(UR-666) CFSTI: HC $3.00/MF $0.75

Albino male rats were exposed to 600 R total-body X-irradiation and sacrificed thereafter at various time intervals up to 40 days. Samples of pancreas, intestine, thymus, liver, kidney, adrenal, and testis were prepared for histopathological and mitochondrial study by means of the optical-microscope. Globulation, clumping and disappearance of the mitochondria were observed in the degenerating radiosensitive cells of the intestine, thymus, and testis after irradiation. No changes in the morphology, number, or distribution of the mitochondria were detected in the radioresistant parenchymal cells of the pancreas, liver, kidney, and adrenal, or other radioresistant cells in any of the organs studied. It was concluded that mitochondrial morphology was relatively resistant to the actions of X-rays and that the effects observed were not specific for irradiation but secondary to other injuries in cells. The mitochondrial content in the different kinds of cells was suggested as an important factor in the relative degree of the sensitivity of resistance of the cells to the cytocidal effects of irradiation, with radiosensitive cells generally containing a smaller mitochondrial content than radioresistant cells. Author (NSA)

N66-20219# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
CONDITIONING OF PRIMATES FOR EXPERIMENTATION [CONDITIONNEMENT DES PRIMATES POUR L'EXPERIMENTATION]
Bernard Legeay, Michel Geneste, and Guy Brawers Mar. 1965 35 p refs In FRENCH
(CEA-R-2714)

The care and feeding of monkeys for experiments is discussed. The construction of a monkey-house, the hygiene rules necessary for obtaining subjects with relatively stable biological parameters are described. This hygiene includes prophylactic treatment, because the animals lived originally in the wild state; a balanced diet, following modern dietetic standards; and a habitat which recreates the original living conditions of the species. The rate of reproduction was used as a criterion of the efficiency of the methods applied.
Author (NSA)

N66-20225# Norsk Radiumhospital, Oslo.
INDUCED RADIOACTIVITY CAUSED BY THERAPEUTIC USE OF HIGH ENERGY RADIATION
Aksel Strömme [1965] 9 p
(Contract AT(30-1)-3364)
(NYO-3364-6) CFSTI: HC $1.00/MF $0.50

Measurements of patients in a whole-body counter after therapeutic irradiation indicated induced radioactivity of the order of 350 microcuries. The therapeutic betatron beam used contained, besides γ rays, a certain unknown neutron flux. The counting equipment used allowed the detection of only those isotopes giving rise to γ radiation in excess of 25 keV energy and with half-lives in excess of about 20 sec. The isotopes detected and identified by measurements of their half-life and energy spectrum included ^{11}C, ^{13}N, ^{15}O, ^{30}P, ^{34}Cl, ^{38}K, and iodine. These were created by $(\gamma,2n)$ or (n,γ) reactions. The amounts of isotopes created per gramatom during an 11 min irradiation, the equivalent of 200 R, were calculated. NSA

N66-20244# Nuclear Utility Services, Inc., Washington, D. C.
CALCULATIONAL MODELS FOR BETA DOSE FROM SPHERICAL PARTICLES
George H. Anno 26 Feb. 1965 83 p refs
(NUS-217) CFSTI: HC $3.00/MF $0.75

A means of calculating the beta ray dose in tissue from a mixed radionuclide source particle of arbitrary size is considered for possible inclusion in the ROVER Flight Safety evaluation or NURSE programs. For the present case, the source particle is a high-Z material ($Z \simeq 84$) and contains a mixed beta ray spectra, while dose distribution in tissue, a low-Z material ($Z \simeq 7$), is desired; a situation for which appropriate data are lacking. An investigation of the presently available techniques and data was carried out in order to (1) prescribe a method of computing the beta dose from a fuel particle for present use and also to (2) determine alternate methods to accomplish this task more accurately, perhaps by more detailed methods, if necessary in the future. A current calculational model based on experimental dose attentuation of more monoenergetic beta ray sources was developed for which the equations can readily be translated to FORTRAN. Some hand calculations have been made in order to compare results with experimental data and results obtained by other methods. These comparisons indicate good agreement with measured data for the particle surface leakage dose, and only approximate agreement for deeper penetration. Author (NSA)

N66-20280*# Oak Ridge National Lab., Tenn. Biology Div.
THE ORNL SPACE BIOLOGY PROGRAM Annual Report, Period Ending 30 Jun. 1965
G. E. Stapleton and E. B. Darden, Jr. Sep. 1965 19 p refs
(NASA Order R-77; NASA Order R-60; Contract W-7405-ENG-26)
(ORNL-TM-1217) CFSTI: HC $1.00/MF $0.50 CSCL 06R

Work performed in the AEC-NASA Space Biology Program is described. At present the general space radiobiology program supports chiefly high energy proton studies on several mammalian systems, including cataractagenesis, shortening of life span, and acute lethality. Development of the Oak Ridge Isochronous Cyclotron facility, pertinent dosimetry, and results to date are reported. Results obtained in mock-up experiments in preparation for the Biosatellite A Project are also reported. Participation in the Gemini IV experiment are not covered in this report. Author (NSA)

N66-20324# State Univ. of New York at Buffalo. Dept. of Biology.
FACTORS INFLUENCING RADIORESISTANCE OF MICROORGANISMS Technical Progress Report, 1 Jan.–15 Sep. 1965
Alan K. Bruce 24 Sep. 1965 25 p refs
(Contract AT(30-1)-3319)
(NYO-3319-7) CFSTI: HC $1.00/MF $0.50

Progress is reported on work continued on ultraviolet modification of *Micrococcus radiodurans* by p-hydroxymercuribenzoate (HMB); X-ray does response of HMB binding in *M. radiodurans*, *S. lutea*, and *E. coli*; the effect of phase state on dose-modification by MEA and HMB in bacteria; and identification of protective compounds in *M. radiodurans*. New approaches during the report period included localization of bound HMB and extraction of DNP from *M. radiodurans*. NSA

N66-20368# Institute for Cancer Research, Philadelphia, Pa.
STUDIES OF THE EFFECTS OF ULTRAVIOLET RADIATION ON CELL STRUCTURE AND BEHAVIOR Annual Progress Report, Jan. 1963–Nov. 1964
Jerome J. Freed 21 Jan. 1965 20 p refs
(Contract AT(30-1)-2356)
(TID-21581) CFSTI: HC $1.00/MF $0.50

A vibrating mirror flying spot microscope is described that was designed and constructed to measure ultraviolet absorbancy of single living cells in culture and to display the absorbancy of the specimen as a television image on a synchronized television display tube. The equipment gave good results in studies of structural and metabolic mechanisms involved in the control of cytoplasmic motility as observed in tissue cultures. It was found that measurements could be made at dose levels low enough to avoid damage to the cell and the normal increase in absorbancy through interphase could be recorded. Preliminary results are reported from studies on isolated rat liver nuclei; measurements of the cell growth-duplication cycle of hamster cells growing in uv-transparent medium; the effects of puromycin, a protein synthesis inhibitor, on HeLa cells grown in perfusion chambers; inclusion bodies in fixed preparations of HeLa cells; the effects of colchicine, a mitotic inhibitor, on the saltatory movement of cytoplasmic particles during interphase of HeLa cells in culture; and genetic studies on haploid and diploid embryo cells of *Rana pipiens* and *Rana sylvatica* in culture. NSA

N66-20415# Atomic Weapons Research Establishment, Aldermaston (England).
CHELATING AGENTS. PART 2: RADIOELEMENT REMOVAL AND THE STRONTIUM-90 PROBLEM
J. H. Grimes, A. J. Huggard, and K. T. B. Scott Apr. 1965 41 p refs
(AWRE-O-4/65) HMSO: 6s

The radioelements which at present constitute hazards to humans are considered with respect to their behavior in the body. Theoretical considerations for their removal from blood and from bone are presented, and suggestions are made for the properties of a suitable chelating agent. Chelation with the alkaline earth metals is discussed and the possibilities of obtaining a strontium-preferring chelating agent are outlined. Author

N66-20466# Milan Univ. (Italy). Inst. of Pharmacology.
EFFECT OF IONIZING RADIATIONS ON THE CONTROL MECHANISMS OF LIPID TRANSPORT Annual Report No. 2, 1 Feb. 1964–31 Jan. 1965
[1965] 24 p refs
(Contract AT(30-1)-3097)
(TID-21496) CFSTI: HC $1.00/MF $0.50

Total body X-irradiation (1000R) induced a significant increase in cholesterol and triglyceride plasma levels of old rats and a much more pronounced effect on the same lipid fractions in rabbits. The three possible mechanisms responsible for this type of hyperlipemia were investigated. Increased

lipid mobilization, fatty acid synthesis in the liver or triglyceride hypersecretion to the plasma could now be invoked as the responsible mechanisms. Data indicate a decreased peripheral utilization of triglycerides as the major cause of hyperlipemia. The modified lipoproteins produced in irradiated rabbits and accumulated in the plasma compartment were slowly metabolized by the RES and the resulting hyperlipemia is therefore greatly dependent on the functional activity of RES. A conventional radio-protective drug (cysteamine) was not able to counteract this particular effect of total-body irradiation.
Author (NSA)

N66-20470# California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
ECOLOGY OF THE NEVADA TEST SITE. I: GEOGRAPHIC AND ECOLOGIC DISTRIBUTIONS OF THE VASCULAR FLORA (ANNOTATED CHECKLIST)
Janice C. Beatley (Nev. Test Site Herbarium) Apr. 1965 67 p refs
(Contract AT(04-1)-GEN-12)
(UCLA-12-553) CFSTI: HC $3.00/MF $0.75

A checklist of vascular plants of the Nevada Test Site is presented for use in studies of plant ecology. Data on the occurrence and distribution of plant species are included. Collections were made from both undisturbed and disturbed sites.
NSA

N66-20494# Princeton Univ., N. J. Dept. of Biology.
BIOCHEMISTRY OF GAMETOGENESIS AND FERTILIZATION IN ALGAE Final Report, Oct. 1962–30 Sep. 1964
Raymond F. Jones 29 Jan. 1965 10 p refs
(Contract AT(30-1)-3105)
(NYO-3105-1) CFSTI: HC $1.00/MF $0.50

The life cycle of the algae, chlamydomonas, is discussed with emphasis on the biochemistry of gametogenesis and fertilization.
NSA

N66-20511# Colorado State Univ. Research Foundation, Fort Collins. Dept. of Poultry Science.
X-IRRADIATION OF THE DEVELOPING AVIAN EMBRYO AS A FACTOR OF AGING Research Report, Sep. 20, 1964–Sep. 10, 1965
Harry D. Muller 24 Sep. 1965 36 p
(Contract AT(11-1)-1119)
(COO-1119-4) CFSTI: HC $2.00/MF $0.50

Data are reported on the body weight, reproductive capacity, blood pressure, heart rate, and mortality parameters of chickens exposed to X-irradiation during embryonic development, evaluated at 42 mo. of age. Body weight evaluations demonstrated that the control animals and the survivors of low doses of irradiation demonstrate heavier body weights than the survivors of LD_{50} or greater doses of irradiation. Age at time of administration of the treatment appears to have less influence than the total dose administered. Sex apparently has no observable influence on these responses other than those normally found in the mature body weights of the domestic fowl. Reproductive capacity evaluations demonstrated that irradiation survivor females continue to demonstrate impaired ovulation rate. However, the ability of the male survivors to fertilize both irradiation survivor and control females is not measurably impaired. Matings between control individuals and survivor individuals, as well as matings between survivor individuals, have demonstrated that these individuals are capable of competing on a percentage basis with unexposed individuals in the production of viable progeny. Blood pressure evaluations demonstrated that the survivors of the higher doses of irradiation demonstrate lowered diastolic and systolic pressures when compared to the control individuals. Physiological impairment at a period of 36 months after exposure still demonstrates statistically significant deviation from control values. Heart rate measurements showed few significant differences between irradiation survivors or between irradiation survivors and unirradiated controls. Where these significant deviations were observed the heart rate of control individuals decreased to a point significantly less than that of several survivor groups. This was the first observation of this nature and will be carefully scrutinized for its behavior in the next test period. Mortality rates have yet to reach a sufficient level for accurate statistical probit analysis of effects of embryonic irradiation on life span. Only a few of the survivor groups have cumulative mortality rates which exceed the mortality rates of the control groups. It is possible that the prenatal irradiation treatments acted as a selective process, eliminating those which would have died during their juvenile life. Categorical breakdown of mortality causes still does not supply sufficient information to project the effects of embryonic irradiation upon the reproductive, somatic, or the interaction of the effects upon these two systems.
Author (NSA)

N66-20512# Max-Planck-Institut für Biophysik, Frankfurt am Main (West Germany).
RADIATION EFFECTS ON LIVING TISSUES AND ORGANISMS. SERIES C: BIBLIOGRAPHIES
W. Stahlhofen, comp. Apr. 1965 248 p refs In GERMAN; ENGLISH Summary
(AED-C-04-18)

A list is presented of 820 references to recent publications on radiation effects on living tissues and organisms. Author, corporate source, and subject indexes are included.
NSA

N66-20515# Brookhaven National Lab., Upton, N. Y. Biology Dept.
THE RADIOSENSITIVITY OF *MARCHANTIA* THALLI AS RELATED TO NUCLEAR AND INTERPHASE CHROMOSOME VOLUMES
Morton W. Miller and Arnold H. Sparrow [1965] 6 p refs Presented at the Symp. on Mutational Process, Prague
(Contract AT(30-2)-GEN-16)
(BNL-9611; CONF-650814-3) CFSTI: HC $1.00/MF $0.50

Studies on the comparative radiosensitivities of plants have shown that the size of the nucleus and/or the chromosomes is an important factor in determining tolerance. Results are reported from an attempt to determine the radiosensitivity of cells within multicellular structures, the gemmae and thalli of *Marchantia polymorpha* L., a thalloid liverwort. The gemmae are asexual reproductive propagules produced by the haploid thallus within a gemmae cup. The bryophytic capacity for cellular totipotency is well known and the gemmae and thalli Marchantia have this capacity for proliferation; it appears that if an intact cell has not lost is reproductive integrity it will produce a vegetative outgrowth in the absence of other inhibitory factors. The nuclear volume of apical cells ($98.9 \pm 4.9\mu^3$) of Marchantia gemmae was much larger than the nuclear volume of other vegetative cells capable of producing a vegetative outgrowth ($54.7 \pm 3.3\mu^3$). The lethal x radiation exposures for the apical and non-apical vegetative cells of the gemmae were approximately 29 kR and 55 kR respectively. The energy absorbed by the gemminiferous apical and non-apical vegetative cells at the 100% lethal exposure is $18.3 \pm 0.9 \times 10^6$ev and $19.2 \pm 1.6 \times 10^6$ev•per chromosome, respectively. Thus actual tolerance is not different. These amounts of energy are approximately 4.7 times greater than the reported average amount of energy absorbed per chromosome for growing herbaceous angiosperms at the 100% lethal exposure. The nuclear volumes for apical and non-apical vegetative cells of Marchantia thalli are approximately 129 μ^3 and 12 μ^3, respectively. Apical and non-apical proliferation in

thalli are eliminated by exposures of 10 kR and 55 kR, respectively. The energy absorbed at the 100% lethal exposure by the most resistant cells of the thallus was 4.0×10^6 ev per chromosome, which is insignificantly different from the amount of energy absorbed by herbaceous angiosperms irradiated at the 100% lethal exposure. Author (NSA)

N66-20550# Atomic Weapons Research Establishment, Aldermaston (England)

THE HAZARDS TO THE HUMAN EAR FROM SHOCK WAVES PRODUCED BY HIGH ENERGY ELECTRICAL DISCHARGES

Pamela M. Golden and R. Clare Aug 1965 24 p refs (AWRE-R-1165) HMSO: 6s

Recent years have produced a proliferation of multiple condenser banks in connection with plasma physics and other research. Examples of other electrical discharges at high energy are spark gaps and exploding wire devices, all of which are liable to produce shock waves which constitute a further possible hazard. Hitherto the energy from such sources has been regarded as being of the same level as that from small arms fire, and no particular precautions, other than using conventional ear muffs, defenders or keeping at an arbitrary safey distance, have been considered necessary. The blast pressures developed by a high energy electrical discharge as received by a transducer mounted in a large baffle normal to the blast were measured and compared with those received by a model ear. It is shown that the pressures developed at the drum of the ear are in excess of those in air and can cause damage to the ear unless precautions are taken. There is a high proportion of large amplitude noise at audio frequencies present which many protective devices transmit. Measurements with samples of these show that there is some attenuation of pressure and it is probable that a muff protector is more efficient than an ear defender which consists of a solid plug with a small axial air channel. Author (NSA)

N66-20573# Naval School of Aviation Medicine, Pensacola, Fla

TOWARD AN OPTIMAL METHOD OF EQUATING SUBGROUPS COMPOSED OF DIFFERENT SUBJECTS

Robert J. Wherry, Jr. 4 Aug. 1964 103 p refs *Its* Monograph no. 9

(AD-627258) CFSTI: HC $4.00/MF $0.75

Whenever two or more individuals are to be compared on the basis of scores obtained from different evaluators, certain differential non-equivalence errors should be removed from their scores. A rationale for understanding how these non-equivalence errors affect a set of scores is presented. Various non-equivalence errors such as 'leniency,' 'exaggeration,' 'floor and ceiling,' 'differential treatment of extremes,' and various 'composition' effects such as differential emphasis of factors, reliability, and validity are included in the rationale. The confounding effect of differential spread of ability and differential average ability among subgroups is discussed. The problem of optimally removing non-equivalence errors involves finding the best variable or composite of variables to use as a 'standardization' variable against which the data from different evaluators may be equated. Two methods for accomplishing this goal are described. The superiority of a nonlinear solution, rather than a linear solution was demonstrated. Cross validation results are also presented. Author (TAB)

N66-20642# Naval Air Development Center, Johnsville, Pa.

RESPONSE DURATION AND INTERRESPONSE TIME UNDER FR5 AND VR5 SCHEDULES AND SUBSEQUENT EXTINCTION

Robert M. Herrick 8 Nov. 1965 19 p refs (NADC-MR-6505, AD-625324) CFSTI: HC $1.00/MF $0.50

With respect to press duration, t, and interresponse time, i, rats under FR5 and VR5 schedules and subsequent extinction behaved similarly. During acquisition days, mean t and mean i decreased, and mean response rate increased. Compared with acquisition, in extinction (a) the relative frequency of short t's decreased, (b) either the relative frequency of short is decreased or the relative frequencies of both short and long is increased. Variations in several central tendency and variability measures of t and i within the first extinction day were greater than variations within the last acquisition day. Median duration of the first press or of the first interresponse time following water-dipper operation was relatively long ('postreinforcement pause'). Thereafter, both median t and median i, as function of ordinal number following dipper operation, tended to remain relatively constant. Within an FR5 or VR5 cycle, response rate changed abruptly from zero to a constant rate. During extinction, periods of responding at a normal or slighly subnormal rate alternated with periods of little or no responding Author (TAB)

N66-20646# Istituto Superiore di Sanita, Rome (Italy) Laboratori di Fisica.

MORPHOLOGICAL DESCRIPTION OF A BACTERIOPHAGE OF EXTRAORDINARY DIMENSIONS, ACTIVE ON *B. MEGATHERIUM* [DESCRIZIONE MORFOLOGICA DI UN BATTERIOFAGO DI ECCEZIONALI DIMENSIONI, ATTIVO SU *B. MEGATHERIUM*]

C. Frontali and F. Tangucci 5 Oct. 1965 25 p refs (ISS-65/30) CFSTI: HC $1.00/MF $0.50

A phase of unusual dimensions, active on B.megatherium is described. It has been identified in lysates of B.megatherium together with phage α, but, so far, it has not been possible to culture it separately. It has been possible to describe the contractile mechanism of the tail as a result of morphological studies done with the aid of the electron microscope. The head, octahedral in shape (a shape never before observed in other viruses) has an edge 0.14 μ long. Author

N66-20647# Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.

QUANTUM MECHANICS AND MOLECULAR BIOPHYSICS [MECCANICA QUANTICA E BIOFISICA MOLECOLARE]

M. Ageno 17 Dec. 1965 58 p refs *In* ITALIAN; ENGLISH Summary Presented at a Conf. held at Rome Univ., 17 Dec. 1965

(ISS-65/46) CFSTI: HC $3.00/MF $0.50

This report discusses the limits within which it could be necessary to use quantum mechanics to understand the phenomena which take place in living cells. After using two examples to show that quantum mechanics sometimes leads to conclusions different from those of classical mechanics even in macroscopic systems, we propose to examine such a theory to see if it could be used to describe biological phenomena. The calculations concerning this problem made by Wigner and Landsberg, who have reached negative conclusions, are examined critically. Having shown why such theories are not applicable in the case of living organisms, we demonstrate that quantum mechanics effectively possesses the necessary means to also describe complex biological phenomena such as cellular reproduction. Thus we can undertake with confidence the application of quantum mechanical concepts in order to explain particular cellular phenomena. Author

N66-20649# Argentina. Comision Nacional de Energia Atomica, Buenos Aires.

LABELLED TRIIODOTHYRONINE IN THE STUDY OF THE THYROID FUNCTION BY MEANS OF ITS USE *IN VITRO* [TRIYODOTIRONINA MARCADA EN EL ESTUDIO DE LA FUNCION TIROIDEA MEDIANTE SU USO *IN VITRO*]

Hector Forcher and Osvaldo Jorge Degrossi 1965 17 p refs In SPANISH
(CNEA-166) CFSTI: HC $1.00/MF $0.50

Results are presented of an *in vitro* study of the thyroid function by means of the fixation of triiodothyronine I^{131} by a resin of anionic interchange (Amberlita IRA 400) and by polyurethane sponge. With the obtained results, it was possible to differentiate between euthyroidism and hypo- and hyperthyroidism. The correlation between both methods was excellent. Transl. by R.N.A.

N66-20656# Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.
GLYCOGEN PARTICLES SEEN IN THE ELECTRON MICROSCOPE [GRANULI DI GLICOGENO AL MICROSCOPIO ELETTRONICO]
G. Rosati 5 Oct. 1965 24 p
(ISS-65/33) CFSTI: HC $1.00/MF $0.50

Liver and striated muscle glycogen particles were examined in the electron microscope. Enzymatic treatment was applied to them. Liver glycogen particles disappeared from the sections after treatment by all the enzymes used, whereas, the striated muscle particles remained intact. Author

N66-20678# California Univ., Berkeley. Sanitary Engineering Research Lab.
A STUDY OF FUNDAMENTAL FACTORS PERTINENT TO MICROBIOLOGICAL WASTE CONVERSION IN CONTROL OF ISOLATED ENVIRONMENTS Eighth Quarterly Report, Feb. 1964–Feb. 1965
Clarence G. Golueke, William J. Oswald, and Henry K. Gee 31 Mar. 1965 54 p refs *Its* Sci. Rept.-2
(Contract AF 19(628)-2462)
(SERL-65-14; AFCRL-65-496, AD-627036) CFSTI: HC $3.00/MF $0.50

The report describes experiments with an algatron system (i.e., one that involves the use of a mechanically rotated culture) and presents a design of a system to support two men. An average algae yield of 1500 mg/l/day was obtained at inner and outer light intensities of 225 and 270 ft-c, respectively, the maximum light intensities obtainable with the available light source. From 87 to 91% of incoming volatile solids were stabilized at detention periods from 0.25 to 1 day. No relation was noted between detention period and removal of P, Mg, Ca, and N. Low temperature distilled water yield was 1.83 ml/sq m/min (ambient relative humidity, 80%). Water losses from an algal culture and from a carbon black suspension were closely similar, and that from both, about 5% greater than from water alone. Design estimates based on the experimental conditions indicate that a maximum of 11 algatrons, each 18 in. in diameter and 4 ft. long would be required per man for gas exchange, waste treatment, and water recovery (about 200 liters/day). Author (TAB)

N66-20691# United Kingdom Atomic Energy Authority, Research Group
ACTION OF TRISODIUM MONOCALCIUM SALT OF DIETHYLENE-TRIAMINE-PENTA-ACETIC ACID (Ca D.T.P.P.A. Na_3) IN HUMAN LEAD POISONING
S. Martin, C. Boudene, R. Truhaut, and C. Albahary Sep. 1965 22 p refs Transl. into ENGLISH from Arch. Maladies Profess. Med. Trav. Securite Sociale (Masson), v. 25, no. 7-8, 1964 p 407–418
(AERE-TRANS-1042) HMSO: 2s 6d

Investigations on more than 100 subjects, resulting in 1200 estimations of urinary lead, were made to test the effectiveness of diagnosing and treating lead poisoning. The trisodium monocalcium salt of diethylene-triamine-pentaacetic acid, Ca D.T.P.A. Na_3, was used, and a comparison made with the disodium monocalcium salt of ethylene-diamine-tetra-acetic acid, Ca E.D.T.A. Na_2. Subjects tested included: (a) a control group, (b) workers with lead colic, (c) workers exposed to toxic hazards, (d) workers exposed to irregular hazards, (e) workers exposed to minor hazards, and (f) people with alimentary lead poisoning. The chelating agent was administered intravenously, by perfusion, and by the intramuscular route. It was concluded that the direct intravenous route is at present the best method of administration. The Ca D.T.P.A. Na_3 was found to bring about plumburia a little more markedly than did Ca E.D.T.A. Na_2. The same principles in use and in precautions for the trisodium salt as for the disodium salt are recommended. N.E.N.

N66-20695# United Kingdom Atomic Energy Authority, Harwell (England). Research Group.
DISTRICT BIOLOGICAL MONITORING AT A.E.R.E., HARWELL: RESULTS FOR 1963 AND 1964
A. Morgan, A. Homes, H. D. Vandervell, and W. L. Brooks Nov. 1965 23 p refs
(AERE-R-5015) HMSO: 3s

The results of measurements made during 1963 and 1964 on samples of milk, soil, mat and herbage collected in the vicinity of the Atomic Energy Research Establishment are described. Levels of strontium-90 and cesium-137 in milk, sampled at six farms within three miles of A.E.R.E., were no greater than would be expected from world-wide fallout and, at most, only correspond to about 5 and 3 per cent of the respective derived working limits, appropriate for members of the public living in the neighborhood of controlled areas. Levels of iodine-131 in milk remained below the limit of detection (20 pCi/litre) throughout this period. Measurements of strontium-90 and cesium-137 in soil, mat and herbage, collected at a number of sites within three miles of A.E.R.E., showed that the total deposition of these fission products could be accounted for by fallout from the testing of nuclear weapons. It may be concluded that operations at A.E.R.E. have not affected significantly the levels of radioactive contamination in its immediate neighborhood. Author

N66-20700# United Kingdom Atomic Energy Authority, Harwell (England). Research Group.
THE ADVANCED COURSE IN THE PRINCIPLES OF RADIATION PROTECTION, PART I
W. J. Whitehouse and E. D. Dyson Nov. 1965 28 p refs
(AERE-R-5084) HMSO: 3s 6d

This report reviews the background, history and initial organization of the courses, and summaries their subject matter, including lectures, practical work, visits, and films. The reasons for arranging and presenting the courses, in the way that was adopted, are discussed. Author

N66-20717# Stanford Univ., Calif.
THE RESPONSES OF SIMULATED DETACHED RETINA TO VARIOUS DYNAMIC FORCES
John W. Silvis (M.S. Thesis) Aug. 1965 32 p refs
(Contract AF 33(608)-1278)
(AD-624662) CFSTI: HC $2.00, MF $0.50

The experiments suggest that the application of rotational vibrations and/or the application of approximately a 2G force field could greatly enhance the natural settling of a detached retina in the clinical case and give a firm reattachment around the tear, eliminating the need for surgical intervention. The model studies to date substantiate the feasibility of a migratory reattachment under rotational vibration and/or centrifugal forces and justify proceeding with the next phase of the research project—that of completing the model centrifugal tests

and then studying the response of detached retinas in animals by rotational vibrations and/or centrifugal forces including the effectiveness of various osmolar agents on migratory settling. Author (TAB)

N66-20803# Chicago Univ., Ill.
USAF RADIATION LABORATORY Quarterly Progress Report
Kenneth P. Du Bois et al 15 Oct. 1965 47 p refs
(Contract AF 41(609)-1693)
(QPR-57; AD-623599) CFSTI: HC $2.00/MF $0.50

The report concerns studies on the scope and the nature of the inhibitory affect of X-radiation on the biosynthesis of enzymes in the microsomal fraction of the liver. The results of the research summarized in the report indicate that radiation specifically inhibits the process responsible for the development of a sex difference in hepatic detoxification enzymes in rats and that this effect is mediated through some area in the central nervous system. TAB

N66-20825# Naval Training Device Center, Port Washington, N. Y.
AN EVALUATION OF VARIOUS TACHISTOSCOPIC AND WEFT TECHNIQUES IN AIRCRAFT RECOGNITION Final Report
Edward I. Gavurin Nov 1965 28 p refs
(NAVTRADEVCEN-IH-40; AD-626468) CFSTI: HC $2.00/MF $0.50

The study evaluated some of the basic assumptions, techniques and procedures underlying current aircraft recognition training. The effectiveness of the WEFT (analytical) vs. the tachistoscopic approach to training, the relative merits of a successive vs. a simultaneous presentation of stimuli, and the role of image exposure time were investigated. Recommendations for current training and additional research are included. Author (TAB)

N66-20827# California Univ., Los Angeles. School of Medicine.
1, 1-DIMETHYLHYDRAZINE EFFECTS ON CENTRAL EXCITATORY AND INHIBITORY MECHANISMS IN CATS Final Report, Jan. 1964-Jun. 1965
M. D. Fairchild and M. B. Sterman Wright-Patterson AFB, Ohio, AMRL, Aug. 1965 41 p
(Contract AF 41(609)-2329)
(AMRL-TR-65-142; AD-623786) CFSTI: HC $2.00/MF $0.50

Experiments, using cats with chronically implanted brain electrodes, were performed to explore the influence of subconvulsive doses of 1, 1-dimethylhydrazine (UDMH) on certain excitatory and inhibitory mechanisms in the central nervous systems (CNS). The cats were stimulated electrically in the midbrain reticular activating system, the basal forebrain inhibitory area, and both areas simultaneously while the animal was tested for performance in a positively reinforced experimental situation. UDMH was compared with amphetamine, chlorpromazine and phenobarbital both in the presence and absence of CNS stimulation. UDMH acted in a manner similar to chlorpromazine in subconvulsive doses in these tests. The most interesting and consistent effect of UDMH was to abort performance when the basal forebrain inhibitory area was stimulated. The animals resumed performance when the stimulus was terminated. UDMH has detectable CNS effects at doses well below convulsive levels. Author (TAB)

N66-20832# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE UNIVERSE UNDER THE MICROSCOPE
A. L. Dmitriyev 3 Jan. 1966 14 p Transl. into ENGLISH from Vokrut Sveta (USSR), no. 9, 1963 p 37-39
(FTD-TT-65-1341/1+2+4; AD-627119) CFSTI: HC $1.00/MF $0.50

A narrative approach is taken to the various biological and exobiological problems associated with man's penetration of space. Several viewpoints are reviewed, the possibility of extraterrestrial life is discussed, and the findings from experimental simulations are summarized. D.T.

N66-20833# Air Force Systems Command, Bedford, Mass. Electronic Systems Div.
IMMEDIATE RETRIEVAL OF VERBAL SERIES AS A FUNCTION OF STIMULUS GROUPING
William H. Sumby Oct. 1965 21 p refs
(ESD-TR-64-554; AD-627260) CFSTI: HC $1.00/MF $0.50

Four questions were investigated. (1) Is the learning rate enhanced if disconnected words are presented visually in clusters, e.g., pairs of quadruples, rather than individually and successively? (2) If changes do occur, and in a lawful fashion, can such differences be accounted for adequately in terms of the development of differential inter-item association strengths as a function of such stimulus arrangement? (3) What differences, if any, become evident in free-recall serial position curves by such organization? (4) How is the order of responding affected by the clustering? It was found that clustering will enhance learning rate, but that the limits are extremely restricted. It was revealed that such stimulus arrangements do affect the buildup of differential inter-item association strengths, but this again is within the limits alluded to above. Apparently, differential associative strengths developed by clustering markedly affect the shapes of the serial position curves for the different groups. Clustering affects the strategy an individual adopts in responding. Such became evident in the typically different orders of responding for the various conditions. Author (TAB)

N66-20849# Joint Publications Research Service, Washington, D. C.
BIOLOGICAL LABORATORY IN ORBIT
N. M. Sisakyan, V. N. Pravestskiy, and B. B. Yegorov 17 Mar. 1966 16 p Transl. into ENGLISH from Krasnaya Zvezda (Moscow), 2 Mar. 1966 p 3
(JPRS-34-600; T-66-31039) CFSTI: $1.00

The physiological experiments being carried out on the two dogs in the satellite Kosmos 110 in March 1966 are reported. The state of the neuro-reflex regulation of the cardiovascular system was investigated by means of implanted electrodes. The arterial pressure, heart biocurrents, the carotid artery pulse curve, and the heart's mechanical operation were measured. The cabins for the dogs are described, and also the feeding arrangements, in which the food was fed directly into the stomach by means of pneumatic devices. Radiosensitivity of biological specimens, and the radiation doses and their distribution in the cabin were measured, and types of shielding were investigated. It was reported that data was arriving satisfactorily. N.E.N.

N66-20855# United Kingdom Atomic Energy Authority, Harwell (England). Health Physics and Medical Div.
STUDIES ON THE RETENTION AND METABOLISM OF INHALED METHYL IODIDE. 3: METABOLISM OF METHYL IODIDE
A. Morgan, D. J. Morgan, J. C. Evans, and B. A. J. Lister Dec. 1965 29 p refs
(AERE-R-5013)

A number of experiments are reported in which methyl iodide, labelled with iodine 132, was administered by inhalation to four volunteer subjects to study the metabolism of the retained material. The fate of iodine 132, administered in this way appears to be very similar to that of radioiodine administered orally as inorganic iodide. This indicates that in vivo, methyl iodide is broken down very rapidly and the organically bound iodine converted to the iodide ion. This conclusion is supported by a comparison of thyroid uptake and urinary excretion rates observed after administration of iodine 132 to the same subject by (a) inhalation as methyl iodide and (b) ingestion as sodium iodide. Apart from small differences, due to the longer time taken for the ingested radioiodine to be absorbed, the metabolism appeared to be identical for all practical purposes. The average radiological dose to the thyroid, in these studies with iodine 132, was less than 20 mrem per experiment. Author

N66-20858# George Washington Univ., Washington, D. C. Human Resources Research Office.
SHORT-TERM MEMORY: AN ANNOTATED BIBLIOGRAPHY
Donald Reynolds and Richard D. Rosenblatt Dec. 1965 83 p refs
(Contract DA-44-188-ARO-2)
(HUMRRO-TR-65-13; AD-627394) CFSTI: HC $3.00/MF $0.75

The bibliography is divided into 12 areas as follows: (1) Information Theory; (2) Proactive and Retroactive Interference and Interpolated Activities, (3) Set, Subject-Strategies, and Coding Techniques; (4) Paired-Associate Studies; (5) Simultaneous Listening and Memory Span Studies; (6) Rate and Mode of Stimulus Presentation; (7) Rate and Order of Recall, and Serial and Sequential Tasks; (8) Methods, Theory, and Review Articles; (9) Meaningfulness, Degree of Learning, and Stimulus Organization; (10) Age Differences; (11) Comparisons of Short-Term Memory and Long-Term Memory; and (12) Perceptual Studies. There are 170 articles annotated in the bibliography and extensive cross-indexing to facilitate location of articles. Although the earliest study included is dated 1910, the majority of articles were published in the period from 1959 through 1964. Author (TAB)

N66-20879# Midwest Research Inst., Kansas City, Mo.
OBJECTIVE TESTS FOR USE IN THE TECHNOLOGY OF COMPRESSED FOODS Final Report, Jun. 1963–Jun. 1964
E. R. Morris Natick, Mass., Army Natick Labs., Sep. 1965 109 p refs
(Contract DA 19-129-AMC-130(N))
(FD-26; AD-624869) CFSTI: HC $4.00/MF $0.75

Objective methods are described for determining specific physical, chemical and microbiological properties of compressed food bars. The suitability of these methods was demonstrated by application to fresh and aged (3 months at 100°F) bars prepared from meat, fruit, cereals, vegetables, and dairy products and which represented broad concentration ranges of moisture, fat, protein, carbohydrate, and common approved chemical additives. Author (TAB)

N66-20880# Washington Univ., St. Louis, Mo. Dept. of Environmental and Sanitary Engineering
WATER RECOVERY FROM HUMAN LIQUID WASTES BY DISTILLATION AND CHEMICAL OXIDATION
Michael James Ryan (M. S. Thesis) Jan. 1966 116 p refs
(Contract AF 33(608)-1292)
(AD-624671) CFSTI: HC $4.00/MF $0.75

The recovery of potable water from human urine by atmospheric and vacuum distillation and by chemical oxidation was investigated utilizing the parameters of organic carbon, BOD, and COD. Linear relationships existed between organic carbon, BOD, and COD for the human urine samples studied. These relationships were as follows: organic carbon to BOD ratio equals 1.34, BOD to COD ratio equals 0.52, and organic carbon to COD ratio equals 0.64. The vacuum distillation of urine yielded a water suitable for human consumption. The chemical oxidation of human urine by ozonation was not found to be a practical means of treatment and water recovery due to the excessive quantities of ozone required. Author (TAB)

N66-20884# Lincoln Lab., Mass. Inst. of Tech., Lexington
GRAPHICS Semiannual Technical Summary Report, 1 Jun.–30 Nov. 1965
Jack I. Raffel 30 Nov. 1965 15 p refs
(Contract AF 19(628)-5167; ARPA Order 691)
(ESD-TDR-65-561; AD-625567) CFSTI: HC $1.00/MF $0.50

Recent efforts in the Graphics Program have concentrated on the development of a Graphical Service System, display routines compatible with the new time-sharing system, APEX, and a universal translator, VITAL, which will be used to generate a graphical compiler. Programs for clipping and approximating conic segments have been developed and initial experiments which apply graphical techniques to procedure description have been attempted. Author (TAB)

N66-20932*# National Aeronautics and Space Administration, Washington, D. C.
SOIL MICROBIOLOGY AND ITS CURRENT PROBLEMS [POCHVENNAYA MIKROBIOLOGIYA I YEYE OCHEREDNYYE ZADACHI]
Ye. N. Mishustin Mar. 1966 30 p refs Trans. into ENGLISH from Tr. Inst. Mirkobiol., Akad. Nauk SSSR (Moscow), v. 1, no. 1, 1965 p 155-175
(NASA-TT-F-414) CFSTI: HC $0.35/MF $0.50 CSCL 02C

Problems in the afforestation of grassland and wasteland are discussed from the viewpoint of soil microbiology, including aspects of increase in grain and other harvests by optimum soil management. Symbiotic association of fungi and higher organisms is suggested for growth promotion of young tree plantings, with such soil to be provided by mycorhiza nurseries. Grassland conservation cropping and artificial humus enrichment by microbe inoculation and suppression of aerobic bacteria are discussed in their theoretical and practical aspects. The Waksman theory of humus formation in the soil by polymerization of lignin and bacterial proteins is disputed, and the theory of combination of protein matter with uronqnic acids from pectin decomposition is advanced instead. A brief review of microbiological soil testing is included, with tabulated data on microbe contents of various types of soil.
Author

N66-20935*# Webb Associates, Yellow Springs, Ohio.
A SYSTEMATIC STUDY OF THE HUMAN SWEAT RESPONSE TO ACTIVITY AND ENVIRONMENT IN THE COMPENSABLE ZONE OF THERMAL STRESS Final Report
W. V. Blockley Dec. 1965 128 p refs
(Contract NAS9-3356)
(NASA-CR-65260) CFSTI: HC $4.00/MF $1.00 CSCL 06S

The interrelationships between several physiological variables involved in thermal regulation and their effect on performance reserve were examined. Environments varied from cool to oppressively warm, and three levels of activity and five temperatures for each activity level were selected. Test results are analyzed, and the data tabulated. Among the conclusions drawn from the findings are the following. (1) The sweat

rate and skin temperature are linearly related. (2) The sweating threshold is highly variable in terms of surface skin temperature, being dependent upon metabolic rate, skin thermal resistance, and skin-fold thickness. (3) Voluntary dehydration was successfully eliminated by pre-experiment fluid intake. Body weight can be maintained even with high sweat rates by starting water intake early and continuing with frequent drinks at brief intervals. (4) Environment–activity combinations equal in P4SR index are not necessarily equal in physiological strain.
N.E.N.

N66-20978# Joint Publications Research Service, Washington, D. C.

EFFECT OF PROPHYLACTIC ADMINISTRATION OF A MUCOPOLYSACCHARIDE (MPS) PREPARATION ON HEMOPOIESIS AND SURVIVAL OF ANIMALS FOLLOWING X-RAY IRRADIATION

A. S. Shitikova. 14 Mar. 1966. 9 p. refs. Transl. into ENGLISH from Med. Radiol. (Moscow), v. 10, no. 12, Dec. 1965, p. 44–46.
(JPRS-34550; TT-66-30990) CFSTI: $1.00

Prophylactic administration of a mucopolysaccharide (MPS) preparation made from the spleen of cattle is found to have a favorable effect on the proliferation and maturation of hemopoietic organs in irradiated rabbits. The MPS administration results in less reduction of bone marrow cells on the seventh day following irradiation, and lesser changes in peripheral blood are evidenced at the height of radiation sickness. The absolute number of erythroblasts and basophilic normoblasts on the 21st day after irradiation was 216% of the initial level, whereas in the control rabbits these numbers did not reach the initial levels. In addition to studies with rabbits, survival rate of irradiated mice who received MPS injection was found to be higher than for those who received no injection. In the control group, there was a 50% mortality rate on the ninth day following irradiation, and in the MPS-group half of the mice did not expire until the 13th day.
M.W.R.

N66-20981# Institut d'Embryologie Experimentale, Nogent-Sur-Marne (France).

STUDY OF RADIATION EFFECTS ON THE EMBRYO AND ITS ORGANS *IN VIVO* AND *IN VITRO*, 1 OCTOBER, 1964–30 SEPTEMBER, 1965 [ETUDE DE L'EFFET DES RAYONNEMENTS SUR L'EMBRYON ET SES ORGANES *IN VIVO* ET *IN VITRO*, 1.10.1964–30.9.1965]

Brussels, EURATOM, Jan. 1966. 20 p. refs. In FRENCH; ENGLISH summary.
(Contract EURATOM-039-64-10 BIOF)
(EUR-2643.f) CFSTI: HC $1.00/MF $0.50

The research findings set out in this report relate to various aspects of radiobiology. They concern the action of X-rays on germ-cells, the migratory power of these cells, and DNA synthesis in gonocytes studied by means of labelling with tritiated thymidine. The action of X-rays on the physiology and respiratory metabolism of the embryo intestine and heart was investigated extensively. Certain biochemical X-ray effects on coenzyme I and its glycohydrolase were revealed. The mode of action of chemical radioprotective agents, such as cysteamine, was studied on an embryonic organ cultivated *in vitro*. Certain early radiation lesions were detected by electron microscopy. The radiosensitivity of the natural inductor in amphibians was measured, as also was the teratogenous action of radiomimetic substances such as nitrogenated mustard gas. Irradiation experiments were carried out on cancerous nodules cultivated *in vitro* and a number of regeneration problems solved with the aid of X-ray irradiations.
Author

N66-21007*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

DESIGN AND FABRICATION OF A TRACE CONTAMINANT REMOVAL SYSTEM FOR APOLLO Phase I Report, 1 Sep. 1964–15 Mar. 1965

15 Mar. 1965. 237 p. refs.
(Contract NAS9-3415)
(NASA-CR-65278; M-58-65-1) CFSTI: HC $6.00/MF $1.25 CSCL 06K

Eighty-eight potential spacecabin trace contaminants were classified according to method of removal. Candidate sorbents and catalysts were selected and subjected to experimental evaluation. A Polanyi potential plot for the prediction of charcoal adsorption was developed experimentally, under Apollo cabin atmosphere conditions. Acidic and basic sorbents, a solid oxidant, and catalysts were experimentally evaluated for removal and/or conversion of contaminants shown by the potential plot not to be adsorbed on a specified amount of charcoal. Experimental data described above were used to develop an optimum contaminant removal system. This system was designed in detail, and test planning was accomplished in sufficient depth to begin the second phase of the program.
Author

N66-21015*# Ling-Temco-Vought, Inc., Dallas, Tex. Astronautics Div.

UNMANNED EXTRAVEHICULAR ENVIRONMENTS OPERATION QUALIFICATION TEST OF THE GEMINI ELSS (EXTRAVEHICULAR LIFE SUPPORT SYSTEM) Test Plan

F. H. Goodnight and T. E. Mouritsen. 10 Sep. 1965. 73 p. refs. *Its* Rept.-00690
(Contract NAS9-3414)
(NASA-CR-65279) CFSTI: HC $3.00/MF $0.75 CSCL 06K

The test plan for the unmanned portion of the extravehicular environments operation qualification test program for the Gemini Extravehicular Life Support System (ELSS) is described. The test facility, special equipment, and instrumentation are also described. Simulation of environments will include: (1) vacuum, (2) solar radiation at 1 solar constant, (3) heat sink of deep space, and (4) simulation of crewman metabolic sensible and latent heat loads. The plan calls for the unit to be subjected to normal operational modes up to the unit's design limits and to the following simulated failures: (1) umbilical failure, (2) simulated suit penetration, and (3) heat exchanger failure. Test data will be recorded during the testing, to provide documentation of acceptable operation of the system within specified parameters. The data processing and check procedures and test procedures to be used are also discussed.
L.S.

N66-21016*# Ling-Temco-Vought, Inc., Dallas, Tex. Astronautics Div.

THERMAL PERFORMANCE TEST OF THE A-2H APOLLO EXTRAVEHICULAR MOBILITY UNIT, VOLUME I

F. G. Goodnight, R. O. Pearson, and R. J. Copeland. 15 Mar. 1965. 393 p. refs. *Its* Rept.-00638
(Contract NAS9-3414)
(NASA-CR-65280) CFSTI: HC $7.00/MF $2.00 CSCL 06K

The results and analyses of the results of three experiments, II-a, II-b, and II-c, of a series of twelve space suit thermal evaluation tests performed to evaluate the performance and thermal response of an Apollo Extravehicular Mobility Unit (space suit), EMU, in space and lunar environments are presented. The test facility, equipment, instrumentation, test procedures, data recording, and test variances are described and discussed. The experiments subjected a prototype Apollo EMU containing a thermal dummy to low pressure and simulated extreme thermal environments of space and the lunar surface. Test objectives included determination of suit temperatures and pressures as a function of

time, heat load, and position; net suit heat gain or loss; effects of suit contact with spacecraft surfaces; suit gas leakage; and other objectives. Simulation of the thermal and pressure environments during the tests included astronaut body temperatures, a deep space heat sink, solar heat flux, lunar surface radiation, hot and cold spacecraft surfaces, vacuum, and a portable life support system. Photographs of the dummy, test setups, and equipment are presented, along with tables of data, and graphs. L.S.

N66-21019*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
DESIGN AND FABRICATION OF A TRACE CONTAMINANT REMOVAL SYSTEM FOR APOLLO Phase II Report, Mar.–Sep. 1965
23 Nov. 1965 116 p refs
(Contract NAS9-3415)
(NASA-CR-65299; M-58-65-2) CFSTI: HC $4.00/MF $0.75 CSCL 06K

The hardware designed was constructed and evaluated. The evaluation was done in three steps: (1) a bench test of the main sorbent canister alone, (2) a bench test of the catalytic oxidizer—post sorbent assembly, and (3) the closed-chamber testing of the complete system under simulated Apollo cabin atmosphere conditions in a 200 ft^3 volume. In this report the hardware is described, together with the test procedures, apparatus, and results. The installation of the contaminant removal system in the Apollo Command Module is described, together with the additional hardware development required prior to entering the flight qualification phase. Author

N66-21020*# AiResearch Mfg. Co., Los Angeles, Calif.
PERFORMANCE EVALUATION TEST RESULTS: SPACECRAFT CABIN MOISTURE-REMOVAL SYSTEM 630275-1
V. Vidugiris 20 Oct. 1965 58 p ref
(Contract NAS9-4238)
(NASA-CR-65286; SS-3929) CFSTI: HC $3.00/MF $0.50 CSCL 06K

Performance evaluation tests were conducted to determine the performance of a spacecraft regenerable cabin moisture-removal system under 14-day spacecraft mission simulation, with varying moisture injection rates. All of the test objectives, i.e., the determination of 1) the amount of moisture that the system adsorbs, (2) dew points in and out of the system and the cabin dew-point profile, (3) bed temperatures as a function of time, (4) cycle-time effects, and (5) extended cycling effects were met, and the results are presented. Numerous graphs are given; and schematic diagrams for the cabin moisture-removal system, for the pressure transducer and dew-point analyzer installation, and thermocouple installation are shown, along with photographs of various parts of the test setup. L.S.

N66-21094*# Allied Research Associates, Inc., Concord, Mass.
SUMMARY REPORT ON A REVIEW OF BIOLOGICAL MECHANISMS FOR APPLICATION TO INSTRUMENT DESIGN, VOLUME III
J. Healer and M. Messer, ed. Washington, NASA, Mar. 1966 109 p refs
(Contract NASw-535)
(NASA-CR-415) CFSTI: HC $1.40/MF $0.75 CSCL 06D

This study is concerned with the investigation of the function, structure and operational principles of biosensor mechanisms throughout the animal world, the integrated role of the sensor in a total regulatory control loop, engineering analyses of sensor operation, and the evaluation of this data in terms of present and anticipated instrumentation requirements for a variety of applications. Similarities and differences between these bio-transducers and their physical counterparts were investigated with particular emphasis paid to studying those characteristics of biosensors which are not currently used in instrumentation. Instrumentation thus conceived may have application in a variety of areas ranging from hydrospace to interplanetary space. The problems and conditions encountered in spaceflight and exploration have created unprecedented instrumentation requirements. Some of these include extraterrestrial life detection, trace contaminant monitoring in a close environment, orbital docking, physiological measurements, communication problems, etc. Many astronaut tasks can be most economically performed only by very careful man-machine integration. The astronaut's sensory input channels are overloaded making desirable a communication scheme whereby the external sensors are bypassed en route to the central nervous system. Understanding the various sensory systems offers possibilities of using standard sensory channels in different or unorthodox ways. Author

N66-21098*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
REVIEW OF RESEARCH AND METHODS FOR MEASURING THE LOUDNESS AND NOISINESS OF COMPLEX SOUNDS
Karl D. Kryter Washington, NASA, Apr. 1966 59 p refs
(Contract NASw-1102)
(NASA-CR-422) CFSTI: HC $0.85/MF $0.50 CSCL 05E

A detailed review of the research and concepts underlying the evaluation of the subjective attributes of the loudness and noisiness of complex sounds is presented. Knowledge about the attribute of loudness has reached the stage where two procedures for the calculation of the loudness of a complex sound from purely physical measurements (octave, one-half octave, or one-third octave band spectra) were proposed for standardization on an international basis. The methods are those proposed by Stevens and by Zwicker. It is proposed that the perceived noisiness or "unwantedness" of a sound is more important to the evaluation of man's noise environment than is loudness. The following physical and temporal aspects of a sound, listed in order of importance, were found to influence how people will in general rate its subjective noisiness. (1) intensity level, (2) spectrum shape and bandwidth, (3) spectral complexity (presence of one or more pure tones in a band of random noise), and (4) duration. Various methods were developed for calculating the perceived noisiness of complex sounds from either one-third octave or full octave band spectra. National and international standards were proposed to use perceived noise level in PNdB for the evaluation of aircraft noise. Author

IAA ENTRIES

A66-19899
LEVEL AND SPECIFICITY OF ANTIBODIES EVOKED BY CRUDE AND PURIFIED ANTIGENS OF POLIOVIRUS I AND ECHOVIRUS 7.
Laurence H. Frommhagen (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Applied Microbiology, vol. 13, Nov. 1965, p. 895-898. 5 refs.
Public Health Service Grant No. E-1475.

Study of methods of purification of poliovirus I and echovirus 7, including density gradient centrifugation, liquid-phase partition, and anion exchange chromatography. It is found that these preparations evoke high antibody levels of substantial specificity in the complement-fixation assay. Certain practical aspects of the three purification methods are discussed, such as their ease and efficiency. It is concluded that the results argue for the use of purified viral antigens for the production of antisera, particularly in view of the simplicity of the purification methods now available. M. L.

A66-19900
THE SOLUBILITY AND OTHER PHYSICOCHEMICAL PROPERTIES OF HUMAN γ-GLOBULIN LABELED WITH FLUORESCEIN ISOTHIOCYANATE.
Laurence H. Frommhagen (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Journal of Immunology, vol. 95, no. 3, 1965, p. 442-445.

Study of the solubility characteristics and electrophoretic and ultracentrifugal properties of human γ-globulins. Human serum fractions IV-4 (46% α-globulin, 38% β-globulin, 16% albumin), II (>99% γ-globulin), and V (>99% albumin) are labeled with fluorescein isothiocyanate (FITC). It is found that the solubility of γ-globulin, unlike that of albumin and α-β-globulins, is modified by the addition of FITC. It is considered that this solubility, as well as electrophoretic behavior, fluorescein-labeled γ-globulin demonstrate a considerable heterogeneity of labeling at higher conjugation ratios and a more homogeneous labeling at low conjugation ratios. The value of optimum labeling of immune globulin preparations in order to ensure specific staining is emphasized. M. L.

A66-19977
EFFECT OF TRANSIENT WEIGHTLESSNESS ON VISUAL ACUITY.
Leroy D. Paige and William N. Kama (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Journal of Engineering Psychology, vol. 4, no. 2, 1965, p. 33-44.

Experimental study of the effects on human visual acuity of short periods of weightlessness. The subjects, experimental conditions, procedures, and instrumentation are described. A comparison of visual acuity scores under laboratory 1 g, inflight 1 g, and zero g conditions is presented. It is found that visual acuity, as measured with the Sight Screener (American Optical Co.) and the Vision Tester with checkerboard targets (Bausch and Lomb) installed in a C-131B aircraft, is detrimentally affected during exposure of subjects to short periods of weightlessness in that aircraft. The decrement is not considered to be of practical significance. When zero-g scores are compared with control scores at 1 g in flight, the loss is in the order of 6% change in visual angle of targets at threshold acuity. When acuity at zero g is compared with that in a laboratory environment, the loss is approximately 10%. This loss is similar to that found in another study in which acuity at +2 g was compared with laboratory acuity. Thus, it appears that changes of 1 unit of g in either direction from the normal gravity environment result in comparable losses in visual acuity. M. L.

A66-19978
VISUAL ACUITY IN RELATION TO BODY ORIENTATION AND G-VECTOR.
Leroy D. Paige and William N. Kama (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Journal of Engineering Psychology, vol. 4, no. 2, 1965, p. 45-56. 6 refs.

Experimental study of human visual acuity as affected by body position and various g values. Twenty-four subjects were tested for left, right, and binocular acuity of near and far vision in each of four body positions: body upright, head upright; body prone, head upright; body supine, head inverted; and body and head inverted. The first three conditions produced various combinations of acceleration and hydrostatic effects for control measurements, while the last one effectively produced a -1 g acceleration. Based on the experimental results, as well as comparisons with previous studies, it is concluded that at 0 g and 2 g, each one unit removed from the normal environment, comparable acuity losses are produced, while at -1 g and 3 g, each two units removed from normal, greater but still comparable losses are produced. It thus appears that equal changes in either direction from the normal acceleration environment produce equal losses in visual acuity, with such losses increasing as a function of the amount of change. M. L.

A66-19979
EFFECT OF OBSERVER ELEVATION ON THE MOON ILLUSION.
James E. Hamilton (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).
Journal of Engineering Psychology, vol. 4, no. 2, 1965, p. 57-67. 9 refs.

Experimental study of the effect of elevation of an observer above terrain on the moon illusion (in which the moon appears larger on the horizon than it does at the zenith). It is noted that recent studies have shown that the apparent distance of terrain is necessary for the moon illusion, although just what characteristics of terrain are responsible for the illusion are not yet definitely known. The effect of an increase in elevation of an observer above terrain on the magnitude of the moon illusion is investigated, as well as how such an elevation affects distance estimation. A comparison is made to determine a relationship between the magnitude of the moon illusion at different elevations of the observer and the corresponding estimation of distance. A method is presented for the measurement of the moon illusion for latitudes of sky spaced at intervals of 15° between the horizon and the zenith in the daytime sky. It is found that the mean ratio of magnitude of this illusion presents a curvilinear function, showing a ratio of 1.13 at 15° to a ratio of 1.31 at 90°. A comparison of the mean measured magnitude of the moon illusion and the mean magnitude of estimated distance is found to show a general decrease in the magnitude of the moon illusion coinciding with a general increase in estimated distance when the observed ascended from 25.5 ft to 98.0 ft. It is concluded that evidence is lacking to support the apparent-distance theory when the observer ascends above terrain. M. L.

A66-20243 #
PRESSURIZATION SYSTEMS - AIRCRAFT CABINS AND FLIGHT SUITS.
L. K. Hoff (Alberta, University, Southern Alberta Institute of Technology, Calgary, Canada).
Canadian Aeronautics and Space Journal, vol. 12, Jan. 1966, p. 17-27. 20 refs.

Discussion of pressurization, the primary life-sustaining system in high altitude and spaceflight 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. It is noted that in space applications, pressurization is absolutely essential to maintain life, for without it body fluids would boil and death would occur instantly. On spaceflights, 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 protection. The Apollo space suit is described and illustrated. M. M.

A66-20249 #
ENGINEERING PROBLEMS IN CAPSULE STERILIZATION.

V. J. Magistrale (California Institute of Technology, Jet Propulsion Laboratory, Sterilization Group, Pasadena, Calif.).
Astronautics and Aeronautics, vol. 4, Feb. 1966, p. 80-84. 12 refs.

General consideration of the problem of capsule sterilization for spaceflight. Both engineering problems in which the sterilization requirement must be considered and those unique because of it are discussed. Basic concepts and techniques of sterilization are outlined. Solutions are not offered, but rather statements and formulations of the problems are suggested. R.A.F.

A66-20300

CHEMICAL PROTECTION AGAINST IONIZING RADIATION.
Z. M. Bacq (Liège, Université, Liège, Belgium).
Springfield, Ill., Charles C. Thomas, 1965. 328 p.
$14.

This monograph presents the current status of chemical protection against ionizing radiation in chemical mechanism and clinical management from experimental and clinical data with due regard to the specific implications of radiotherapy. The initial chemical changes induced by ionizing radiation proceed from metabolic derangements to cellular damage to cell destruction within days or weeks. This book brings together in critical fashion the pertinent data concerned with the chemical protection of warm-blooded animals and man. The role of SH- and NH_2-containing substances is summarized. A general summary of the protective compounds is given. A chapter on pharmacology presents some of the effects other than radiation protection as encountered in the radioprotective substances. A discussion of the metabolic problems that may be induced by the use of protective chemicals is made. Also included are summarizations of the experiments dealing with the reactions of intracellular structures such as mitochondria to ionizing radiation and the role of protective substances in relation to them. M. F.

A66-20521

RADIATION EXPOSURE FROM HEAVY NUCLEI IN SOLAR PARTICLE BEAMS IN SPACE SYSTEMS OF LOW SHIELDING.
Hermann J. Schaefer (U.S. Naval Aerospace Medical Institute, Pensacola, Fla.).
(Aerospace Medical Association, Annual Meeting, New York, N.Y., Apr. 27, 1965, Paper.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 1-4. 6 refs.
NASA Contract No. R-75.

Analysis of the proton, alpha, and medium heavy fluxes for the Nov. 12, 1960 flare showing that, on the rad dose level, only the alpha component contributes significantly to total dose and does so only in the first 5 mm of tissue. It is noted that, on the RBE dose level, the alpha component is the predominant contributor in near-surface regions, becoming equal to the proton dose at a depth of 2 mm in the tissue. The contribution of the medium heavy group never exceeds, even in the tissue surface and on the RBE dose level, a few per cent of total exposure. It is pointed out that no experimental data with laboratory radiations exist that would lend themselves to an interpretation of the peculiar depth dose patterns for flare-produced particles behind low shielding in terms of radiation damage or permissible exposure. M.M.

A66-20522

INJURIES DUE TO EXPLOSION, DECOMPRESSION AND IMPACT OF A JET TRANSPORT.
J. Robert Dille (Federal Aviation Agency, Western Region, Aviation Medical Div., Los Angeles, Calif.) and A. Howard Hasbrook (Federal Aviation Agency, Aeromedical Service, Civil Aeromedical Research Institute, Oklahoma City, Okla.).
Aerospace Medicine, vol. 37, Jan. 1966, p. 5-11. 9 refs.

Discussion of the causes of injuries to and of the brief survival of a passenger who was lying across a triple forward-facing tourist seat during an explosion of a dynamite device which occurred in the right rear lavatory of a Boeing 707 cruising at 39,000 ft over Iowa. The time of decompression can be calculated as approximately 1.8 sec. The possible causative roles of the decompression, any antecedent overpressure, and the impact forces for the pulmonary lesions and the ruptured ear drums, which were found at autopsy, are discussed. Other injuries, human factors, autopsy findings, and procedures are discussed. Recommendations are made which include the installation of crash locator beacons on civil aircraft, additional procedures for the investigation of such accidents to ensure the collection of maximum crash injury correlation data, and possible design features for future, particularly V/STOL, aircraft, to improve crash survivability. M.M.

A66-20523 #

THERMAL TRANSIENTS TO 205°C (400°F) - BIOCHEMICAL AND HEMATOLOGICAL EFFECTS IN HUMAN SUBJECTS.
Raymond H. Murray (Indiana University, Cardiopulmonary Laboratory, Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 37, Jan. 1966, p. 11-15. 24 refs.
Contract No. AF 33(616)-8378.

In order to evaluate the hematological and metabolic effects of brief, intense, thermal stress, six clothed human subjects were exposed to thermal transients 20 minutes in duration, wall temperature rising 28°C (50°F)/min to peaks of 205°C (400°F) with subsequent passive wall-cooling. There was no evidence of hemolysis, and blood cellular elements showed only nonspecific "stress" and hemoconcentration effects. There were no significant changes in serum electrolytes, blood sugar, total protein or protein electrophoresis. There was an increase in tidal volume without an increase in respiratory rate, an example of heat hyperpnea, causing an increase in blood oxygen and a fall in carbon dioxide values with consequent increase in pH. Lactic acid rose slightly and a small amount of excess lactate was generated. Lactic dehydrogenase activity decreased although there was no demonstrable change in the LDH isozymes. (Author)

A66-20524

HUMAN TOLERANCE TO GZ 100 PER CENT GRADIENT SPIN.
Thomas E. Piemme, Alvin S. Hyde, Michael McCally, and George Potor, Jr. (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Multi-Environment Div., Biophysics Laboratory, Environmental Stress Branch, Wright-Patterson AFB, Ohio).
(Aerospace Medical Association, Meeting, New York, N.Y., Apr. 28, 1965, Paper.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 16-21. 13 refs.

The concept of short radius on-board centrifugation has been suggested, should simulated gravity be found necessary during prolonged space flight. That this is not equivalent to a distributed gravity field is obvious. As a first step to any further consideration of such a device as a countermeasure to any deconditioning effects of space flight, further understanding of tolerance to, and physiologic effects of, high G gradient systems is necessary. Seven Air Force volunteers have been studied on a short radius (4 foot, 9 inch) spin table with the subject restrained in the supine position, the Z-axis along the radius. Zero Gz was effectively achieved at eye level; maximum G at the feet. At two arbitrarily selected rates of onset (0.10 G per second and 0.05 per second) the tolerance to levels up to 7 G maximum at the feet has been determined. Electrocardiogram and respiration were monitored. Tolerance end-points were defined as peripheral light loss, cardiac rates in excess of 170 per minute, or the onset of such subjective symptoms as nausea, sweating, or lightheadedness. A logarithmic time duration curve may be constructed from 7 G, tolerable for 2 min. 41 sec, through 1 G, tolerable in excess of two hours (at which experiments were arbitrarily terminated). This clearly exceeds tolerance to standard long arm centrifuge acceleration. At high G levels, grayout and tachycardia were found to be limiting; in the mid-zone range musculoskeletal discomfort of the back and lower extremities was prominent, but not as limiting as in standard low gradient +Gz profiles. Coriolis phenomena were marked, and demanded fixation of head position. Hematocrits and free fatty acids did not change as a function of G load. With these background data, one is now in a position to study the high gradient spin system as a countermeasure to adverse effects of "deconditioning" due to bed rest, water immersion, etc. (Author)

A66-20525

INJURY MECHANISM OF INTERNAL ORGANS OF ANIMALS EXPOSED TO SINUSOIDAL VIBRATION.
J. B. Boorstin, J. R. Hayes, and D. E. Goldman (National Naval Medical Center, Naval Medical Research Institute, Bethesda, Md.).
Aerospace Medicine, vol. 37, Jan. 1966, p. 22-28. 7 refs.
NASA Contract No. R-10.

High speed X-ray cinematography has been used to determine organ motion in vibrated cats. Data processing with a motion analyzer and a computer permits rapid analysis of X-ray photographs. Results of experiments at several amplitudes and frequencies are compared to show wave distortions due to heart-lung-chest wall interactions and frequency response characteristics associated with the means of restraint of the animal and the way in which the vibratory motion is impressed. Gross and microscopic pathological studies as well as some chemical determinations provide correlation of mechanical response and tissue damage.
(Author)

A66-20526

AIR TRAINING COMMAND EJECTION EXPERIENCE, 1 JANUARY 1962 TO 31 DECEMBER 1964.

Robert A. Farmer, A. M. Donnell, Jr., and John P. McCann (USAF, Air Training Command, Office of the Surgeon, Randolph AFB, Tex.).

Aerospace Medicine, vol. 37, Jan. 1966, p. 28-31.

Analysis of ATC's ejection experience for flying experience of the ejectees, considered to be relatively straightforward. It is pointed out that the assessment of the training of the flyers in ejection procedures, parachute landing falls and parachuting is more difficult. Only five of the ejectees considered had not received ejection seat firing training. One of these men was unsuccessful. Three men had not had procedural training in the seat utilized. One of these was unsuccessful. The feeling is expressed that such small numbers have relatively little significance. It is noted that the ATC of the USAF has compiled a comparatively good record for ejection success during the last three years. The rates of ejections and of major aircraft accidents for this command are significantly less than those of the entire USAF. Successful ejection rates for the years from 1960 to 1964 compare favorably with USAF rates to which ATC rates contribute.
M.M.

A66-20527

ERROR IN MEASUREMENT OF PULMONARY VENTILATION DURING SINUSOIDAL VIBRATION AND A METHOD OF CORRECTION.

F. W. Zechman, Jr. and Davis Peck (Kentucky, University, Medical Center, Dept. of Physiology and Biophysics, Lexington, Ky.).

Aerospace Medicine, vol. 37, Jan. 1966, p. 32-34. 5 refs.
Contract No. AF 33(657)-9331.

Determination of the origin of the error in measurements of ventilation by the open-circuit technique caused by amplitudes of oscillation greater than the amplitude of airflow produced by a subject during whole-body vibration, when respiratory airflow is forced into oscillation. A device is proposed for eliminating the forced-oscillation component from the airflow signal. The device consists of a time delay and summing circuits.
M.M.

A66-20528

EFFECTS OF HYPOHYDRATION ON WORK PERFORMANCE AND TOLERANCE TO $+G_z$ ACCELERATION IN MAN.

J. E. Greenleaf, M. Matter, Jr., L. G. Douglas, E. G. Averkin (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.), and J. S. Bosco (San Jose State College, San Jose, Calif.).

Aerospace Medicine, vol. 37, Jan. 1966, p. 34-39. 33 refs.

Nine men were water-depleted up to 6.9% of their body weight during controlled 5-day dietary periods and then subjected to various physical performance tests, including grayout tolerance while undergoing $+G_z$ -3.0G/min acceleration, to define set points (the percent hypohydration where functional deterioration begins). Hypohydration refers to a depletion of body water. The following set points were observed: isometric muscular strength - greater than 4%; modified Harvard step-test - 4 to 4.5%; submaximal O_2 intake - greater than 4%; and $+G_z$ -3.0G/min centrifugation - greater than 4%. Total body reaction time decreased with hypohydration. The concept of free circulating water was suggested as a possible explanation for the diversity of results regarding the effects of water depletion on bodily deterioration and work performance.
(Author)

A66-20529

EFFECT OF POSITIVE PRESSURE BREATHING ON THE VIBRATION TOLERANCE OF THE MOUSE.

J. F. Brady and B. D. Newsom (General Dynamics Corp., General Dynamics/Convair, Advanced Design and Technology Section, San Diego, Calif.).

Aerospace Medicine, vol. 37, Jan. 1966, p. 40-45. 30 refs.

Experimental investigation of PPB (positive pressure breathing) as a method for increasing the inherent tolerance of crews of boosters for manned spacecraft to intense, low-frequency mechanical vibrations. A total of 153 mice were vibrated along their Z-axis at 20 cps, with an intensity of 7.07 rms g, for 10 min. The 63 controls breathed ambient air and the 90 experimental animals breathed one of three levels of PPB air: 1.5, 3.75, and 6.00 in. of H_2O. It is noted that those receiving the two highest levels of PPB air sustained significantly less tissue damage and mortality, validating PPB as a feasible means of low-frequency vibration protection for mammals.
M.M.

A66-20530

EFFECTS OF FLYING EXPERIENCE ON THE VESTIBULAR SYSTEM - A COMPARISON BETWEEN PILOTS AND NONPILOTS TO CORIOLIS STIMULATION.

Patrick J. Dowd, Edwin W. Moore, and Robert L. Cramer (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Aeromedical Indoctrination Branch, Vestibular Section, Brooks AFB, Tex.).

Aerospace Medicine, vol. 37, Jan. 1966, p. 45-47. 12 refs.

Certain flight maneuvers, as when an aircraft is banking and turning, were simulated by the USAFSAM biaxial stimulator. Subjective responses for pilots were markedly different from nonpilots. A "threatening" maneuver for the pilots was preferred as "exciting" by the nonpilots. Significant differences were found between pilots and nonpilots in the rate of decay of nystagmus in response to two different simulated maneuvers. Such nystagmic differences are discussed with reference to their sensations. Results indicated that flying experience or flight training produced such differences.
(Author)

A66-20531

TRAINING THE VESTIBULE FOR AEROSPACE OPERATIONS USING CORIOLIS EFFECT TO ASSESS ROTATION.

Kent Gillingham (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).

Aerospace Medicine, vol. 37, Jan. 1966, p. 47-51. 18 refs.

Discussion of the possibility of perceiving otherwise undetectable rotation in the semicircular canals by employing self-induced Coriolis stimulation. How accurately this can be done is studied by determining the psychophysical functions for the discrimination of direction or rotation at different yaw velocities. It was found that subjects with minimal training can accurately perceive angular velocities slower than the four-minute turn of instrument flight, despite the fact that velocities of much greater magnitude remain unperceived until the Coriolis acceleration is induced. The potential use of this and of similar maneuvers as a means of countering spatial disorientation is discussed.
M.M.

A66-20532

CARDIAC ARRHYTHMIAS OCCURRING DURING ACCELERATION.

D. E. Torphy (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Biodynamics Branch, Acceleration Section, Brooks AFB, Tex.), S. D. Leverett, Jr. (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Biodynamics Branch, Brooks AFB, Tex.), and L. E. Lamb (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).

Aerospace Medicine, vol. 37, Jan. 1966, p. 52-58. 15 refs.

Forty-two pilots were exposed to $+G_x$ and $+G_z$ acceleration in a variety of profiles and the incidence of arrhythmias investigated. $+G_z$ acceleration did not increase the incidence of arrhythmias. $+G_x$ acceleration increased the incidence of arrhythmias and this increase seemed related to both the degree and duration of acceleration. Premature contractions, with and without aberrant conduction, from both the atria and ventricles were noted. One subject had paroxysmal atrial tachycardia with $+G_x$ acceleration. Possible causal mechanisms are discussed.
(Author)

A66-20533
AN A.M.E.'S EVALUATION OF PILOT FITNESS TO FLY.
J. Harold Brown.
(Federal Aviation Agency, Advanced Medical Seminar for Aviation Medical Examiners, Portland, Ore., July 28, 1965, Paper.)
Aerospace Medicine, vol. 37, Jan. 1966, p. 59-66. 12 refs.

Discussion by an aviation medical examiner of some of the practical problems in evaluating pilot fitness which may occur in conducting the physical examination required by the FAA. The primary and personal role of the AME in assessing the physical and emotional capability of an aircraft pilot is emphasized, as it constitutes the physician's contribution to flying safety. M.M.

A66-20534
INFLUENCE OF LIGHT ON HUMAN CIRCADIAN RHYTHMS.
F. Gerritzen (K. L. M./Royal Dutch Airlines, Medical Dept., Amsterdam, Netherlands).
Aerospace Medicine, vol. 37, Jan. 1966, p. 66-70. 11 refs.
Research supported by the Foundation for the Promotion of Medico-Scientific Research.

The influence of light on the rhythmic excretion of water and electrolytes was studied in 4 groups of 5 healthy students under strict experimental conditions - hourly intake of food and fluid, hourly collection of the urine - during 47 to 62 hours. Inverse illumination resulted in a decrease of the amplitude and a reversal of maxima and minima. This procedure was not able to produce a maximum of certain magnitude on a different place in the cycle. In a fifth experiment a shorter period of darkness proved to be incapable of depressing the amplitude. Light was considered an unsuitable stimulus to shorten the period of adaptation after rapid flights in the East-West direction or vice versa. Induction of artificial sleep might be more appropriate. The significance of circadian rhythms in connection with our conception of the stability of the "milieu intérieur" is discussed. (Author)

A66-20535
PSYCHIATRIC AND PSYCHOLOGICAL PROBLEMS IN COMMERCIAL AVIATION.
C. Blanc, E. Lafontaine, R. Laplane (Compagnie Nationale Air France, Paris, France).
Aerospace Medicine, vol. 37, Jan. 1966, p. 70-73. 7 refs.

Discussion of the frequency of neurotic depressive reactions and of other neuroses (65%), considered a rather striking finding in a study of 400 Air France employees of whom 148 were flying personnel. Fifty percent of the personnel showed conflicts having no direct relationship to their professional activities. The importance of neuropsychiatric examinations as a part of the preemployment evaluation is stressed. M.M.

A66-20633
THE SEPARATION AND PHYSICOCHEMICAL PROPERTIES OF THE C AND D ANTIGENS OF COXSACKIEVIRUS.
Laurence H. Frommhagen (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Journal of Immunology, vol. 95, no. 5, 1965, p. 818-822. 12 refs.

Experimental study of two antigens of coxsackievirus, Type B-5, separated by centrifugation in sucrose and cesium chloride density gradients. It is shown that the antigens are very similar to the C and D antigens of poliomyelitis virus in their infectivity, complement-fixing properties, particle size and shape, and nucleic acid content. Certain practical aspects of the efficiency of separation of the C and D antigens in sucrose and cesium chloride density gradients are also discussed. M. L.

A66-20634
CONVERSION OF ACETATE TO LIPIDS AND CO_2 BY LIVER OF RATS EXPOSED TO ACCELERATION STRESS.
D. D. Feller and E. D. Neville (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.).
(Federation of American Societies for Experimental Biology, Annual Meeting, 48th, Chicago, Ill., Apr. 12-18, 1964, Paper.)
American Journal of Physiology, vol. 208, May 1965, p. 892-895. 10 refs.

Experimental study of some aspects of altered fat metabolism resulting from acceleration stress in rats. Male Sprague-Dawley rats in age groups from 1 to 20 weeks are exposed to centrifugation at 4.5 g for between 0.5 hr and 14 days. Slices of liver, kidney, and inguinal adipose tissue are incubated with C^{14}-labeled acetate, and the resulting isotopic CO_2 and lipids are measured. It is found that when compared with tissues from control rats, liver and adipose tissue from nonfasted centrifuged rats showed increased formation of C^{14}-labeled lipids, while kidney tissue showed a decrease. It is also found that liver from fasted centrifuged rats showed increased formation of C^{14}-labeled lipids when compared to fasted noncentrifuged controls. It is shown that the increase in acetate conversion to lipids varied with the age of the animal and duration of exposure to acceleration. No significant change in acetate-C^{14} oxidation to $C^{14}O_2$ by liver is noted in either fed or fasted centrifuged animals as compared to their corresponding controls. It is concluded that the total lipid content of liver from rats that were exposed to centrifugation was lower than that from control animals. M. L.

A66-20876
A COMPARISON OF TWO TYPES OF EXTINCTION FOLLOWING FIXED-RATIO TRAINING.
Norman W. Weissman (NASA, Ames Research Center, Neurobiology Branch, Moffett Field, Calif.) and Edward K. Crossman (NASA, Ames Research Center, Moffett Field, Calif.).
Journal of the Experimental Analysis of Behavior, vol. 9, Jan. 1966, p. 41-46. 13 refs.

Five groups of pigeons were food reinforced on various schedules. Half of each group were extinguished in the normal manner; the others were presented with a stimulus change, previously paired with reinforcement, each time they completed their respective fixed ratios. Response rate in training was an increasing negatively accelerated function of the FR. Increasing the FR produced transitory rate changes, the amount of which yielded a quantitative index of ratio strain. Cumulative records of extinction performance revealed that the stimulus change exerted discriminative control by maintaining the cohesiveness of FR response units. Nevertheless, neither the absolute number of extinction responses nor extinction response units differed appreciably for the two extinction procedures. (Author)

A66-20931 #
THE ACTION OF MICROWAVES ON LIVING ORGANISMS AND BIOLOGICAL STRUCTURES.
A. S. Presman.
(Uspekhi Fizicheskikh Nauk, vol. 86, June 1965, p. 263-302.)
Soviet Physics - Uspekhi, vol. 8, Nov.-Dec. 1965, p. 463-488. 219 refs. Translation.
[For abstract see issue 19, page 2748, Accession no. A65-29938]

A66-20952
END POINT OF LATERALIZATION FOR DICHOTIC CLICKS.
Harvey Babkoff and Samuel Sutton (New York State Department of Mental Hygiene; Columbia University, New York, N.Y.).
Acoustical Society of America, Journal, vol. 39, Jan. 1966, p. 87-102. 22 refs.
Research supported by the U.S. Public Health Service.

A series of experiments was undertaken to systematically study one aspect of binaural interaction for dichotically presented clicks - the end point of lateralization, which is referred to in this paper as the lag-click threshold (Δt_2). The results of experiments in which click parameters were manipulated are presented. These results indicate that the lag-click threshold is decreased by an increase in the sensation level (SL) of both clicks, by an interaural intensity asymmetry favoring the lag click, or by a decrease in the low-frequency components of both clicks. The results of experiments in which the background-noise parameters were manipulated are presented. As the SL of binaural broad-band noise (125-8000 cps) is increased to 30 db, the lag-click threshold decreases; but as the noise level is increased further, the lag-click threshold increases. The finding of a minimum point at 30 db is related to the broad spectrum of the noise. One-octave bandwidths of noise produce monotonic functions. A 1-oct low-frequency band of noise presented either to both ears or to the ear receiving the lead click decreases the lag-click threshold, while a 1-oct high-frequency band of noise presented either to both ears or to the ear receiving the lead click increases the lag-click threshold. Finally, a 1-oct low-frequency or high-frequency band of noise presented to the ear

receiving the lag click produces a substantial increase in the lag-click threshold. The results are discussed briefly in terms of the available physiological literature and a model is proposed. (Author)

A66-20953

REMOTE MASKING IN THE ABSENCE OF INTRA-AURAL MUSCLES.
Robert C. Bilger (Eye and Ear Hospital, Bioacoustics Laboratory; Pittsburgh, University, School of Medicine, Pittsburgh, Pa.).
Acoustical Society of America, Journal, vol. 39, Jan. 1966, p. 103-108. 8 refs.
Research supported by the U.S. Public Health Service.

To ascertain the role of the stapedial reflex in remote masking, remote and contralateral remote masking were studied on separate groups of listeners who had had their stapedius muscles excised surgically. In addition, separate groups of listeners who had audiometrically and otoscopically normal ears were used to obtain control data. The results of these studies show that neither remote nor contralateral remote masking depends upon the stapedial reflex; both, however, do vary with degree of hearing loss. In the case of remote masking, an orderly relation was found to exist between the amount of remote masking and the sensation level (SL) of the masker. This, along with exaggerated remote masking in cases of sensorineural loss, supports the earlier explanations of remote masking solely in terms of cochlear mechanics. For contralateral remote masking, the relationship between masking and hearing loss was not as orderly as that for remote masking. The absence of a systematic relationship between SL of the masker and onset or amount of contralateral remote masking suggests it to be a central rather than a peripheral phenomenon. (Author)

A66-20954

AUDITORY THRESHOLD LOCATION AND UNCERTAINTY AS A FUNCTION OF TONE PARAMETERS AND FATIGUE.
Herman R. Silbiger and D. N. Elliott (Wayne State University, Auditory Research Laboratory, Detroit, Mich.).
Acoustical Society of America, Journal, vol. 39, Jan. 1966, p. 117-124. 13 refs.
Research supported by the U.S. Public Health Service.

The relationship of auditory threshold location for various pulsed and continuous tones was investigated, using a Békésy audiometer. It was found that for periods from 250 to 750 msec an increase in repetition rate results in a decrease in threshold, independent of the duty cycle. This relationship was maintained after a $TTS_{6\text{-}10}$ (temporary threshold shift) of 20 db. The pen-excursion size, however, was found to be a function of the pulse length, during $TTS_{6\text{-}10}$, with the longer pulse giving the greatest reduction in pen-excursion size (PES); continuous tones yield the highest thresholds and the greatest reduction in pen-excursions size, with under normal conditions and under $TTS_{6\text{-}10}$. It therefore appears that threshold location and pen-excursion size may be independently manipulated. The differences in threshold location are thought to be owing to an increase in the ability to make tone present-absent decisions during interruptions, while the decreases in pen-excursion size during TTS may be owing to the perception of the increased rate of loudness growth. (Author)

A66-20955

EARPHONE VERSUS SOUND-FIELD THRESHOLD SOUND-PRESSURE LEVELS FOR SPONDEE WORDS.
Tom W. Tillman, Robert M. Johnson, and Wayne O. Olsen (Northwestern University, Auditory Research Laboratory, Evanston, Ill.).
Acoustical Society of America, Journal, vol. 39, Jan. 1966, p. 125-133. 15 refs.
Research supported by the U.S. Veterans Administration and the National Institutes of Health.

This experiment sought to establish the difference between earphone and sound-field measures of spondee threshold SPL (sound-pressure level). Recorded spondee words were delivered to both a conventional and an insert-type earphone as well as to a single loudspeaker that generated the signal in the sound field. Monaural spondee threshold SPL's were established for both normal hearing and hypoacoustic subjects under the three listening conditions. The intensity level of the spondee words under the three conditions was expressed as the SPL of an "equivalent" speech spectrum noise. For both groups of subjects, the mean sound-field threshold SPL was about 7.5 dB lower than that measured under the conventional earphone and approximately 12.5 dB lower than that established under the insert-type earphone. These results tend to confirm the reality of the "missing 6 dB." Further, they indicate that the difference between minimum audible pressure (MAP) and minimum audible field (MAF) is a product of both diffraction and "closed-ear" effects. The latter effect appears to vary as a function of the volume of air enclosed by the pressure transducer. (Author)

A66-20956

INTERAURAL TIME AND INTENSITY DIFFERENCE AND THE MLD.
Stanley Zerlin (Central Institute for the Deaf, St. Louis, Mo.).
Acoustical Society of America, Journal, vol. 39, Jan. 1966, p. 134-137. 5 refs.
Research supported by the National Institutes of Health.

Masking-level differences (MLD) for a 600-cps low-pass transient were explored as a function of (1) interaural time difference (Δt); (2) interaural intensity difference (ΔI); and (3) combinations of Δt and ΔI. Masking-level difference here is the difference between two levels of coherent noise (N_0), one required to mask a given condition of click, the other to mask a binaural in-phase click (S_0). MLD increases with signal Δt in a manner similar to that for interaural phase differences of the tonal frequency within the filtered transient. Furthermore, for larger values of Δt, where the transients no longer overlap in time, the MLD decreases in a manner suggesting temporal integration of two brief signals. As signal ΔI increases, MLD approaches a limiting value of about 7 db, for signal monaural (S_m) condition. An interaural intensity difference of 24 db yields an MLD of 6 db, still a decibel or so short of the monaural value. When ΔI is combined with Δt greater than 0.4 msec, the MLD decreases as ΔI increases, no matter whether the louder signal is leading or lagging in time. (Author)

A66-20957

MASKING OF SPEECH BY AIRCRAFT NOISE.
K. D. Kryter and Carl E. Williams (Bolt, Beranek, and Newman, Inc., Cambridge, Mass.).
Acoustical Society of America, Journal, vol. 39, Jan. 1966, p. 138-150. 10 refs.
Research sponsored by the Federal Aviation Agency.

Word-intelligibility tests at various intensity levels were administered to a crew of trained listeners in the presence of recorded noise from jet and propeller-driven aircraft. The noise was that which would be present outdoors and in a house as the result of engine runup operations and if aircraft were flying overhead shortly after takeoff and prior to landing. According to visual inspection of the data, methods of measuring or evaluating aircraft noise predict the results of the speech tests in the following order of merit, from best to worst: (1) articulation index (AI), (2) perceived noise level in PNdB, (3) speech-interference level (SIL), (4) noise criteria (NC), (5) over-all sound-pressure level (SPL A scale), and (6) over-all SPL C scale. The differences among PNdB, SIL, NC, and dB(A), in this regard, are probably not significant according to these tests. (Author)

A66-20964

PENTOBARBITAL SODIUM - VARIATION IN TOXICITY.
H. A. Lindsay and V. S. Kullman (West Virginia University, Medical Center, Morgantown, W. Va.).
Science, vol. 151, Feb. 4, 1966, p. 576, 577. 6 refs.
Grant No. NsG-533.

Investigation to determine if the susceptibility of a mammal to pentobarbital sodium would vary during a 12-hour period. Groups of 18 mice were given a peritoneal lethal dose of 130 mg per kilogram of body weight at intervals of 1-1/2 hr during a 12-hour period. Each day's experiment was based on 162 mice. Data were subjected to the arcsin transformation and analyzed by the method of orthogonal polynomials. The data indicate the existence of short-term fluctuations in the toxicity of pentobarbital sodium in a mammalian species. D. P. F.

A66-21185 #
A WASTE MANAGEMENT SYSTEM FOR MANNED SPACE VEHICLES.
R. W. Murray and L. Cooper (General Electric Co., Philadelphia, Pa.).
American Institute of Chemical Engineers, Annual Meeting, 58th, Philadelphia, Pa., Dec. 5-9, 1965, Symposium on Management of Space Vehicle Environment, Preprint 19B. 24 p.
$0.50.

Consideration of the problems involved in the recovery of reusable products in human excretory wastes as part of closed-loop life support systems for manned spaceflights of extended duration. The basic Hydro-John concept involves expulsion of the urine into an adjustable urinal and removal of the feces through a hopper. In both cases cabin air is used as the transport medium and the air flow ensures sanitary cabin conditions. The urine, which is stored in a reservoir until defecation occurs, is mixed with the feces and flush water in a pump blender; the resultant slurry is pumped to an evaporator where the water is boiled at reduced pressure. The larger part of the condensate is filtered through charcoal and stored for reuse as flush water. The smaller portion is heated to 1800°F, passed through a Pt catalyst in the presence of O_2, and condensed to yield potable water. D. P. F.

A66-21186 #
BIOSATELLITE GAS MANAGEMENT ASSEMBLY.
W. E. Funsch, J. H. Hoffnagle, and R. A. Miller (General Electric Co., Philadelphia, Pa.).
American Institute of Chemical Engineers, Annual Meeting, 58th, Philadelphia, Pa., Dec. 5-9, 1965, Symposium on Management of Space Vehicle Environment, Preprint 19D. 11 p.
$0.50.

Description of the biosatellite space vehicle and associated systems which are designed to provide data on the effects of prolonged weightlessness and radiation on various life forms. Three payloads will be orbited by an improved Thor Delta rocket for three, twenty one, and thirty days. The systems design criteria are examined and it is shown that the success of the experiments depends on the successful functioning of the Gas Management Assembly (GMA). The GMA system used in the 3-day mission is described. Humidity is conditioned by silica gel and provision is made for a gas supply circuit to maintain cabin pressure at 14.15 lb/in.^{2}. Provisions for the oxygen make-up supply and control are described for the 30-day mission. Carbon dioxide in the air is controlled with LiOH. D. P. F.

A66-21189 #
GASEOUS CONTAMINANT REMOVAL BY ADSORPTION.
A. J. Robell, F. G. Borgardt, and E. V. Ballou (Lockheed Aircraft Corp., Palo Alto, Calif.).
American Institute of Chemical Engineers, Annual Meeting, 58th, Philadelphia, Pa., Dec. 5-9, 1965, Symposium on Trace Contaminant Control in a Closed Environment, Preprint 26B. 13 p. 11 refs.
$0.50.
Research supported by the Lockheed Independent Research Program; Contract No. NAS-93415.

A general approach to the study of gaseous contaminant removal by adsorption is presented, based on classical adsorption potential theory. Data on the removal of six contaminants at various conditions in a flowing system are well correlated on a potential plot. Retention time data for slug injections of contaminants are consistent with potential theory. Potential theory as a design tool provides a way of estimating the adsorption quantity of contaminants for which retentivity data are unavailable, and indicating problem and critical contaminants. (Author)

A66-21190 #
KINETICS AND CATALYST SELECTION IN THE COMBUSTION OF ATMOSPHERIC TRACE CONTAMINANTS.
R. H. Johns (Atlantic Research Corp., Alexandria, Va.).
American Institute of Chemical Engineers, Annual Meeting, 58th, Philadelphia, Pa., Dec. 5-9, 1965 (Symposium on Trace Contaminant Control in a Closed Environment), Preprint 26C. 12 p. 6 refs.
$0.50.

Study of the kinetics of oxidation of various atmospheric contaminants for several catalysts. A table is presented in which the typical compounds found in the atmosphere of nuclear submarines and in the "Friendship 7" space capsule are listed. Hopcalite catalysts were found effective in oxidizing most alcohols, hydrocarbons, and oils but less effective against methane and the freons. Methane is the most difficult hydrocarbon to oxidize, and the determination of its differential oxidation rate in the presence of Hopcalite was used to provide a basis for comparing other contaminants and catalysts. The apparatus and experimental techniques are described. The determination of a single differential rate required the selection of about five volumetric flow rates at which data points were taken. Palladium catalyst showed high activity in oxidizing methane.
D. P. F.

A66-21191 #
REGENERATIVE SEPARATION OF CARBON DIOXIDE VIA METALLIC OXIDES.
G. V. Colombo and E. S. Mills (Douglas Aircraft Co., Inc., Santa Monica, Calif.).
American Institute of Chemical Engineers, Annual Meeting, 58th, Philadelphia, Pa., Dec. 5-9, 1965, Symposium on Trace Contaminant Control in a Closed Environment, Preprint 26D. 11 p.
$0.50.

This paper contains the results of analytical and experimental studies to determine the feasibility of a new process using metallic oxides for the separation and recovery of carbon dioxide from manned atmospheres. These results are immediately applicable to space stations, space vehicles, submarines, and portable life support system concepts currently under study and development at Douglas. Expendable absorbents are eliminated in this method, and the recovered carbon dioxide is available for supply to oxygen-regeneration equipment. The analytical program described in this document is concerned with an evaluation of the equilibrium characteristics of systems comprised of carbon dioxide with the oxides of metals belonging to Group II of the (chemical) periodic table. These equilibrium studies indicate the feasibility of a process, characterized by the reaction between the metallic oxides and carbon dioxide, to form the metallic carbonate and the subsequent regeneration process to recover the oxide and carbon dioxide at moderately high temperatures. Based upon the results of these equilibrium studies, a process utilizing magnesium oxide pellets was selected for further study. A commercial source of magnesium oxide pellets was found. These pellets, together with pellets compounded at Douglas were tested for their selective affinity for carbon dioxide. Data from these experiments demonstrate that the process is feasible and worthy of further development. The commercially manufactured pellets were found to absorb carbon dioxide to less than 1% of theoretical capacity, while the pellets manufactured at Douglas achieved a theoretical efficiency up to 40%. (Author)

A66-21296
UNCONDITIONED RESPONSE TO ELECTRIC SHOCK - MECHANISM IN PLANARIANS.
Jay Boyd Best and Errol Elshtain (Colorado State University, Dept. of Physiology, Fort Collins, Colo.).
Science, vol. 151, Feb. 11, 1966, p. 707-709. 13 refs.
National Institutes of Health Grant No. 5-R01 MH 07603-03; Grant No. NsG-625.

Some implications of a mathematical theory relating neuronal geometry to the parameters of excitation in unconditioned response of planarians to electric shock are experimentally verified. The regions and patterns of primary neural excitation depend on the relation between the distribution of neural sizes and the waveform of the electric stimulus. (Author)

A66-21335
LOW HUMIDITY AND DEHYDRATION IN JETS.
James E. Crane.
Air Line Pilot, vol. 35, Jan. 1966, p. 12, 13, 18.

Discussion of the possibility that the low humidity in the fuselage of a jet aircraft is an environmental situation which may eventually lead to a performance decrement in the crew and discomfort to the passengers. It has been found that the relative humidity in a jet aircraft is only 5% at 30,000 ft, and that this exposes the crew and passengers to an arid tropical climate to which an adjustment should

be made. The processes of water metabolism are outlined, and the effects of coffee, tea, and alcohol on water loss are briefly described It is considered that bottled water, carbonated beverages, or fresh orangeade are preferable to other beverages. F.R.L.

A66-21529

THE STUDY OF BASIC PHYSICAL/BIOLOGICAL PHENOMENA UNDER ZERO-G CONDITIONS IN EARTH ORBITAL SPACECRAFT.

Jacob I. Trombka (NASA, Washington, D.C.), John M. Teem, and Hubert R. Smith (Electro-Optical Systems, Inc., Pasadena, Calif.).

IN: SCIENTIFIC EXPERIMENTS FOR MANNED ORBITAL FLIGHT; PROCEEDINGS OF THE THIRD GODDARD MEMORIAL SYMPOSIUM, WASHINGTON, D.C., MARCH 18, 19, 1965. [A66-21517 10-30]
Edited by P. C. Badgley.
Washington, D.C., American Astronautical Society (AAS Science and Technology Series. Volume 4), 1965, p. 261-271. 5 refs.

Identification of the potential of earth-orbital experiments as a new approach to the space sciences. The use of the space environment for fundamental scientific purposes is considered, and the overall rationale for an integrated program of basic physical and biological experimentation is discussed. A range of fluid-vapor-solid and interface phenomena are considered, which may yield new insights into fundamental properties of fluids, crystallization studies, chemical kinetics free from wall effects, and other factors. The effects of weightlessness and controlled g-level on reproduction and metabolic processes, geotaxis and geotropisms, rhythms and intracellular motions are investigated, ranging from the organismal and system levels in small animals and plants down to biochemical and microscopic studies at the cellular or subcellular levels. B.B.

A66-21530

CRITICAL AREAS FOR BIOMEDICAL RESEARCH ON FUTURE MANNED ORBITAL SPACECRAFT.

William M. Helvey (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Palo Alto, Calif.).

IN: SCIENTIFIC EXPERIMENTS FOR MANNED ORBITAL FLIGHT; PROCEEDINGS OF THE THIRD GODDARD MEMORIAL SYMPOSIUM, WASHINGTON, D.C., MARCH 18, 19, 1965. [A66-21517 10-30]
Edited by P. C. Badgley.
Washington, D.C., American Astronautical Society (AAS Science and Technology Series. Volume 4), 1965, p. 273-282. 9 refs.

Evaluation of the "critical areas" of biomedical research necessary for future manned spaceflight. The effects of weightlessness and radiation on spacecraft crew members are considered, and the problem of chemical and biological contamination is discussed. Psychophysiological factors relating to spaceflight are investigated, and figures showing the changes in weight of several American and Soviet astronauts and radiation absorbed by them during spaceflight are tabulated. It is concluded that there have been no permanent serious ill effects of spaceflight to date. Whether the problems will be severe in the future, requiring artificial g, is a matter of speculation as well as of research in preparation for the alternatives. B.B.

A66-21740

THE SEARCH FOR EXTRATERRESTRIAL LIFE.

N. H. Horowitz (California Institute of Technology, Jet Propulsion Laboratory, Bioscience Section, Pasadena, Calif.).

Science, vol. 151, Feb. 18, 1966, p. 789-792. 15 refs.

Examination of the Martian environment in the light of the Mariner 4 data to determine the possibilities of the existence of life on that planet. Owing to the low density of the atmosphere and the absence of a magnetic field the surface of Mars is subject to an almost unattenuated bombardment by cosmic rays and solar radiation. However, it would not be difficult for Martian organisms to be protected against this otherwise lethal barrage. The atmosphere of Mars contains approximately 1/1000 the amount of water found in the terrestrial atmosphere so that the scarcity of water is probably the most serious limiting factor for any Martian biology. The objectives and goals of Martian biological exploration are examined. The "Gulliver" culture chamber is described. D.P.F.

A66-21754

MILITARY PILOTING AND EXPERIMENTAL PSYCHOLOGY [PILOTAGE MILITAIRE ET PSYCHOLOGIE EXPERIMENTALE].

A. de Brisson and J. Bremond.

Forces Aériennes Françaises, vol. 20, Feb. 1966, p. 185-218.
In French.

General discussion and evaluation of psychological tests used in selection of aircrew personnel for the French Air Force. Results of various tests which have been used on aircrew cadres in France and the U.S. indicate that the complexity of the criteria for pilot adaptation considerably limit the possibilities of prognosticating success or failure. Test methods are essentially pragmatic. The variation of aptitudes and motivations according to recruitment categories is studied, and recruitment of personnel from the best schools is discussed. F.R.L.

A66-21989 #

SENSITIVITY OF MITOTIC PHASES OF TRADESCANTIA PALUDOSA MICROSPORES TO SPACEFLIGHT FACTORS ABOARD THE "VOSKHOD 1" SPACESHIP [CHUVSTVITEL'NOST' FAZ MITOZA MIKROSPOR TRADESCANTIA PALUDOSA K FAKTORAM KOSMICHESKOGO POLETA NA KORABLE-SPUTNIKE "VOSKHOD-1"].

N. L. Delone, B. B. Egorov, and V. V. Antipov.

Akademiia Nauk SSSR, Doklady, vol. 166, Jan. 21, 1966, p. 713-715.
In Russian.

Analysis of the effect of the complex of factors accompanying the flight of the "Voskhod 1" spaceship on the various mitotic phases of Tradescantia paludosa spores. It is found that the number of chromosome changes is greatest of all during the action of spaceflight factors on the middle and late prophase and that the number of changes then decreases and reaches a minimum value during the action of these flight factors on the early interphase. The largest number of cells with mitosis disturbances is noted during the action of spaceflight factors on the late interphase. A.B.K.

A66-22020

ASTROGLIAL REACTIONS TO IONIZING RADIATION - WITH EMPHASIS ON GLYCOGEN ACCUMULATION.

J. Miquel and W. Haymaker (NASA, Ames Research Center, Moffett Field, Calif.).

IN: PROGRESS IN BRAIN RESEARCH. VOLUME 15.
Edited by E. D. P. De Robertis and R. Carrea.
Amsterdam, Elsevier Publishing Co., 1965, p. 89-114. 49 refs.

Description of the effects of α-particle and X-irradiation on cerebral astroglial cells and blood vessels. The materials and methods are reviewed, in which young rats received various dosages of X-irradiation in the head. A constant-potential X-ray therapy unit was the source of the irradiation, and the 60-in. cyclotron at Berkeley and Heavy Ion Linear Accelerator (HILAC) were the sources of α-particles. Shortly after exposure of the brains of rats to X-ray or α-particles, disturbances in vascular permeability, glial mitosis and edema of the white matter were observed. Accumulation of glycogen in the astroglial cells was especially noted. The glycogen increase is observed in the absence of morphological changes in the brain cells, and is found to be maximal in the gray matter. It is concluded that the disturbances in the glycogen metabolism appear to be associated with a derangement of the aerobic metabolism of the astroglia-neuron metabolic unit. M.L.

A66-22062

LIFE INTO SPACE.

C. C. Wunder (Iowa State University, Iowa City, Iowa).

Philadelphia, F. A. Davis Co., 1966, 324 p.
$9.50.

Physical, engineering, biological, and medical scientists are offered an introduction to the considerations involved in applying their specialized knowledge to the problems of carrying life into space. The text deals largely with experimental information that has been obtained under earth conditions. Although intended for college graduates, the material is presented in such a way as to be comprehensible to graduates of a good high school science program. Information of a more advanced nature is included in certain tables, figures, and footnotes. Of the two primary parts of the book, the first part deals with introductory considerations: the concept of space biology, biological and cultural history, entering space, and

overcoming the problems of the space environment. The second part considers specific problems: temperature and heat, pressures and vacuums, metabolism and the chemical environment, the influence of inertial fields and motion (acceleration, gravity, weightlessness, rotation, and vibration), radiation and electromagnetic energy, selection and supplies (the biologistic problems), and life on other planets. Emphasis is placed throughout on an elucidation of scientific principles rather than upon a description of the equipment or hardware necessary for carrying life beyond the earth. F. R. L.

A66-22065

THE MACHINERY OF LIFE.
D. E. Wooldridge (California Institute of Technology, Pasadena, Calif.).
New York, McGraw-Hill Book Co., 1966. 212 p.
$7.95.

This book is dedicated to an inquiry into the adequacy of the purely physical laws of nature for an explanation of the properties and evolution of living terrestrial organisms from comparatively simple organic compounds. The successful interpretation of the functions of the body organs in terms of chemical processes is of great significance. The historical development of an understanding of the similarities and differences between organic and inorganic matter is traced. Protein molecules are considered, and the extent to which the physically based principles of chemistry are capable of explaining their properties and formation is described. Established laws of physics and chemistry are used to devise a plausible explanation for the formation in nature - before the existence of living organisms - of the complex molecules on which life depends. The natural processes are discussed whereby isolated pools of water and other molecules may three or four billion years ago have produced the building blocks of the living cells that in turn comprise all living organisms. It is shown how physical principles resulted inevitably in the development of naturally selective forces which gradually effected the generation of more complex and life-like aggregations of matter. The properties of new and complex nucleic acid molecules account for the control of growth and reproduction that is exhibited by the internal mechanisms of modern organisms. The mechanism of protein synthesis is examined and the role of messenger RNA in such synthesis is considered. The development of living cells from the amoeba to man is reviewed. D. P. F.

A66-22104

A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965. 1226 p.
$30.

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DECOMPRESSION SICKNESS. D. I. Fryer (Royal Air Force, Farnborough, Hants., England) and H. L. Roxburgh, p. 122-151. 44 refs. [See A66-22109 10-04]

THE PRESSURE CABIN. H. H. S. Brown, p. 152-186. 18 refs. [See A66-22110 10-05]

FAILURE OF THE PRESSURE CABIN. D. I. Fryer (Royal Air Force, Farnborough, Hants., England), p. 187-206. 43 refs. [See A66-22111 10-05]

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THE EFFECTS OF ANOXIA ON THE CENTRAL NERVOUS SYSTEM. J. Ernsting, p. 270-289. 41 refs. [See A66-22114 10-04]

THE METABOLIC EFFECTS OF ANOXIA. J. Ernsting, p. 290-302. 21 refs. [See A66-22115 10-04]

THE PHYSIOLOGICAL REQUIREMENTS OF AIRCRAFT OXYGEN SYSTEMS. J. Ernsting, p. 303-342. 23 refs. [See A66-22116 10-04]

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FACTORS AFFECTING THE SURVIVAL OF MAN IN HOSTILE ENVIRONMENTS. P. D. G. V. Whittingham (Royal Air Force, Farnborough, Hants., England), p. 479-513. 59 refs. [See A66-22121 10-05]

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THE PHYSIOLOGY OF POSITIVE ACCELERATION. P. Howard, p. 551-687. 296 refs. [See A66-22123 10-04]

THE PHYSIOLOGY OF NEGATIVE ACCELERATION. P. Howard, p. 688-716. 53 refs. [See A66-22124 10-04]

THE PHYSIOLOGY OF TRANSVERSE ACCELERATION. P. Howard, p. 717-745. 53 refs. [See A66-22125 10-04]

THE EFFECTS OF ACCELERATION OF SHORT DURATION. D. H. Glaister (Royal Air Force, Farnborough, Hants., England), p. 746-795. 42 refs. [See A66-22126 10-05]

MOTION SICKNESS. T. C. D. Whiteside, p. 796-803. 24 refs. [See A66-22127 10-04]

NOISE AND VIBRATION.

INTRODUCTION. J. C. Guignard (Royal Air Force, Farnborough, Hants., England), p. 807-812.

VIBRATION. J. C. Guignard (Royal Air Force, Farnborough, Hants., England), p. 813-894. 189 refs. [See A66-22128 10-05]

NOISE. J. C. Guignard (Royal Air Force, Farnborough, Hants., England), p. 895-967. 171 refs. [See A66-22129 10-05]

AUDITORY PERCEPTION IN AIRCREW. P. F. King, p. 968-988. 12 refs. [See A66-22130 10-05]

VISUAL FACTORS IN AVIATION.

INTRODUCTION. T. C. D. Whiteside, p. 991-993.

THE ENVIRONMENT AND EYE PROTECTION. T. C. D. Whiteside, p. 994-1003. 5 refs. [See A66-22131 10-05]

VISUAL MECHANISMS OF SPECIAL IMPORTANCE IN AVIATION. T. C. D. Whiteside, p. 1004-1013. 7 refs. [See A66-22132 10-04]

ACCOMMODATION AND EYE MOVEMENTS. T. C. D. Whiteside, p. 1014-1020. 12 refs. [See A66-22133 10-04]

VISIBILITY AND PERCEPTION. T. C. D. Whiteside, p. 1021-1028. [See A66-22134 10-05]

AIRCREW PERFORMANCE.

PSYCHOLOGICAL ASPECTS OF EQUIPMENT DESIGN. J. M. Rolfe (Royal Air Force, Farnborough, Hants., England), p. 1031-1060. 29 refs. [See A66-22135 10-05]

THE EFFECT OF ENVIRONMENTAL STRESS ON PERFORMANCE. K. G. Corkindale (Royal Air Force, Farnborough, Hants., England), p. 1061-1072. 53 refs. [See A66-22136 10-05]

AIRCREW SELECTION. A. Cassie (Air Ministry, London, England), p. 1073-1085. 16 refs. [See A66-22137 10-05]

SPATIAL DISORIENTATION IN FLIGHT. A. J. Benson (Royal Air Force, Farnborough, Hants., England), p. 1086-1129. 109 refs. [See A66-22138 10-05]

AIRCRAFT ACCIDENTS.

INTRODUCTION. D. I. Fryer (Royal Air Force, Farnborough, Hants., England), p. 1133-1138.

ACCIDENT STATISTICS. D. I. Fryer (Royal Air Force, Farnborough, Hants., England), p. 1139-1142. [See A66-22139 10-05]

HUMAN FACTORS IN THE CAUSATION OF ACCIDENTS. D. I. Fryer (Royal Air Force, Farnborough, Hants., England), p. 1143-1156. 10 refs. [See A66-22140 10-05]

THE RESULTS OF ACCIDENTS. D. I. Fryer (Royal Air Force, Farnborough, Hants., England), p. 1157-1192. 71 refs. [See A66-22141 10-05]

THE MEDICAL INVESTIGATION OF ACCIDENTS. D. I. Fryer (Royal Air Force, Farnborough, Hants., England), p. 1193-1201. 34 refs. [See A66-22142 10-05]

THE PREVENTIVE MEDICINE OF ACCIDENTS. D. I. Fryer (Royal Air Force, Farnborough, Hants., England), p. 1202-1212. 21 refs. [See A66-22143 10-05]

INDEX, p. 1213-1226.

A66-22106

AERODYNAMIC FORCES AND THEIR EFFECTS UPON MAN.
G. Melvill Jones (McGill University, Dept. of Physiology, Aviation Medical Research Unit, Montreal, Canada) and Melvill Jones.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 55-94. 5 refs.

Review of the effects on man of movement through the atmosphere. Both direct effects, due to exposure (as in escape), and indirect effects, due to flight through the atmosphere in an aircraft, are considered. Aerodynamic forces at moderate (350 to 400 knots) and high speeds are considered, in order to impart a working knowledge of how to compute relevant variables from standard aerodynamic data. Measurement of air speed, aerodynamic lift and drag, and stalling are analyzed. As part of the discussion of high speeds, air compressibility, Mach number, and shock waves are considered. The ways in which man can be affected by the aerodynamic forces and consequent accelerations acting upon his aircraft during flight are recounted. In particular, the accelerations associated with change of direction due to lift and those due to roll are emphasized as capable of producing sizable g forces on the pilot. An account is presented of certain problems bearing on the relation between control application and aircraft response. Buffeting, control reversal, aerodynamic cabin pressure and suction, and aerodynamic heating are discussed. M.L.

A66-22107

OTITIC BAROTRAUMA.
P. F. King.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 100-112. 17 refs.

Review of the facts to date concerning a condition caused by a difference between the environmental atmospheric pressure and the pressure within the middle ear cavity, which is termed otitic barotrauma (or aerotitis media or aviation pressure deafness). It is shown that the conditions, either chronic or acute, can arise during flight, during compression chamber tests, or in the course of descent in water. It is characterized by pain, deafness, injection and infolding of the tympanic membrane (sometimes with rupture) and by effusion and bleeding into the middle ear cavity. A short history of the study of the condition is given. The mechanism of causation and the anatomy of the middle ear are described. It is emphasized that the key factor is the ability (or inability) to equalize the pressure differential by opening the eustachian tube; several predisposing factors are identified, including upper respiratory infections, anatomical insufficiency of the eustachian tube, and ignorance of the methods of autoinflation. The rate of otitic barotrauma is considered to be rising, especially among pilots of high-performance jet aircraft. It is stated that about 15% of those suffering from the condition cannot be returned to flying duties. M.L.

A66-22108

SINUS BAROTRAUMA.
P. F. King.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 113-121. 10 refs.

Clinical review of a condition arising from pressure differentials between the sinuses and the outside atmosphere, which is termed sinus barotrauma. It is emphasized that unlike otitic barotrauma (or aviation pressure deafness), the pressure difference cannot voluntarily be resolved by ventilating the middle ear cavity via the eustachian tube. Various suggestions are presented as to how the condition might first arise, but it is pointed out that the major predisposing factor is upper respiratory infection. Sinus barotrauma is found to occur in most instances during descent, especially in the lower range of altitudes (8000 to 10,000 ft), since it is there that increasing rates of pressure change with descent are most likely to cause barotrauma. The condition is marked by pain, blood clot in the nose, and nasal discharge, but is only positively established upon X-ray examination. While data are considered somewhat unreliable, it is concluded that the incidence of the condition is increasing. The prevention and treatment of the condition are described. It is stated that about 30% of the patients cannot return to flying duties. It is concluded that acute and chronic upper respiratory infections are the most important factors in producing sinus barotrauma, and that the presence of such infections in a pilot should be a basis for grounding. M.L.

A66-22109

DECOMPRESSION SICKNESS.
D. I. Fryer (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England) and H. L. Roxburgh.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 122-151. 44 refs.

Clinical review of the group of diseases termed decompression sickness. It is noted that the term is adopted because it defines the causative circumstances, and because it also embraces those syndromes which can occur as a result of decompression to ground-level conditions from high-pressure environments. Two types are distinguished: caisson disease, encountered in surfacing from deep-water diving, and subatmospheric (or aviator's) decompression sickness. A brief history of the study of the diseases is presented. It is noted that every tissue and fluid in the body is saturated with nitrogen and other inert gases in an amount that produces a partial gas pressure equal to that in the surrounding atmosphere, if the atmospheric pressure is reduced, the gases are put into a state of supersaturation, and may come out of solution in the form of bubbles - which account for most (but not all) of the symptoms of decompression sickness. Bubble formation, stability, and growth are analyzed. The clinical features of the diseases are discussed, including the frequency of symptoms, causative mechanism for individual symptoms, and the course of the symptoms. The factors affecting the onset of symptoms are evaluated, and data presented to support the conclusions that increasing age is directly related to increased susceptibility, certain body types predispose to the diseases, rapid rate of ascent is better than a slow one (in contra-distinction to caisson disease), and that exercise and oxygen increase susceptibility. Treatment is shown to consist essentially of recompression. Three major means of prevention are considered: pressurization, denitrogenation, and careful selection of air crew personnel. The phenomenon of postdecompression shock is discussed. A brief comparison is made with caisson disease. M.L.

A66-22110

THE PRESSURE CABIN.
H. H. S. Brown.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 152-186. 18 refs.

Comprehensive review of the factors involved in pressure cabin design and utilization. The history of the efforts to design pressure cabins is presented, and it is shown that early successes were designs for one-man pressure capsules for installation in non-pressurized transport aircraft. The general requirements for a pressure cabin are discussed, and the relationship between air speed and environmental temperature on kinetic heating, and the effect of altitude and cabin pressurization on relative humidity within aircraft are summarized in several tables. The problem of contamination of cabin air in passenger aircraft is assessed. It is shown that most present-day systems operate on the basis of an oversupply of air to the cabin (usually by means of engine operated pumps) with sufficient loss through appropriate valves to the external atmosphere to maintain a constant pressure level. Factors affecting the degree of pressurization are considered, and it is noted that while it is physiologically desirable to be able to maintain normal atmospheric pressure no matter what altitude is reached, the penalty in increased fuselage rigidity to meet the increased stresses is too much at present. It is further noted, however, that the present compromise of pressure at 8000 ft, which involves a maximum pressure differential of 8-1/4 lb/in^2, could advantageously be lowered to 4000 ft. The control of pressurization is considered, and diagrams of control devices and overall cabin configuration are included. A detailed consideration of the sealed cabin is made and it is compared with the true pressure cabin, one having the external atmosphere as its air source. The successful use of sealed pressure cabins on high-altitude balloon flights and the Mercury flights is examined. Ten factors are identified as determining the choice of a true pressure or sealed cabin. M.L.

A66-22111
FAILURE OF THE PRESSURE CABIN.
D. I. Fryer (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 187-206. 43 refs.

Review of the data concerning the biological effects of explosive decompression when a pressure cabin fails. The biological effects of decompression are considered to depend on four factors: the altitude at which decompression takes place, pressure differential at the time of failure, volume of the pressurized compartment, and the size of the hole permitting loss of pressure. The calculation of the rate of decompression is mathematically analyzed, based on Fliegner's equation and the work of Haber and Clamann, and of Violette. The data derived from experimental studies on animals that were explosively decompressed is reviewed; also reviewed is the limited amount of data from experiments on human subjects, which found no injury under decompression conditions when explosively decompressed from 8000 to 35,000 ft in 0.09 sec. Explosive decompression is analyzed as a cause of injury, and three important ways are identified in which such decompression might cause injury are identified: propagation of a "blast wave" through the organism, gas expansion in closed cavities (as in the intestine), and gas expansion in semiclosed cavities (as in the lungs, middle ear, and paranasal sinuses). The factors influencing the outcome of a given explosive decompression are discussed, including oxygen equipment, existing pathology, and breath holding. The few reported cases of human injury following explosive decompression are commented on, and it is pointed out that the surprising fact is that no case of pulmonary injury resulting from explosive decompression in the air has so far been reported. It is suggested that massive failure of the pressure cabin caused the loss of two Comets in early 1954. M.L.

A66-22112
RESPIRATION AND ANOXIA.
J. Ernsting.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 214-263. 52 refs.

Review of anoxia or failure of the body tissues to receive enough oxygen. Three types of anoxia are distinguished: that due to inadequate oxygenation of the arterial blood (anoxic anoxia), that arising from a reduced oxygen-carrying capacity of the blood, and finally that caused by an inadequate flow of oxygenated blood to the tissues. The commonest type of anoxia encountered in aviation is the anoxic anoxia that results from a decreased oxygen tension in the inspired air, but other types of anoxia can, nevertheless, affect an aircrew. Only the form of anoxia arising from a reduced oxygen tension in the inspired air is analyzed in detail. A general account is given of the normal processes of gaseous exchange within the body, and this is used as a background for discussion of the effects of anoxic anoxia. Respiration is also considered, which is defined as embracing all the mechanisms that are involved in the supply of oxygen for tissue metabolism, in the regulation of this supply, and in the disposal of the carbon dioxide formed as a result of cellular oxidation. Pulmonary respiration, the carrying of gases by the blood, supply of oxygen to the tissues, and the nervous control of respiration are discussed. The effects of exercise in anoxia and the physiological basis of the symptoms and signs occurring during acute anoxia are evaluated. M.L.

A66-22113
THE CIRCULATION IN ANOXIA.
I. D. Green (Queen Elizabeth Hospital, Dept. of Medicine, Birmingham, England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 264-269. 20 refs.

Brief analysis of the effects on the blood circulation experienced by a person during anoxia or failure of the body tissues to receive enough oxygen. It is shown that since the amount of oxygen available in each unit volume of blood is decreased in anoxia, some measure of compensation can only be achieved by an increase in the quantity of blood flowing through the tissues per unit time. Three processes are identified by which this may be done: an increase in cardiac output; change in the usual pattern of distribution of the available blood, so that vital tissues (brain) are supplied at the expense of less vital areas (extremities); and an increase in the total circulating red blood cell volume. It is pointed out that the extent of the part played by each of these mechanisms depends on the severity and duration of the anoxia; for instance, an increase in red blood cell volume is an adaptation to long-term anoxia. In aviation, only the effects of acute anoxia are vital. The amount of data derived from experiments on anesthetized animals and its questionable extrapolation to human subjects are noted. The systematic and pulmonary circulations, and the electrocardiogram in anoxia are discussed. It is concluded that in a normal man cardiac output rises during anoxia, and is achieved mainly by a change in heart rate, which begins to rise when the arterial oxygen tension falls to about 85 mm Hg. M.L.

A66-22114
THE EFFECTS OF ANOXIA ON THE CENTRAL NERVOUS SYSTEM.
J. Ernsting.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 270-289. 41 refs.

Clinical review of the effects on the central nervous system of anoxia, or failure of the body tissues to receive enough oxygen. It is pointed out that of all the tissues of the body, that of the nervous system is least capable of withstanding oxygen lack, and that, therefore, anoxia impairment of function first becomes apparent in the central nervous system, and is the site of the most profound physiologic disturbances. The effect of anoxia on the personality and intellect is reviewed. It is shown that when air is breathed at altitudes of from 8000 to 25,000 ft symptoms of mild disturbance begin to occur at about 12,000 ft (as measured by arm/hand steadiness, and various computation tests), and become worse with increasing altitude; not only does the time between exposure and onset of impairment of function decrease, but the time rate of impairment increases. The nervous symptoms of anoxia are evaluated, including blurring of vision, inability to think clearly, weakness, and dizziness. Data on the incidence of symptoms caused by breathing air at simulated altitudes of 14,000 and 25,000 ft are summarized in a table. Unconsciousness due to anoxia and anoxic convulsions are considered. M.L.

A66-22115
THE METABOLIC EFFECTS OF ANOXIA.
J. Ernsting.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.

Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 290-302. 21 refs.

Review of the changes in normal cellular metabolism brought about by anoxia, or failure of the body tissues to receive enough oxygen. Normal cellular metabolic processes are reviewed in detail, in particular, the Krebs or tricarboxylic acid cycle, and the critical importance of adenosine triphosphate, creatine phosphate, and acetyl-coenzyme A is emphasized. It is shown that when the rate at which oxygen is supplied to the interior of a cell falls below metabolic needs, the oxidation-reduction systems shift toward a more reduced state. It is noted that with the moderate degree of anoxia caused by breathing air at altitudes of 15,000 to 18,000 ft, there is no demonstrable increase in the lactic acid of resting subjects, but when exercise takes place with this degree of anoxia there is a greater increase in the concentration of lactic acid than occurs on performing the same exercise at sea level; exposure to anoxia at 18,000 ft causes a moderate but significant rise in the blood glucose level in man. On the basis of experimental evidence reviewed, it is concluded that with moderate degrees of anoxia the heart maintains an aerobic metabolism. The metabolic events involved in impulse conduction by nerve cells are recounted, and it is shown that anoxia causes a progressive loss of potassium and gain of sodium in the intercellular fluid, leading to consequent depolarization of the nerve cell membrane and eventually to interruption in impulse conduction. It is noted that in man, a reduction of the arterial oxygen saturation to 65% by breathing 10% oxygen in nitrogen does not cause significant change in overall cerebral oxygen uptake. M.L.

A66-22116
THE PHYSIOLOGICAL REQUIREMENTS OF AIRCRAFT OXYGEN SYSTEMS.
J. Ernsting.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 303-342. 23 refs.

Review of the fundamental physiology of breathing in relation to determining the requirements of an aircraft oxygen system. The composition of the inspired gas, total pulmonary ventilation and air flow during flight, and the mechanics of normal respiration are analyzed and compared. It is shown that an aircraft oxygen system must supply a mixture of oxygen and nitrogen that will maintain a normal alveolar oxygen tension up to 33,000 ft with minimum disturbance to respiratory function, provide peak flows up to 250 liters/min, and cope with minute volumes of the order of 100 liters/min. Aircraft oxygen systems are generally discussed, and closed-circuit and open-circuit systems described and compared. The design, air flow through, and leakage problems of the oxygen mask are detailed. Several design configurations of masks are compared. Applications of the study to civil passenger aircraft are made. Six factors are identified as criteria in evaluating which crew members should wear their oxygen masks, and emergencies in the aircraft are also considered. It is shown that the performance of even experienced, trained personnel suffers following short-term (3 to 15 sec) rapid decompression (8000 to 35,000 and 40,000 ft). Requirements regarding the quality or purity of oxygen and its storage are reviewed. M.L.

A66-22117
THE PHYSIOLOGY OF PRESSURE BREATHING.
J. Ernsting.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 343-373. 22 refs.

Review of the physiological change taking place under pressure breathing. It is noted that although at altitudes up to 33,000 ft the alveolar oxygen tension may be maintained at its sea-level value by increasing the proportion of oxygen in the inspired gas, above this altitude the alveolar oxygen tension falls even when pure oxygen is breathed. Positive pressure breathing is shown to be one method whereby pressure in the alveoli may be maintained under ambient conditions. A short history of the study of pressure breathing is given. Four major aspects of the study of pressure breathing are considered: the application of pressure to the respiratory tract; respiratory effects of pressure breathing; circulatory effects; and pressure breathing and anoxia, or failure of the body tissues to receive enough oxygen. It is shown that an oronasal mask is a satisfactory piece of equipment for pressure breathing that does not exceed 2 or 3 min at 60 mm Hg, but that beyond that a pressure helmet is necessary. It is concluded that positive pressure breathing eventually leads to syncope (fainting), but that the elapsed time before syncope depends primarily on the pressure which is applied to the respiratory tract. M.L.

A66-22118
THE PRINCIPLES OF PRESSURE SUIT DESIGN.
J. Ernsting.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 374-405. 6 refs.

Review of the history, design configurations, construction, and materials of full and partial pressure suits to protect aircraft personnel at high altitude. It is shown that no matter what the design, all pressure suits are very cumbersome to wear and, when inflated, seriously restrict limb movements. It is noted that the development of pressure cabins superseded that of pressure suits; and that nowadays pressure suits are worn in the uninflated state and inflated only in the event of failure of the pressure cabin or escape at high altitude. The basic feature of the full pressure suit is that the pressure delivered to the suit is evenly applied to the entire body surface. The construction of various types of suits is compared, especially the design of shoulder and elbow points so as to allow maximum mobility. It is shown how the concern for mobility has dictated the use of an impermeable but generally flexible fabric vs a rigid metal suit. Various pressure suit control system configurations are illustrated and compared. The design and operation of present-day British partial pressure helmet are discussed. The maximum acceptable breathing pressures with various partial pressure combinations are summarized in a table. M.L.

A66-22119
THE EFFECTS OF THERMAL STRESS ON THE HUMAN BODY.
D. McK. Kerslake (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 409-440. 43 refs.

Comprehensive review of the mechanisms of heat regulation when the human body is exposed to moderate, hot, and cold temperatures. The physics of heat exchange are briefly reviewed, including the processes of conduction, radiation, convection, and evaporation. The effect of clothing on the processes of heat exchange is assessed. Heat regulation, acclimatization, and tolerance to warm and cold conditions are analyzed and compared. It is shown that acclimatization can increase the tolerance to extremes of temperature, especially when exercise is performed during exposure to the conditions, and the possibility of simultaneous adjusting to both heat and cold is suggested. The concept of the effective temperature is introduced, and is defined as the temperature of still air saturated with water vapor that gives rise to the same degree of thermal comfort as the environment being assessed; two nomograms are presented that allow its being calculated. The rate and amount of sweating both in warm and cold conditions are evaluated. M.L.

A66-22120
THERMAL STRESS IN AVIATION.
D. McK. Kerslake (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England), J. D. Nelms (Rhodesia and Nyasaland, University College, Dept. of Physiology, Salisbury, Southern Rhodesia), and J. Billingham (NASA, Manned Spacecraft Center, Crew Systems Div., Environmental Physiology Branch, Houston, Tex.).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 441-478. 23 refs.

Comprehensive review of thermal stress from the viewpoint of air conditioning the microclimate, defined as the atmosphere between the skin and inner layer clothing worn by aircraft personnel. Seven factors are delineated in defining conditions appropriate to comfort: metabolic heat production of the man, clothing worn, air and wall temperatures, air movement, atmospheric pressure, and solar radiation. It is shown that thermal comfort for a man sitting still

or doing light manual work is associated with a mean skin temperature of about 33°C and an evaporative heat loss of about 20% of the total body heat production - the remainder of the heat lost through conduction, convection, and radiation. The concept of the microclimate is introduced, and it is noted that there is no difference between conditioning the microclimate directly and conditioning it indirectly by suitable control of the cabin environment, but that the former method is economical because weight and power consumption of the necessary support equipment are less. The principles of microclimate control are analyzed. The mechanisms, regional requirements, and dangers of electrical heating are considered. The mechanism of air heating is discussed, in which warm, dry air is circulated through the microclimate region. Problems of air heating and air cooling are evaluated. M.L.

A66-22121
FACTORS AFFECTING THE SURVIVAL OF MAN IN HOSTILE ENVIRONMENTS.
P. D. G. V. Whittingham (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 479-513. 59 refs.

Review of the principles, techniques, and equipment involved in the survival of man in hostile environments. Five needs are cited as critical: protection from the essential hostility of the environment; rapid location and rescue, whenever possible; water; food; and auxiliary aids, such as first-aid pack, knife, etc. Clothing, as it affects survival in cold water and air environments and desert conditions, is evaluated. It is shown that survival time in cold water can be directly related to the quality and insulating value of the clothing worn. A nomogram for estimating tolerance times to cold water immersion is given. It is remarked that if techniques could provide for rescue within 24 hr, most survival problems would be minimal. It is emphasized that in hostile environments the need for water is more urgent than that for food, and the danger of drinking sea water is stressed. Survival at sea is considered, and compared with that on land, the essential difference being that on land, for the most part, potable water is more readily obtainable. Food rations are also compared, and important differences shown to exist, depending on what hostile environment they are designed for. Composition of several presently used emergency rations is given. M.L.

A66-22122
ACCELERATIONS - INTRODUCTION.
P. Howard.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 517-550.

Review of the basic ideas and principles of elementary mechanics as an introduction to the study of the physiological effects of accelerations. Speed and velocity are defined; force, mass, and acceleration are related. Accelerations, both rectilinear and at constant speed - motion in a circle - are recounted. The relationship between weight and gravity is shown, and, while weight is defined in terms of gravitational acceleration, the lack of knowledge concerning the essential nature of gravity is noted. Weightlessness and the means of producing it are summarized. The confusion regarding the nomenclature of acceleration research is noted, and the tools of acceleration research, especially centrifuge systems, are discussed. M.L.

A66-22123
THE PHYSIOLOGY OF POSITIVE ACCELERATION.
P. Howard.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 551-687. 296 refs.

Comprehensive review of the effects of positive (or headwards) acceleration on vision, the cardiovascular system, the kidneys, respiration, brain-wave patterns, and on total performance. It is noted that impairment of vision is one of the most important consequences of exposure to positive g, but that the fact that a particular degree of visual impairment is produced by a value of acceleration reliably related to that necessary to cause unconsciousness makes vision a useful index of overall tolerance to positive g. The time-course of visual symptoms, the origin, mechanism, and extent of blackout, and other positive-g effects on vision are analyzed. The measurement of tolerance to positive g is recounted, including the limits of tolerance. The effects of positive g on the cardiovascular system are extensively discussed, and the theoretical considerations involved in the term "pressure" are examined. As part of the discussion on the cardiovascular system, the use of a simplified model of the system is considered, Changes in the circulation through the heart, brain, and kidney are compared. Six conclusions are reached as to the effects of positive g on the electrocardiogram. Respiration, including the effects of anti-g suits, is analyzed. One conclusion reached about the electroencephalogram is that the hope that it might yield information about the finer changes in cerebral physiology under positive g is clearly not justified. Heat and hypoglycemia (low blood sugar level) are evaluated as additional stresses during exposure to positive g, and it is concluded that heat definitely lowers tolerance to positive g, and that hypoglycemia quite also lowers tolerance. Alcohol, overbreathing, anoxia, degree of filling of the stomach, and breathing of 100% oxygen are also evaluated. Two broad conclusions are drawn: any major stress, such as high temperature, hyperventilation, etc., can reduce positive-g tolerance by a significant amount, and when more than one of these factors is present, even in a minor degree, the tolerance to acceleration is reduced to a greater extent than would be suggested by a simple summation of effects. The effects of exposure to positive g on vision and hearing, and the performance of simple motor and complex tasks is evaluated. Biochemical changes during positive g are briefly noted. Methods of increasing tolerance to positive g are discussed, including voluntary action, posture, water immersion, and anti-g suits. M.L.

A66-22124
THE PHYSIOLOGY OF NEGATIVE ACCELERATION.
P. Howard.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 688-716. 53 refs.

Review of the effects of negative (or footwards) acceleration on the heart, blood pressure, and respiration. It is noted that although the symptoms are well known (fainting, very low tolerance as compared with positive acceleration, blurring of vision) the physiological reasons are not. The effects of negative g are shown to be much more dramatic than those of exposure to positive g. It is noted that negative g produces its symptoms by affecting the pressure in the veins of the neck and head. Cerebral hemorrhage and unconsciousness are considered and compared. M.L.

A66-22125
THE PHYSIOLOGY OF TRANSVERSE ACCELERATION.
P. Howard.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 717-745. 53 refs.

Evaluation of the effects of transverse acceleration on the cardiovascular system, respiration, and performance. The extensive modifying effects of the prone and supine positions, and transverse accelerations and space travel are discussed. The variation in observed reactions concerning body position is noted, and it is shown that varying the positions of the body extremities affects the results. It is noted that, until recently, interest in transverse accelerations was limited, but that with the development of large rockets, interest in human performance under such conditions has renewed. It is emphasized that the only practical method of withstanding the accelerations of launch and especially reentry is to make certain they act transversely. In a sense, the use of transverse accelerations in space flight is also a means of protection against headward acceleration (positive g). It is concluded that the limits of acceptable transverse accelerations are largely set by the difficulty with respiration. The work in breathing, oxygen consumption, and vital capacity are examined. M.L.

A66-22126
THE EFFECTS OF ACCELERATION OF SHORT DURATION.

D. H. Glaister (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 746-795. 42 refs.

Review of the mechanical and physiological factors involved in the design, testing, and operation of ejection seats as exemplifying the effects of short-duration accelerations (less than 1 sec). It is noted that although accelerations of this type are encountered in catapult launching, deck landing, escape from aircraft, and in crashes, the most important case is in the use of the ejection seat. Its various stages involve forces similar in degree and direction to those of almost all other situations. The main components of a modern ejection are discussed, and several operational sequences are considered. The accelerations experienced during ejection are analyzed as they occur at five points in the ejection sequence. Types of back injuries suffered during ejection are compared and related to the use of compressible packs between the man and the seat. Decelerations encountered upon entering the airstream are evaluated, as are those involved in the parachute-opening shock and upon landing. Underwater and downward ejection are briefly considered. M.L.

A66-22127
MOTION SICKNESS.
T. C. D. Whiteside.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 796-803. 24 refs.

Review of the incidence, clinical features, etiology, and treatment of motion sickness. It is considered that the terms car sickness, air sickness, and sea sickness all refer to a single clinical entity, not to different illnesses peculiar to the mode of travel. It is noted that the fact that most people can experience motion sickness is definitely established. The clinical symptoms are viewed, and the lack of any characteristic pulse change is noted. The part played by passive movement of the head in producing motion sickness is emphasized, and it is shown that immobilizing the head decreases the incidence. Three types of motion sickness are delineated: a nonlabyrinthine type associated with rapid negative (or footwards) acceleration; a type associated with purely psychological factors, such as fear and anxiety; and a type which appears to be brought about by the conflicting information provided by a visual display of motion without labyrinthine verification of that motion, and is considered similar to that of the labyrinthectomized subject who is motion sick for several days until he adapts to his loss of labyrinthine function. It is noted that treatment still tends to be largely empirical. M.L.

A66-22128
VIBRATION.
J. C. Guignard (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 813-894. 189 refs.

Review of the mechanical, forced vibrations encountered in aviation and description of their biological and physiological actions. The principles of vibration theory and analysis are reviewed. Types of vibration systems are analyzed, including an undamped free vibration of a simple linear system, and forced sinusoidal vibration and resonance. It is considered advisable not to seek a too-rigorous definition of vibration, but rather define it practically, along the lines of a series of reversals of velocity. Measurement and measuring devices are briefly considered. The different types of vibration encountered in aeronautics and astronautics are compared. Experimental vibration and flight simulation are examined, and some of the types of equipment used are illustrated. Among the major biological factors are body resonance phenomena; these are analyzed in some detail. Physiological and neurophysiological effects are assessed, and the effect of vibration on visual acuity is considered. Disease states produced by vibration and the principles of protection against it are discussed. M.L.

A66-22129
NOISE.
J. C. Guignard (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 895-967. 171 refs.

Comprehensive review of noise in aviation, where "noise" is defined as any sound that is unpleasant, loud, harsh, or distracting. The physical nature of sound and the principles of noise measurement are reviewed. Representative levels of equivalent and relative loudness for sounds ranging from rustling leaves to a large rocket engine at 100 yards are summarized in a table. Techniques of noise measurement and analysis are discussed. Noise, as encountered in aviation, is examined from the viewpoint of its source, including the aircraft itself, airfield equipment, etc. Sound propagation hrough air under various meteorological conditions is compared. The physiology and microanatomy of the ear are described, and the effects of noise are assessed. The psychology of noise is also considered, but it is emphasized that while many people find various sounds annoying, an exact definition of annoyance and its nature is difficult to formulate. Principles of noise suppression in aviation and equipment used for this purpose are examined. M.L.

A66-22130
AUDITORY PERCEPTION IN AIRCREW.
P. F. King.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 968-988. 12 refs.

Review of the measurements, technique, and standards involved in auditory perception in aircraft personnel. Although considered obvious, the need for the members of an aircrew to have good hearing is emphasized. It is shown that, in practice, a pilot who is required to hear speech in a background of noise is unlikely to make use of a greater range of speech frequencies than that from 500 to 3000 cps. The clinical and audiometric techniques of examining hearing acuity are described, and three different tests administered by the RAF are evaluated and compared. The risk to hearing and acoustic trauma to which personnel, especially service personnel, are subjected are shown to depend on factors which include age, individual susceptibility, and nature and intensity of noise. It is stated that any noise with an overall intensity in excess of 95 db can be hazardous to hearing. Measures to reduce the risk of hearing loss are reviewed, in particular the RAF Mark III ear defender is described and illustrated. The use of audiograms to measure and follow the progress of hearing loss is described. M.L.

A66-22131
THE ENVIRONMENT AND EYE PROTECTION.
T. C. D. Whiteside.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 994-1003. 5 refs.

Review of the physiological problems of vision in flight at high altitude and the physical characteristics of the pilot's environment which are responsible for the problems. The abnormal distribution of brightness below and darkness above is noted, as is the fact that sky brightness decreases with increasing barometric pressure. The contrast between sunlit areas and shadows is shown to become very extreme due to the thinness of the upper atmosphere and consequent increasing intensity of sunlight. Various means of designing instrument lighting and navigation and runway lights and of protecting the eye with a visor/helmet combination are discussed and compared. The problem of glare is also considered. M.L.

A66-22132
VISUAL MECHANISMS OF SPECIAL IMPORTANCE IN AVIATION.
T. C. D. Whiteside.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1004-1013. 7 refs.

Review of the nature of (1) night vision and dark adaptation, (2) scanning technique to locate an object, (3) glare, and (4) dazzle from artificial sources, as factors of special importance in aviation. A brief history is presented, and it is shown that the attention paid to night vision during World War II resulted in studies

of these factors. The biochemistry of the eye in dark adaptation is briefly summarized. The technique of search for an object by using peripheral vision in order to avoid the blind spot is described. The means by which glare disturbs normal vision is examined. Dazzle from artificial sources (such as runway lights under poor conditions of visibility) is assessed, and the dazzle produced by the fireball of a high-yield weapon is considered. M.L.

A66-22133
ACCOMMODATION AND EYE MOVEMENTS.
T. C. D. Whiteside.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1014-1020. 12 refs.

Review of data concerning two important factors in visual observation and tracking of objects by aircraft personnel - accommodation and eye movements. It is shown that in attempting to detect an object against an empty visual field, such as a uniformly overcast sky or dense haze, the maximum visual range is dependent upon the target being focused upon accurately; this implies that, in air-to-air search, the eye of the observer must be focused at infinity. It is noted that the depth of focus available in the human eye compensates for many inaccuracies in focusing and, when a pupil diameter of 3-4 mm is considered, an eye focused at 30 ft can be considered as focused at infinity. Although it has often been stated that in the resting state the eye is focused for infinity, this is not necessarily the case; it has been found that accommodation cannot be relaxed voluntarily to the far point when one looks into an empty visual field. The accommodation mechanism is in a state of constant fluctuation. If the subject is an emmetrope with the far point at infinity, he will actually focus on a point 1 or 2 m away. Thus, despite the depth of focus available, objects whose angular size is at the threshold of visual acuity will then have to increase to almost twice the minimal size - or approach twice as closely - before they can be detected because of the consequent out-of-focus blurring. Eye movement and instrument presentation are considered. M.L.

A66-22134
VISIBILITY AND PERCEPTION.
T. C. D. Whiteside.
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1021-1028.

Evaluation of the loss of visibility that takes place at high altitude with respect to the very rapid closing times of high-performance aircraft approaching each other. It is shown that the problem can be thought of in terms of a loss of contrast between the target object and the background against which the search is made. The optical and atmospheric conditions that account for this situation are considered, and its consequences are made obvious in the light of the shortened reaction times available to pilots of high-speed aircraft. Restriction of the visual field at high speed is diagramed, and three visual illusions that further complicate the situation are considered. The phenomenon of fixating a distant point when landing is examined. M.L.

A66-22135
PSYCHOLOGICAL ASPECTS OF EQUIPMENT DESIGN.
J. M. Rolfe (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1031-1060. 29 refs.

Review of human-factors engineering in cockpit instrumentation presentation and its design. It is shown that an aircraft and its pilot can be regarded as a closed loop made up of the various sensors, controls, and instruments; the aircraft's position and performance (termed the system input) are measured by the sensor and displayed by the instruments to the pilot, whose job it is to decide what control actions, if any, are necessary. Various means of more efficiently presenting instrumentation data to the pilot are discussed, including one based on the use of CRT's to generate views of the vertical and horizontal from integrated instrument readings. It is shown that to achieve the greatest efficiency, it is necessary for the man and machine to be closely coordinated. Some inherent limitations of man - including man's poor monitoring ability and time lags (reaction times) - are considered as parameters of such systems. It is considered the responsibility of the human-factors scientist to make the man-machine coordination as efficient as possible, and it is therefore considered necessary to study both man and machine. It is postulated that the efficiency of the operator depends on four factors: man-machine dynamics, or the tasks which the operator is required to perform; the layout of the workspace, or the arrangement of the tools in relation to the operator in the working area; the design of equipment, or the tools with which the operator is expected to perform his tasks; and the working environment, or the influence of stress on his performance. M.L.

A66-22136
THE EFFECT OF ENVIRONMENTAL STRESS ON PERFORMANCE.
K. G. Corkindale (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1061-1072. 53 refs.

Evaluation of variously defined stresses as they affect performance efficiency in tasks requiring constant monitoring. The methods of research and the types of performance measure are described. Failure, distraction, fear, physical discomfort, speed and load, dangerous duty, and biological stresses are studied. It is considered clear that a wide variety of situational factors can cause a deterioration in performance, and in a given situation the level of performance will depend not only on the environment but also on the nature of the task and characteristics of the individual. One consistent finding identified is that stressful working conditions produce different effects in different individuals. It is concluded that three factors seem to be most often associated with poor performance: high anxiety, poor motivation, and a low level of skill at the task. The need for suitable selection (screening) and training programs is especially emphasized. An additional factor pointed out is that the working environment and the task must be designed to avoid extreme conditions. M.L.

A66-22137
AIRCREW SELECTION.
A. Cassie (Air Ministry, London, England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1073-1085. 16 refs.

Review of the principles, processes, and criteria involved in aircrew selection. The principles and some specific forms of aptitude tests are considered and compared, including the use of the Minnesota Multiphasic Inventory (MMPI) to assess temperamental suitability for aircrew. The validity of various batteries of aptitude test is evaluated, and a direct relation is demonstrated between high test score, previous flying experience, and high degree of success at completing flying training. Nine traits are identified as making for aircrew success regardless of aircrew role: calmness, confidence, dependability, cooperation, attitude to others, decisiveness, determination, initiative, and keenness. The group-situational approach to aircrew selection based on these traits is considered. M.L.

A66-22138
SPATIAL DISORIENTATION IN FLIGHT.
A. J. Benson (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1086-1129. 109 refs.

Comprehensive review of the factors involved in disorientation in flight. Several simplified anatomical diagrams are presented of the sense organs which produce sensations of various types of acceleration. The perception of angular motion is considered. Pressure vertigo and the role played by the otolith organ in the perception of the vertical are examined. The importance of normal vestibular function in an aircrew is emphasized. The visual sense and the illusions to which it is subject are considered at length. Instrument flight and errors - especially those possibly caused by

poor instrument design leading to misreadings - are discussed. Disorientation and performance are discussed and considered to be related to the extent that disorientation probably accounts for 2% of all major accidents and about 14% of all fatal accidents. M.L.

A66-22139

ACCIDENT STATISTICS.
D. I. Fryer (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1139-1142.

Brief survey of the accident classification system adopted by the RAF. The foundations of such statistical data are considered to be completeness (all occurrences must be reported) and adequate classification. The basis of the system is shown to be the definitions of an aircraft accident vs a special occurrence (roughly equivalent to an incident in other systems). Causes of accidents are grouped into eight main classes, and each accident is coded under prime and contributory causes. The headings are presented, and it is pointed that they could be conveniently regrouped under technical error, human error, natural hazards, and unknown. It is emphasized that accidents must not only be considered in terms of absolute numbers, but should also be expressed in relation to the utilization of aircraft so that the extensive influence of takeoffs and landings will be truly reflected. Two charts are presented showing the distributions of the main and contributory causes of major aircraft accidents in the RAF in 1960. M.L.

A66-22140

HUMAN FACTORS IN THE CAUSATION OF ACCIDENTS.
D. I. Fryer (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1143-1156. 10 refs.

Assessment of human error in causing aircraft accidents. Five types of errors commonly made - and their contributory causes - are enumerated; it is considered that when there is failure of the man/machine complex, it can be attributed to faults in the human external data receiving system (senses), the input from aircraft instrumentation, the higher centers of the central nervous system, or the effector output from the central nervous system. Each is considered in detail. Faulty perception involving vision, hearing, attitude, and instrument misreading is analyzed. M.L.

A66-22141

THE RESULTS OF ACCIDENTS.
D. I. Fryer (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1157-1192. 71 refs.

Review of the statistics and the nature of the results of aircraft accidents in terms of injuries and deaths. It is noted that an accident is usually defined so as to include any occurrence during flight which results in an injury. Therefore, injuries arising during flight as well as impact-force (crash) injuries are extensively reviewed. Accident injuries are classified in relation to the following phases: flight, impact, subsequent to impact, and during in-flight escape. Both aircrew and passenger injuries are examined. The work of NASA, in which instrumented aircraft were deliberately wrecked, is especially noted: the actual patterns of forces in such situations were thus firmly established. The findings of this work showed that the rate of deceleration of the center fuselage is governed not by the speed, but by the characteristics of the front part of the fuselage. Six causes of injury and death in aircraft accidents are identified, and each is considered in some detail. Injury associated with escape in flight is evaluated. M.L.

A66-22142

THE MEDICAL INVESTIGATION OF ACCIDENTS.
D. I. Fryer (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1193-1201. 34 refs.

Review of the principles and practice of the medical investigation of aircraft accidents. It is stated that medical information concerning a particular accident has three aspects: investigation of the cause and results of the accident, and accumulation of data relevant to long-term studies of the causes, results, and prevention of accidents. It is noted that the manner in which the investigation should be carried out is dependent largely on the circumstances of the actual accident under examination. The role of the medical profession, especially in view of the training doctors receive in history taking, is especially emphasized as being valuable in accident investigation. The evaluation of both the past history of the aircrew and passengers and the extent of traumatic injury can aid in reconstructing the precipitating circumstances of an accident. The general procedures in the reconstruction of an accident sequence are reviewed. M.L.

A66-22143

THE PREVENTIVE MEDICINE OF ACCIDENTS.
D. I. Fryer (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: A TEXTBOOK OF AVIATION PHYSIOLOGY.
Edited by J. A. Gillies.
Oxford, Pergamon Press, Ltd., 1965, p. 1202-1212. 21 refs.

General review of the part medicine and medical science can play in the overall effort to reduce the incidence and severity of aircraft accidents. It is stated that the practice of aviation medicine must aim at the establishment and maintenance of flying efficiency and that a vital part of this task depends on efforts aimed at the prevention of accidents and potential accident situations. In turn, causes, results, and escape are considered by examining the man, the machine, and the man/machine complex. The critical role of training is especially emphasized. The basic principle of designing aircraft for injury prevention involves assuring that the aircraft retain and restrain its occupants. Design and structural modifications are briefly discussed to better achieve this end. M.L.

LC ENTRIES

A66-80748
THE RADIATION-PREVENTIVE ACTION OF COMBINED CHEMICAL RADIOPROTECTORS (CYSTEAMINE, SEROTONIN, AET, AND GLUTATHIONE) AGAINST ACUTE RADIATION SICKNESS PROVOKED BY FULLY LETHAL DOSES OF X-RAYS. EXPERIENCES IN CHEMICAL RADIATION PREVENTION; EXPERIENCE NO. 7 [AZIONE RADIOPREVENTIVA DI RADIOPROTETTORI CHIMICI ASSOCIATI (CISTEAMINA, SEROTONINA, AET E GLUTATIONE) CONTRO IL MALE ACUTO DA RAGGI PROVOCATO DA DOSI TOTILETALI DI RAGGI X: ESPERIENZE DI RADIOPREVENZIONE CHIMICA: ESPERIENZA N. 7].
C. Arghittu, G. De Renzi, V. De Pascalis, Bragazzi, and L. D'Ambra (Centro Applicazioni Mil. Energia Nucl., Lab. di Radiopatol. e Igiene delle Radiazioni, Pisa, Italy).
(Giornate Med. delle Forze Armate, Torino, Jun. 11–12, 1965).
Minerva Medica, vol. 56, Nov. 14, 1965, p. 3861–3865, 1965. In Italian.
The following results were obtained from experiments with female rats receiving intraperitoneally combinations of cysteamine, serotonin, aminoethylisothiuronium (AET), or glutathione one half hour prior to total-body X-irradiation in lethal doses. In the first group of animals treated with cysteamine, serotonin, and AET there was 80% survival. In the second group treated with cysteamine, serotonin, and glutathione, survival was 50%. In the third group treated with cysteamine, serotonin, AET, and glutathione, survival was 80% as in the first group. The results indicate that the greatest survival appeared in groups treated with radioprotective drug mixtures containing AET. Included are graphic analyses of the radioprotective drug mixtures in terms of survival and X-ray dosage.

A66-80749
RESPONSES OF AVENA COLEOPTILES TO MAGNETIC AND ELECTRICAL FIELDS.
James M. Pickett and A. R. Schrank (Tex. U., Dept. of Zool., Austin).
Texas Journal of Science, vol. 17, Sep. 1965, p. 245–258. 7 refs.
Grant PHS GM-05916-05.
Apical Avena coleoptile segments 17.55 mm. long were exposed to a magnetic field of 565 to 1,020 gauss in the presence of 2,3,6-trichlorobenzoic acid (TCBA) and electrical fields from 500 to 2,500 volts. Bending was unaffected by the magnetic fields when the coleoptile pores were oriented toward the axis of rotation. The magnetic field plus 1×10^{-5} M TCBA inhibited curvature more effectively than the magnetic field alone. From 500 to 250 volts oriented along the longitudinal coleoptile axis also inhibited curvature. Curvature was greater than the mean initial curvature only when the apical plate was 2,500 volts electronegative. The other field strengths caused straightening of the coleoptiles. Polarity of the field was significant only at 500 and 2,500 volts where an electropositive apical plate caused greater decreases in curvature. With the apical plate negative, the magnetic field partially counteracted the inhibition by electrical fields from 1,000 to 2,000 volts. The same curvature reduction was induced by 2,500 volts, with or without the magnetic field. When the apical plate was positive, curvature inhibition by 1,000 to 2,000 volts was independent of the magnetic field. Curvature reduction induced by 2,500 volts was partially counteracted by the magnetic field.

A66-80750
EFFECTS OF EXERCISE ON MYOCARDIAL FORCE-VELOCITY RELATIONS IN INTACT UNANESTHETIZED MAN: RELATIVE ROLES OF CHANGES IN HEART RATE, SYMPATHETIC ACTIVITY, AND VENTRICULAR DIMENSIONS.
Edmund H. Sonnenblick, Eugene Braunwald, John F. Williams, Jr., and Gerald Glick (Natl. Heart Inst., Cardiol. Branch, Bethesda, Md.)
Journal of Clinical Investigation, vol. 44, Dec. 1965, p. 2051–2062. 35 refs.
The responses of the heart to mild exercise were studied in 11 patients utilizing a cineradiographic technique, which allows an evaluation of myocardial force-fiber shortening rate relations as well as cardiac dimensions. Exercise resulted in an augmentation of the contractile state of the myocardium; an increase in the velocity of contraction at any given force was seen, and this shift of the force-velocity relation could be blocked almost completely with the beta-adrenergic receptor blocking agent, propranolol. The contribution of heart rate changes to this shift in the force-velocity relation was minor. Tachycardia induced without exercise reduced ventricular end-diastolic dimensions to a greater extent than exercise, thus providing evidence for the participation of the Frank-Starling mechanism during exercise. It is concluded that the response of the heart to exercise results from a synthesis of three fundamental adaptive mechanisms: (1) shift of the myocardial force-velocity relation, (2) tachycardia, and (3) the Frank–Starling mechanism.

A66-80751
ENZYME ACTIVITIES (ALDOLASE, GLUTAMIC-OXALACETIC TRANSAMINASE, GLUTAMIC-PYRUVIC TRANSAMINASE, LACTATE DEHYDROGENASE, MALEATE DEHYDROGENASE) FOLLOWING EXPERIMENTAL HYPOXIA AND DURING SHOCK FROM HEMORRHAGE AND ENDOTOXIN INTOXIDATION [DIE ENZYMAKTIVITATEN (ALD, GOT, GPT, LDH, MDH) NACH EXPERIMENTELLER HYPOXIE UND IM SCHOCK DURCH HAMORRHAGIE UND ENDOTOXININTOXIKATION].
J. Bartel, J. Dieckhoff, S. Iwanoff, and R. Koch (U.-Kinderklin. der Charite, Berlin, East Germany).
Das deutsche Gesundheitswesen, vol. 20, Dec. 30, 1965, p. 2297–2303. 63 refs. In German.
Aldolase (ALD), glutamic-oxalacetic transaminase (GOT), glutamic-pyruvic transaminase (GPT), lactate dehydrogenase (LDH), and maleate dehydrogenase (MDH) activities were studied in serum, heart, and liver tissues of male rabbits after anoxia, hemorrhagic shock, and endotoxin shock. Lethal anoxia led to an inhibition of the enzyme activity in tissue. Hemorrhagic shock of 1 hour evoked only a moderate hypoxia. The latter resulted in an increased permeability of the cellular membrane and a shift of the enzymes into the circulatory system. Lethal endotoxin shock in contrast, was followed by a primary decrease of transaminase activity in tissue. Other enzymes leaked into the blood stream after hypoxic alteration of cell membrane permeability.

A66-80752
MAN–MACHINE ENGINEERING.
Alphonse Chapanis (Johns Hopkins U., Baltimore, Md.)
Belmont, Calif., Wadsworth Publishing Co., Inc., 1965, viii+ 134 p. 31 refs. $2.60.
This is an outline of selected topics within the field of human engineering, primarily machine oriented. It is aimed at the nontechnical reader. Chapter 1 introduces the field and defines the terms. Chapter 2 defines equipment systems, man–machine systems, and the human factors involved. Chapter 3 discusses problems of machine displays; choice between visual and auditory communication; principles, design and use of visual displays; illumination problems, and design of lighting systems. Chapter 4 reviews auditory displays and problems of speech communication systems. Chapter 5 covers the design of controls including control-display ratios, direction-of-movement relationships, control coding and arrangement. Chapter 6 surveys several other topics in engineering psychology, its methodology and outlook.

A66-80753
A LARGE ULTRAHIGH-VACUUM ENVIRONMENTAL CHAMBER WITH LIQUID-HELIUM-COOLED LINER.
C. D. Elderkin (RCA Serv. Co., Camden, N. J.) and J. M. Bradford (NASA, Langley Res. Center, Hampton, Va.)
Journal of Environmental Sciences, vol. 8, Dec. 1965, p. 11–15.
The design of a large ultrahigh-vacuum environmental chamber which simulates conditions in space is discussed. The 150-cubic-foot chamber consists of an outer, conventional vacuum vessel; an inner, diffusion-tight vessel; and an inner helium panel (cryogenic wall or cryowall) cooled to liquid-helium temperature. Because of openings in the cryowall to provide sufficient molecular conductance to the diffusion pump ports, and with those openings required for model supports, viewing, gauging, and introduction of mechanical motion, a test object is exposed to surroundings that are approximately 85% at helium temperature and 15% at liquid-nitrogen temperature. The system is designed so that it can be operated with the cryowall removed or with both the cryowall and inner chamber removed. With both the cryowall and inner chamber removed, the system is a large vacuum chamber capable of pressures of about 2×10^{-8} torr; with the cryowall removed, the pressure can be about 5×10^{-10} torr; with the cryowall in place, at 5° K., the pressure can reach approximately 5×10^{-11} torr.

A66-80754
TELEMETRY IN PRESSURE CHAMBERS.
C. C. Wilton-Davies (Royal Naval Physiol. Lab., Alverstoke, Hants, Great Britain).
World Medical Electronics, vol. 3, Dec. 1965, p. 329–330.
During dry dives in the laboratory, simulating conditions of deep-sea diving, telemetry devices were tested in order to obtain continuous data on the physiological functions of man subjected to hazards of excessive pressure. With the use of FM transmitters connected to multipoint electrodes the electrocardiogram can be measured. These transmitters can be connected to a mask fitted with thermocouples for registering the respiratory flow. Smaller AM transmitters can be used for electrocardiogram, electroencephalogram, and electromyogram.

A66-80755
FAST METHOD OF QUANTITATIVE DETERMINATION OF HYDROGEN PEROXIDE VAPORS BY USE OF INDICATOR PAPER [EKSPRESSNYI METOD KOLICHESTVENNOGO OPREDELENIIA PAROV PEREKISI VODORODA PRI POMOSHCHI REAKTIVNYKH BUMAZHEK].
V. P. Fedotov.
Gigiena i Sanitariia, no. 9, Sep. 1965, p. 61–63. In Russian.

A fast method for quantitative determination of atmospheric hydrogen peroxide is described which utilizes ash-free filter paper saturated with ammonium molybdate solution and dried. Exposed to hydrogen peroxide vapor, the paper becomes blue upon application of the benzidine solution. The color is then compared with a series of standards. The test is specific, and sensitive in 0.0000075 mg./1. concentration.

A66-80756
FLIGHT INTO WEIGHTLESSNESS [NA SAMOLETE V NEVESOMOST'].
I. Kas'ian, I. Kolosov, V. Kopanev, V. Lebedev, and G. Khlebnikov.
Aviatsiia i Kosmonavtika, no. 11, Nov. 1965, p. 27–32. In Russian.

In the training of Soviet astronauts, weightlessness has been simulated by parabolic flights in jets or in specially constructed flying laboratories. The results show that trainees develop adaptation to the physiological stress of weightlessness. Electrocardiogram, pulse rate, blood pressure, and respiration rate measurements have been taken and subjective reactions recorded on tape. In all cases the onset of weightlessness produced a feeling of elation. The degree of performance, however, decreased, because of difficulties in motor coordination. But even these decreased with the progress of training. Neither acceleration nor weightlessness affected visual acuity.

A66-80757
MAGNETOBIOLOGY [MAGNITOBIOLOGIIA].
IU. A. Kholodov (USSR, Acad. of Sci., Inst. of Higher Nervous Activity and Neurophysiol., Moscow).
Priroda, no. 10, 1965, p. 12–21. In Russian.

Magnetic field may influence various physiological processes, such as mitosis, central nervous system activity, enzyme activity, orientation of macromolecules (ribonucleic and desoxyribonucleic acid), and cell wall permeability to sodium ions. Several theories have been proposed, but further studies are necessary to coordinate the findings in order to formulate a unified theory of biomagnetism.

A66-80758
AGE-CONDITIONED FEATURES OF CARDIOVASCULAR REFLEX RESPONSES EVOKED BY EXPOSURE OF FACE TO JET OF COLD AIR [VOZRASTNYE OSOBENNOSTI REFLEKTORNYKH REAKTSII SO STORONY SERDECHNO-SOSUDISTOI SISTEMY PRI OBDUVANII LITSA STRUEI KHOLODNOGO VOZDUKHA].
N. N. Kartashev (Pedagogic Inst., Dept. of Physiol. and Morphol., Volgograd, USSR).
Fiziologicheskii Zhurnal SSSR, vol. 51, Dec. 1965, p. 1460–1463. 6 refs. In Russian.

Studies of changes in the rhythm of heart beat, arterial oscillogram, and blood pressure in children, adults, and elderly individuals, caused by jets of cold air directed on the face, disclosed a relationship between age and degree of response. Younger persons showed greater response.

A66-80759
INTRACRANIAL BLOOD CONTENT DURING GRAVITATION STRESS IN RATS ADAPTED TO HYPOXIA [VNUTRICHEREPNOE KROVENAPOLNENIE PRI GRAVITATSIONNYKH NAGRUZKAKH U ADAPTIROVANNYKH K GIPOKSII KRYS].
A. A. Shurubura, Z. I. Barbashova, and IU. E. Moskalenko (USSR, Acad. of Sci., I. M. Sechenov Inst. of Evolutionary Physiol., Leningrad).
Fiziologicheskii Zhurnal SSSR, vol. 52, Dec. 1965, p. 1474–1477. 11 refs. In Russian.

Adaptation of white rats to hypoxia produced greater tolerance to transverse acceleration stress, possibly due to greater stability of the respiratory brain centers. The basis for this stability may be changes in brain blood supply, and cell metabolism (due to an increase in oxygen utilization by brain cells at lower partial oxygen tension), greater activity of anaerobic glycolysis, or non-specific stability of cellular structures.

A66-80760
ACTIVE PREFERENCE OF NITROGEN–OXYGEN OR HELIUM–OXYGEN MIXTURES DISPLAYED BY ANIMALS AND HUMANS [OB AKTIVNOM VYBORE ZHIVOTNYMI I CHELOVEKOM AZOTNO-KISLORODNYKH I GELIO-KISLORODNYKH SMESEI].
I. S. Breslav, A. G. Zhironkin, and E. N. Salatsinskaia (USSR, Acad. of Sci., I. P. Pavlov Inst. of Physiol., Leningrad).
Fiziologicheskii Zhurnal SSSR, vol. 51, Dec. 1965, p. 1501–1506. 15 refs. In Russian.

Studies on white mice and man showed that when given a choice between atmosphere of normal air and helium–oxygen mixture, they preferred the helium–oxygen mixture. Both avoided air with a lower than normal concentration of oxygen. The preference given to helium over nitrogen can be explained by the lower density of this gas, which causes an increase in pulmonary ventilation without stressing the pulmonary muscular system. This fact is important under circumstances of ambient hypoxia.

A66-80761
SIGNIFICANCE OF THE FINDING OF FAT EMBOLI IN THE EVALUATION OF AVIATION ACCIDENTS [VYZNAMNOST NALEZU TUKOVYCH EMBOLII PRI HODNOCENI LETECKYCH KATASTROF].
F. Vorel and I. Bagarova (Ustav leteckeho zdravotnictvi, Praha, Czechoslovakia)
Bratislavske Lekarske Listy, vol. 45, 1965, p. 496–500. 10 refs. In Czech.

The finding of fat emboli in the lungs in cases of fatal injuries following unsuccessful ejection from aircraft was studied. The conclusion was that fat emboli in pulmonary capillaries were produced following the powerful impact of the body after the discharge of the cartridge and on ejection of the pilot from the aircraft together with the seat. All findings were evaluated with respect to the possibility of using fat emboli as a medico-legal proof in internal injury sustained during an aircraft accident.

A66-80762
THE EFFECT OF CHANGING VARIOUS ACTIVITIES ON THE COURSE OF HYPOXIC REACTIONS [VLIV STRIDANI RUZNYCH DRUHU CINNOSTI NA PRUBEH HYPOXICKYCH REAKCI].
Mirko Zeman. (Ustav leteckehbozdravotnictvi, Prague, Czechoslovakia).
Pracovni lekarstvi, vol. 17, Nov. 1965, p. 403–407. 14 refs. In Czech.

High altitude (7500–8000 m.) tolerance was tested on 372 persons subjected to low barometric pressure in a pressure chamber. The performance ability was tested by directing the subject to write consecutive numbers in a decreasing order. This exercise was interrupted by periods of tapping. On the basis of results the subjects could be divided into three groups: collapse type, spasmic type, and indefinite type. In the last two types the loss of coordination was noted after 5–8 minutes of exposure. In cases of regaining coordination there was another break in performance seven minutes later. The performance could be improved by varying the two types of exercise.

A66-80763
CONCERNING THE EFFECT OF ADENO- AND NEUROHYPOPHYSEAL HORMONES ON ANIMALS UNDER HIBERATION CONDITIONS.
Gr. Benetato, Ermila Danelluc, V. Nestianu, and Elena Gabrielescu (Acad. of the Socialist Rep. of Rumania, "D. Danielopolu" Inst. for Norm. and Pathol. Physiol., Bucharest).
Revue Roumaine de physiologie, vol. 2, 1965, p. 199–209. 18 refs.

Experiments in ground-squirrels (Citellus citellus) showed that 250–500 mU vasopressin/100 g. brought about in all animals characteristic signs of arousal within 2–4 hours after the intraperitoneal injection, while only 26% of the control animals manifested slight signs of awakening. ACTH (adrenocorticotropic hormone) in 0.5 U/100 g. had an arousal effect upon the hibernating animals; the effect was more rapid than that of vasopressin and of shorter duration. Reserpine diminished the action of vasopressin. The animals subjected to hypothermia did not resist to hibernation. The adrenoprive animals did not go into deep hibernation and vasopressin had more reduced effects. Histologically, the animals exhibited in the hypothalamic region all the signs of a blocked neurosecretory activity and an intense activity at the moment of spontaneous awakening. The arousal was characterized by: increase in the respiratory rate; increase in the cardiac rate; increase in body temperature; appearance on the actogram of spontaneous movements; transition from a flat electrocorticogram, with extremely small (a few microvolts) and spaced waves (at the most 2–3% of the tracing), to a progressively more ample and rapid electrocorticogram up to the appearance of a normal electrocorticogram similar to that prior to hibernation, appearing at 28°–30° C. and marking a start of the activity of ascending activator system.

A66-80764
THE ROLE OF BROWN ADIPOSE TISSUE IN THERMOREGULATORY HEAT PRODUCTION IN THE NON COLD-ADAPTED ADULT RAT, GUINEA PIG, GROUND SQUIRREL AND IN THE YOUNG RABBIT.
S. Donhoffer and Z. Szelényi (U. Med. School, Inst. of Pathophysiol., Pécs, Hungary).
Acta Physiologica Academiae scientiarum hungaricae, vol. 28, 1965, p. 349–361. 21 refs.

Deep colonic temperature, temperature of the interscapular brown adipose tissue and of the thoracic muscle beneath it were recorded with copper-constantan thermocouples. Simultaneous measurement of oxygen consumption showed that in four animal species, adult rats, guinea pigs, ground squirrels, and rabbits, the temperature in the interscapular brown adipose tissue rose most rapidly at the onset of the regulatory heat production in response to exposure to a moderately cold environment. In a thermoneutral environment the temperature of the interscapular fat was frequently the lowest of the three, whereas in a moderately cold one it exceeded deep colonic and thoracic muscle temperature.

A66-80765
OBSERVATIONS ON THE EFFECTS OF "STRESS" ON THE SERUM LIPID LEVEL OF RABBITS.
R. K. Shrivastava (Rajendra Med. Coll., Ranchi, India).
Current Medical Practice, vol. 9, Dec. 1965, p. 733–736. 5 refs.

Twenty-four white male rabbits were kept on high fat diets and were divided into four groups of six each. One group was given ghee (C clarified butter), the second group vanaspati (hydrogenated fat), the third group mustard oil (oil from seeds of Brassica family), and the fourth group was not given any added fat. Each group was further subdivided into stress and non-stress subgroups with 3 rabbits in each subgroup. Each rabbit of the stress group was injected a mixture of 1 ml. of adrenaline (1:1000) and 0.5 ml. of noradrenaline (0.1%) subcutaneously, morning and evening. The experiment lasted for nine months. The results showed a marked rise in serum cholesterol and lipid phosphorus levels in the stress subgroup of rabbits as compared to the non-stress subgroup, in all the dietary groups studied.

A66-80766
DAILY LEUKOCYTE RHYTHMS IN NORMAL AND HYPOPHYSECTOMIZED RATS EXPOSED TO DIFFERENT ENVIRONMENTAL LIGHT–DARK SCHEDULES.
John Edward Pauly and Lawrence Einar Scheving (Tulane U., Dept. of Anat., New Orleans, La.; and Chicago Med. School, Ill.)
Anatomical Record, vol. 153, Dec. 1965, p. 349–364. 13 refs.
Grant PHS A-4659.

Rats were maintained under the following lighting schedules: (1) artificial light 0600 to 1800 alternating with 12 hours of darkness-LD, (2) reversal of the above-DL, (3) constant darkness-DD, and (4) constant illumination-LL. In LD, DL, and DD, but not in LL, the rhythms of lymphocytes, eosinophils, and neutrophils were synchronized, that is, their peaks and troughs occurred at about the same time each day. Some evidence, based on desynchronization from LD rhythms, suggests that all three cells types in DD and the lymphocytes in LL were or had been at one time free-running. Expressed as an overall increase in magnitude, the greatest response in the three cell types to abnormal lighting conditions (DL, DD, and LL) was seen in the neutrophils. Similar determinations made on a second colony of hypophysectomized animals maintained under LD conditions demonstrated that hypophysectomy did not abolish the rhythm characteristic of lymphocytes, since the timing was identical to the rhythm seen in normal LD animals. There was, however, a lymphocytosis in the hypophysectomized group. Hypophysectomy greatly modified, but did not abolish the eosinophil and neutrophil rhythms. The significance of periodicity analysis in relation to bioassay is discussed.

A66-80767
EFFECT OF LOW-PROTEIN DIET ON THE ABILITY OF THE ADULT RAT TO RECOVER FROM A SUBLETHAL DOSE OF IRRADIATION.
Arthur F. Hopper, Milton B. Yatvin, and Robert W. Wannemacher, Jr. (Rutgers-The State U., Bur. of Biol. Res., New Brunswick, N. J.)
Journal of Nutrition, vol. 88, Feb. 1966, p. 202–208. 31 refs.
Grants PHS AM-04341 and GM-835.

Experimental data support the conclusion that a low protein diet fed to adult rats after a sublethal dose of irradiation does not affect repair processes. Those end points which were affected by the low protein diet per se–serum albumin and liver protein metabolism, as indicated by liver protein/DNA, RNA/DNA ratios, methionine uptake, and amino acid content–were also lower for the irradiated animals fed 5% casein than for the irradiated animals fed 15% casein. These effects were not compounded by the irradiation, and in fact, irradiation appeared to serve as a stimulus in the 5% casein group, maintaining liver protein metabolism immediately after irradiation at a level higher than that of the 5% casein-fed controls and equal to that of controls fed 15% casein. However, the detrimental effects of a low protein diet were observed in both control and irradiated rats, and in this respect it is probable that a low protein diet is of no actual benefit following irradiation. In conclusion, when an adult rat had an adequate protein reserve, the feeding of a low protein diet after irradiation did not inhibit its recovery.

A66-80768
THE INFLUENCE OF LOW ENVIRONMENTAL TEMPERATURE ON CELLULAR BLOOD ELEMENTS AND WEIGHT GAIN IN RABBITS [WPLYW NISKIEJ TEMPERATURY SRODOWISKA NA ELEMENTY KOMORKOWE KRWI I PRZYROSTY WAGOWE U KROLIKOW].
Zygmunt Szkutnik (WSR, Katedra Zoohigieny Wydzialu Zootechnicznege, Lublin, Poland).
Polskie Archiwum Weterynaryjne, vol. 9, 1965, p. 109–118. 17 refs. In Polish.

The author studied the influence of rapid fall of environmental temperature in summer on blood morphology in rabbits, food intake habits and reactions, and the general conditions of the animals. During the 15-day exposure of the animals to –9° C. there occurred a statistically significant increase of body temperature, on the average of 0.4° C., from the fifth experimental day. An increase in body weight of about 0.40 kg. (17.8% in relation to the initial weight) by increased food consumption was observed. Low environmental temperature during the summer caused a statistically significant decrease of erythrocytes and hemoglobin content without lowering the color index, and an increase of lymphocytes with a simultaneous decrease of neutrophils.

A66-80769
A COMPARISON OF CHANGES IN PULMONARY FLOW RESISTANCE IN HEALTHY VOLUNTEERS ACUTELY EXPOSED TO SO_2 BY MOUTH AND BY NOSE.
F. E. Speizer and N. R. Frank (Harvard School of Public Health, Boston, Mass.)
British Journal of Industrial Medicine, vol. 23, Jan. 1966, p. 75–79. 18 refs.
Grants PHS ES00002 and OH100.

On separate occasions, healthy male volunteers were exposed either by nose or by mouth to one of two concentrations of sulphur dioxide (SO_2), 15 and 28 p.p.m. Exposure to SO_2 lasted 10 minutes. Pulmonary flow resistance (R1) was measured by the esophageal catheter method, and the lung volume was measured by a modification of the gas-compression method; when SO_2 was administered by nose, nasal flow resistance (Rn) was measured by means of a catheter placed in the posterior pharynx. The increase in R1 was greater when SO_2 was administered by mouth than when it was administered by nose. Similarly, irritative symptoms of the posterior pharynx and chest were more common during exposure by mouth. These findings suggest that the mouth is less effective than the nose as an absorptive surface for SO_2.

A66-80770
THE INFLUENCE OF TEMPERATURE AND pH ON THE DISSOCIATION CURVE OF OXYHEMOGLOBIN OF HUMAN BLOOD.
P. Astrup, K. Engel, J. W. Severinghaus, and E. Munson (Rigshosp., Dept. of Clin. Chem., Copenhagen, Denmark; and Calif. U. Med. Center, Cardiovascular Res. Inst. and Dept. of Anesthesia, San Francisco, Calif.)
Scandinavian Journal of Clinical and Laboratory Investigation, vol. 17, 1965, p. 515–523. 21 refs.

The influence of temperature and pH on the oxygen dissociation curve of normal human blood was investigated. Blood samples from 52 normal persons were equilibrated with gas-mixtures containing varying amounts of oxygen (from 0.95% to 9.5%) and a fixed content of CO_2 of 5%. The temperature was varied between 13 and 38° C., and the pH between about 7.00 and 7.80. The oxygen saturation and the pH of the equilibrated samples were measured. The average change of the dissociation curve with changes of temperature and pH could be calculated from the measured values. The effect of temperature is given by $\Delta \log P_{O_2} = 0.0244\ \Delta T$ and the effect of the pH by $\Delta \log P_{O_2} = -0.50\ \Delta pH$. The coefficients were related to corresponding coefficients given in the literature.

A66-80771
THE RELATIONSHIP OF PAIN SENSATION TO COLD PRESSOR REACTIONS AND LOCAL COLD HABITUATION.
R. Eide (Inst. of Work Physiol., Oslo, Norway).
Scandinavian Journal of Clinical and Laboratory Investigation, vol. 17, 1965, p. 584–588. 7 refs.

The purpose of the investigation was to study the relation of cold pain to cold pressor reactions in a series of local cold exposures planned to bring about habituation. If there is a strict causal relationship between pain and pressor reactions, both would be expected to habituate and dishabituate at the same rate and scale. Three young men immersed the left hand in ice water 6 minutes daily for 11 days in succession and after an interval of 20 days. Blood pressure and temperature on the immersed hand were recorded, and the subjects ranked their cold pain from day to day. A conspicuous reduction in cold pain was found from the first to the last days of the series, but only an insignificant reduction in pressor reactions. After a 20-day period without exposure there was a noticeable return of pain but no changes in pressor responses. The conclusion is that there is no strict and linear relationship between pain and cold pressor responses since pain sensation shows a quicker habituation and dishabituation than cold pressor reactions. It cannot be excluded, however, that some causal relationship may exist between pain and cold pressor reactions.

A66-80772
IMPERMEABLE CLOTHING AND HEAT STRESS.
J. R. Brown (Toronto U., School of Hyg., Dept. of Physiol. Hyg., Canada).
Medical Services Journal Canada, vol. 21, Sep. 1965, p. 518–532. 17 refs.
Atomic Energy, Canada Ltd. supported research.

A study was carried out on the physiological stresses imposed by the wearing of impermeable clothing and the effect of ventilating such clothing. Under conditions of a hot thermal environment, the heat stress to the wearer, imposed by impermeable clothing, was greatly reduced by ventilated clothing. The "Rangue–Hilsch vortex tube cooler" was used for the cooling of air supplied to impermeable suits and was found to provide a satisfactory microclimate when the environmental temperature was between 55 and 71.7° C. (131–161° F.).

A66-80773
DATA EXTRACTION FROM A VIDEO DISPLAY.
J. J. Sanders (IBM Advan. System Develop. Div., Med. Appl. Dept., Rochester, Minn.)
IEEE Transaction on Bio-Medical Engineering, vol. BME-12, Jul.–Oct. 1965, p. 147–154. 11 refs.
NASA Grant NsG-327 and Grant NIH H-3532.

A device for the extraction of data from a video display is described. A medical research application using a video tape recording of a densicardiogram as an example is explained. The methods of recording, reproducing, digitizing, and analyzing cardiovascular characteristics are described from the standpoint of development experience. Further applications outside of the medical field are suggested.

A66-80774
THE DESIGN AND APPLICATION OF AN FM/AM TEMPERATURE TELEMETERING SYSTEM FOR INTACT, UNRESTRAINED RUMINANTS.
A. J. Kurtenbach and A. E. Dracy (S. Dak. State U., Brookings).
IEEE Transactions on Bio-Medical Engineering, vol. BME-12, Jul.–Oct. 1965, p. 187–190. 11 refs.

An FM/AM (frequency modulated subcarrier/amplitude modulated carrier) telemetry system capable of following transient physiological temperatures in animals has been developed. A block diagram of the system, with consideration of each component, is furnished. The transmitters, which have battery lifetimes in excess of 60 days, have sufficient power so that the subject is free to move about in a pen with an area of 30 m^2. All of the components used in the receiving and data acquisition station are commercially available, and the operation procedures are easily mastered by researchers with a life science background.

A66-80775
GUARD RING USE IN PHYSIOLOGICAL MEASUREMENTS.
Martin Graham (Baylor U., Coll. of Med., Dept. of Physiol., Houston, Tex.)
IEEE Transactions on Bio-Medical Engineering, vol. BME-12, Jul.–Oct. 1965, p. 197–198.

A preliminary test on one subject indicated that guard ring techniques would be of use in impedance pneumography to permit simultaneous measurements of various sections of the thoracic cavity (e.g., upper and lower, left and right), as well as in other physiological measurements. There is also the possibility of defining the measured volume even more exactly by using a number of electrodes at various signal levels that correspond to the equipotentials under certain conditions. The theory of this technique would be similar to the theory that is used in the design of Pierce type electron guns.

A66-80776
EFFECT OF TRANSIENT WEIGHTLESSNESS ON VISUAL ACUITY.
Leroy D. Paige and William N. Kama (Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).
Journal of Engineering Psychology, vol. 4, 1965, p. 33–44.

Visual acuity was tested in 36 subjects in three environments: (1) 1 g within a C-131B aircraft on ground, (2) 1 g in flight, and (3) zero g in flight through a "Keplerian trajectory". Each subject was given six tests (left, right, and binocular acuity, near, and far) with the Bausch and Lomb "Armed Forces Vision Tester" (Checkerboard targets) and the American Optical "Sight Screener" (Snellen targets) under each environment. The results show that short-term exposure to weightlessness has a detrimental effect on visual acuity during the period of exposure. The decrement is larger than that found during flight (effects of noise, vibration). The Checkerboard test is the more sensitive measure of differences in visual acuity between static and dynamic environments. When acuity at zero g is compared to acuity at 1 g, the loss amounts to approximately 10%, which is similar to the loss found at 2 g.

A66-80777
VISUAL ACUITY IN RELATION TO BODY ORIENTATION AND G-VECTOR.
Leroy D. Paige and William N. Kama (Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).
Journal of Engineering Psychology, vol. 4, 1965, p. 45–56. 6 refs.

Twenty-four subjects were tested for left, right, and binocular acuity of near and far vision under each of four viewing conditions: (a) body upright, head upright, (b) body prone, head upright, (c) body supine, head inverted, and (d) body and head inverted. The first three conditions produced various combinations of acceleration and hydrostatic effects for control measurements, while the last condition effectively produced –1 g acceleration. Acuity was best in condition a, decreased by 5% in condition b, decreased by additional 5% in condition c, and decreased once more by 5% in condition d, when the fully hydrostatic effect was combined with the effect of –1 g at the eye. The total decrement in the visual acuity at –1 g amounted to approximately 15% which was comparable to the decrement found at 3 g. A zero-g environment produced an intermediate decrement in acuity comparable to that reported at 2 g. It appears that equal changes in either direction from the normal acceleration environment produce equal losses in visual acuity, with such losses increasing as a function of the amount of change.

A66-80778
EFFECT OF OBSERVER ELEVATION ON THE MOON ILLUSION.
James E. Hamilton (School of Aerospace Med., Brooks AFB, Tex.)
Journal of Engineering Psychology, vol. 4, 1965, p. 57–67. 9 refs.

A method is presented for the measurement of the moon illusion for latitudes of the sky spaced at intervals of 15 degrees between the horizon and the zenith in the daytime sky. The mean ratio of magnitude of this illusion presents a curvilinear function showing a ratio of 1.13 at 15 degrees to a ratio of 1.31 at 90 degrees. The findings represent a mean ratio of magnitude for 4 observer levels from ground level to 98 ft. Tests were performed for the estimation of distance at each of the same observer levels used in the moon illusion tests. The estimation of each distance became more accurate when the observer moved from ground level to level 2 (25.5 ft. above ground). Distance estimation was best for all nearer distances at level 2 and more accurate for the farthest distance at level 3 (75 ft. above ground). A decrease in the magnitude of the moon illusion was noted to coincide with a general increase in estimated distance when the observer ascended from level 2 to level 4 (98 ft. above ground). This experiment does not support the apparent-distance theory when the observer ascends above terrain. A change in the characteristics of a terrain in the ascension causes the moon illusion to be decreased. Additional work is still necessary in determining the relationship between apparent size and apparent distance.

A66-80779
EFFECT OF FOOD DEPRIVATION ON PERCEPTION-COGNITION.
Per Saugstad (Oslo U., Norway).
Psychological Bulletin, vol. 65, Feb. 1966, p. 80–90. 28 refs.

Nine experiments designed to investigate the effect of food deprivation on perceptual-cognition processes in man are examined in detail. An effect is revealed in only some of these experiments. The deviating results are explained by assuming that motivational state will not affect perceptual-cognitive processes unless the material presented is meaningful in relation to the motivational state. An examination of the operational definitions given of the processes studied indicate that the processes may be more meaningfully termed imaginary than perceptual. An examination of the operational definition of the motivational state of hunger revealed that in most of the experiments the important condition may not be hours of food deprivation, but the expectancy of the subjects as to when they may next receive food.

A66-80780
INCREMENTAL THRESHOLDS FOR COLORED AND WHITE LIGHTS IN THE HUMAN ELECTRORETINOGRAM.
William R. Biersdorf, Allen M. Granda, and Harold F. Lawson (Walter Reed Army Inst. of Res., Washington, D. C.)
Journal of Comparative and Physiological Psychology, vol. 61, Feb. 1966, p. 102–109. 22 refs.

An electrical analogue of incremental thresholds was studied over a wide range of light adaptation levels and in dark adaptation using test and adaptation fields of 52^0 of visual angle presented in Maxwellian view. Two durations (.01 and .10 sec.) and three colors of test flash (white, red, and blue) were superimposed on a white adaptation field. To obtain a 40-μv. criterion b-wave in the dark-adapted eye required 3 log units of luminance above the visual absolute threshold. For this range of light adaptation levels, electrical thresholds (40 μv.) were essentially unaffected. For light adaptation levels above this range, electrical thresholds were similar to psychophysical thresholds (log ΔI vs. log I) as functions of color and duration.

A66-80781
PREMOTOR AND MOTOR COMPONENTS OF REACTION TIME.
Jack Botwinick and Larry W. Thompson (Duke U., Durham, N. C.)
Journal of Experimental Psychology, vol. 71, Jan. 1966, p. 9–15. 17 refs.
Grants PHS MH-08244, HD-01325, MH-900, and GM-05385.

Reaction time (RT) was fractionated into premotor and motor components based upon the difference between EMG (electromyogram) and finger-lift responses. EMGs were recorded from the extensor muscle of the responding forearm during measurements of simple auditory RTs of 54 subjects. The premotor time was that period from the presentation of the stimulus to the appearance of increased muscle firing, while the motor time was that period from this change in action potential to the finger-lift response. Four preparatory intervals (PI), 0.5, 3.0, 6.0, and 15.0 sec., were used in both a regular and irregular series. Premotor time and RT were highly correlated and showed comparable variations as a function of PI and type of series. Motor time was poorly correlated with RT and was independent of PI and type of series. It was concluded that set, as inferred from the relations between RT and PI and type of series, is a premotoric process.

A66-80782
VISUAL REACTION TIME AND THE HUMAN ALPHA RHYTHM: THE EFFECTS OF STIMULUS LUMINANCE, AREA, AND DURATION.
Daniel N. Robinson (N. Y. City U., Queens Coll.; and Columbia U., Elec. Res. Labs., New York City).
Journal of Experimental Psychology, vol. 71, Jan. 1966, p. 16–25. 24 refs.

Human subjects in a visual reaction-time experiment responded to stimuli of systematically varied luminance, area, and duration. Reaction time, electroencephalogram alpha blocking latency, and alpha blocking duration were recorded and measured. The major findings were: (a) Over a range of luminances (0.65–10.0 mL.) and exposure durations (10–200 msec.) constant I X t products result in constant blocking latencies. (b) Constant products of I X A do not lead to constant blocking latencies beyond areas of 1°. (c) Reaction time decreases with increased luminance or area under equal-energy conditions and is independent of duration over the range of t employed. (d) Blocking duration increases with stimulus duration but is unaffected by luminance. (e) Correlations between reaction time and properties of the alpha rhythm are determined, in large part, by stimulus variables.

A66-80783
DETECTION IN METACONTRAST.
Peter H. Schiller and Marilyn C. Smith (Mass. Inst. of Technol.; Cambridge).
Journal of Experimental Psychology, vol. 71, Jan. 1966, p. 32–39. 16 refs.
Grant PHS 5F2 MH-11, 589-01.

This study investigated metacontrast under a variety of stimulus and response conditions. The results show that (a) although the 1st stimulus in the metacontract situation appears absent or very much darkened at certain intervals between the 1st and 2nd stimulus, it can be correctly detected by observer employing both RT (reaction time) and forced-choice situations. (b) When the luminance of the 1st stimulus is set low relative to that of the 2nd stimulus, a monotonic function is obtained for both detection errors and choice reaction time (CRT), with maximal errors and longest CRTs at the shortest interval between the stimuli. (c) When the 2 stimuli are of equal luminance, increasing the rate of presentation to a point where the interval between 1st and 2nd stimuli within a pair equals the interval between successive pairs, increases the apparent brightness of the 1st stimulus.

A66-80784
EFFECT OF CONTEXTUAL ASSOCIATION UPON SELECTIVE REACTION TIME IN A NUMERAL-NAMING TASK.
Bert Forrin (Toronto U., Scarborough Coll., Canada) and Robert E. Morin (Kent State U., Ohio).
Journal of Experimental Psychology, vol. 71, Jan. 1966, p. 40–46. 14 refs.
Grants NSF GB-323 and GB-1600.

The increase in reaction time (RT) with size of the stimulus set for selective response tasks involving the naming of 1 of n equiprobable numerals has been ascribed to variation in attributes of the stimulus sequence–reduced probability of signal presentation, increased mean intersignal interval, and heightened temporal uncertainty of signal occurrence. The present study provided an independent assessment of the effect upon selective RT of a 4th factor commonly confounded with the preceding three: the presence of incompatible stimulus-response associations in serial context with numeral–numeral pairs. The data indicate that requiring subjects to remain silent to a given subset of numerals, or to respond with the single designation "No" to members of that subset, produced longer reaction latencies to numerals to be named than would be predicted from properties of the stimulus sequence alone. An interpretation in terms of generalized response inhibition and response competition is examined.

A66-80785
CHANGES IN PERCEIVED SIZE OF ANGLE AS A FUNCTION OF ORIENTATION IN THE FRONTAL PLANE.
Paul Weene and Richard Held (Mass. Inst. of Technol., Cambridge).
Journal of Experimental Psychology, vol. 71, Jan. 1966, p. 55–59. 6 refs.
NASA Grant NsG-496; Grants Natl. Inst. of Mental Health M-3657 and M-7642; and Contract AF-AFOSR-354-63.

Continuous subjective bisection of a right angle rotating through 360° in a frontal plane was performed by 10 subjects using the Békésy technique. The largest and most consistent constant errors in bisection, ranging up to 10°, occurred in upper-right and upper-left quadrants. Interindividual and interquadrant differences indicate that the constant errors cannot be attributed solely to the effect of the main axes of space. An influence of the distribution of oriented contours in subjects' normal visible environment is suggested.

A66-80786
EFFECT OF SIZE ON VISUAL SLANT.
Robert B. Freeman, Jr. (Pa. State U., University Park).
Journal of Experimental Psychology, vol. 71, Jan. 1966, p. 96–103. 8 refs.
Grants Natl. Inst. of Mental Health MH-12,935 and MH-08856-01.

Two experiments were conducted to determine the generality of the finding that judged slant of plane rectangular figures varies directly with size. In Experiment I, equal-slant contours were obtained from 54 undergraduate subjects for 14 rectangles whose lengths varied in equal log steps from 1.0 to 42.2 cm. with a reference stimulus of 7.5 cm. In Experiment II, 272 subjects were tested on 9 rectangles varying linearly in 4-cm. steps from 8 to 40 cm., with a 24-cm. reference. Observation was monocular and under complete reduction conditions from a distance of 135 cm. The effect of size on judged slant was only partly reliable in Experiment I, but highly significant in Experiment II. The "size effect" was attributed to the "perspective" cue to slant which was shown to vary with physical size as well as slant, and was probably more discriminable in the stimuli in Experiment II than in Experiment I.

A66-80787
INTERLIMB AND INTERJOINT TRANSFER OF A KINESTHETIC SPATIAL AFTEREFFECT.
G. Singer (Sydney U., Australia) and R. H. Day (Monash U., Victoria, Australia).
Journal of Experimental Psychology, vol. 71, Jan. 1966, p. 109–114. 25 refs.

Transfer of a kinesthetic spatial aftereffect from the stimulated to the nonstimulated arm (interlimb) and from the stimulated to the nonstimulated group of joints in a single arm (interjoint) has been investigated in two experiments. In each case the effects were compared with those occurring within a single arm (intralimb) and joint group (intrajoint). In both experiments the kinesthetic task was that of judging the horizontal after movement of the extended limb across a slanted edge. The results show that whereas there were large intralimb and intrajoint aftereffects, the small interjoint effect was significant in one of two cases, and neither of two interlimb aftereffects achieved significance. The data are discussed in terms of their relevance for theoretical issues including the principal explanations of kinesthetic aftereffects.

A66-80788
TASK CHARACTERISTICS IN SEQUENTIAL DECISION BEHAVIOR.
William C. Howell (Ohio State U., Columbus).
Journal of Experimental Psychology, vol. 71, Jan. 1966, p. 124–131. 12 refs.
Contract AF 33(657)-11718.

Optional stopping behavior was studied for a task in which multiple perceptual discriminations were required and payoff declined with sequential information gathering. Thirty-six experienced subjects served under four levels of difficulty (defined psychophysically) for riskless and risky problems; they were assigned randomly to four groups for investigation of monetary vs. nonmonetary incentives and two modes of varying difficulty. Findings indicate that decisions approximate maximum expected values (EVs) over a wide range of task situations but are most efficient for intermediate levels of difficulty and riskless conditions. Contrary to earlier reports, neither the kind of incentive nor the difficulty mode appears to have an appreciable effect on performance. It is suggested that subtle aspects of EV functions may have an important bearing upon optional stopping behavior.

A66-80789
VISUAL AND PROPRIOCEPTIVE ADAPTATION TO OPTICAL DISPLACEMENT OF THE VISUAL STIMULUS.
John C. Hay (Smith Coll., Northampton, Mass.) and Herbert L. Pick, Jr. (Minn. U., Minneapolis).
Journal of Experimental Psychology, vol. 71, Jan. 1966, p. 150–158. 10 refs.
Grant NIH MH 07588-02.

The effects of long-term optical displacement of the visual stimulus were measured in a wide variety of sensory coordinations. The pattern of changes observed indicated that a transient adaptation in the proprioceptive system is succeeded by a stable adaptation in the visual system. It was found that viewing the whole body during optical displacement, rather than just a part of it, serves to induce the visual adaptation.

A66-80790
RADIOPROTECTIVE EFFECT OF CYSTAMINE, AND ITS CONCENTRATION IN MOUSE THYMUS GLAND IN VIVO AND IN VITRO [O PROTIVOLUCHEVOI EFFEKTIVNOSTI TSISTAMINA I EGO NAKOPLENII KLETKAMI ZOBNOI ZHELEZY MYSHI IN VIVO I IN VITRO].
I. T. Rass and A. G. Tarasenko.
Radiobiologiia, vol. 5, no. 5, 1965, p. 713–719. 31 refs. In Russian.

An injection of cystamine (15 mg. per animal) prior to radiation exposure did not prevent the damage to thymus tissue cells in white mice. It produced only a decrease in pyknosis. Injection of cystamine after radiation exposure showed no effect. In vitro, it reduced the radiation damage to thymus cells. Cystamine-S^{35} was absorbed by both normal and irradiated cells. The amount of the retained cystamine depended on the concentration of the substance injected and the temperature of incubation of excised tissue before sectioning. Greater amounts were absorbed in vivo than in vitro. The results indicate that in vitro cystamine suppresses the glycolytic processes.

A66-80791
INFLUENCE OF CO^{60} GAMMA IRRADIATION ON THE GROWTH OF CHLORELLA CULTURES [VLIIANIE ODNOKRATNOGO GAMMA-OBLUCHENIIA CO^{60} NA ROST KUL'TUR KHLORELLY].
E. A. Gileva, N. A. Timofeeva, and N. V. Timofeev-Resovskii (Ural Branch of Acad. of Sci., Inst. of Biol., Sverdlovsk, USSR).
Radiobiologiia, vol. 5, no. 5, 1965, p. 732–737. 9 refs.

Cultures of Chlorella vulgaris were exposed to various doses of gamma radiation from a Co^{60} source. Small doses (0.5–1 curie) produced a mild stimulation of reproduction. Larger doses caused death of some cells. The lethal effect was reached by doses greater than 25 curies.

A66-80792
MODEL STUDY OF PROTECTIVE CHARACTERISTICS OF SOME RADIOPROTECTORS [MODEL'NOE IZUCHENIE KHARAKTERISTIK TUSHENIIA NEKOTORYKH RADIATSIONNO-ZASHCHITNYKH VESHCHESTV].
A. N. Pisarevskii, A. F. Seleznev, and G. M. Pashek (V. I. Lenin Belorussian State U., Minsk, Belorussian SSR).
Radiobiologiia, vol. 5, no. 5, 1965, p. 768–770. In Russian.

A liquid scintillator was used as a model for the study of characteristics of the damping effect during transfer of excitation energy of β-mercaptopropylamine (MPA), S-β-aminoethylisothiuronium (AET), 5-methoxytryptamine (MOT) and serotonin (ST), which may be used for radiation protection. AET, MOT and MPA showed the same degree of damping. ST did not show any damping characteristics. Comparison of radioprotective qualities of these compounds with the damping effect disclosed the importance of excitation energy transfer on the mechanism of radiation protection.

A66-80793
LABIAL REACTION AS CRITERION OF EFFECTIVENESS OF RADIOPROTECTION [LABIL'NAIA PROBA KAK KRITERII EFFEKTIVNOSTI PROTIVOLUCHEVOI ZASHCHITY].
E. I. Lavrenchik (USSR, Acad. of Med. Sci., Inst. of Hyg. Labor, and Prof. Diseases, Moscow).
Radiobiologiia, vol. 5, no. 6, 1965, p. 882–885. 8 refs. In Russian.

Radiation exposure of white mice after injections of distilled water into a lip caused a local swelling, hemorrhage, or even necrosis of tissues. Injections of radioprotectors such as aminoethylisothiuronium dibromide or monosodium salt of β-aminoethylthiophosphoric acid prior to irradiation decreased this reaction. These radioprotectors decreased death of lethally-irradiated animals by 18–36%. The lip test correlated in degree of suppression of reaction after radioprotectors with the degree of protection by these compounds. Injection of BCG vaccine before the radiation exposure produced no effect on the survival or on the lip reaction.

A66-80794
RADIOPROTECTIVE ACTIVITY OF INERT GASES AND LOW-MOLECULAR NARCOTICS. IV. PROTECTIVE EFFECT OF COMPRESSED NITROGEN IN PHOTODYNAMIC DAMAGE OF PLANT CELLS [PROTIVOLUCHEVOE DEISTVIE INERTNYKH GAZOV I NIZKOMOLEKULIARNYKH NARKOTIKOV. 4. ZASHCHITNYI EFFEKT SZHATOGO AZOTA PRI FOTODINAMICHESKOM POVREZHDENII RASTITEL'NOI KLETKI].
V. P. Paribok, G. F. [illegible]nova, and IU. I. Koroleva (USSR, Acad. of Sci., Inst. of Cytol., Leningrad).
Radiobiologiia, vol. 5, no. 6, 1965, p. 886–889. 16 refs. In Russian.

Exposure of bean sprouts, preliminarily treated with acridine-orange solution, to white light in an atmosphere of pure oxygen, resulted in damaged chromosomes in root meristematic cells. The addition of nitrogen under 40 atmospheres pressure to oxygen under one atmosphere during the exposure of plants to light decreased the number of cells showing chromosome damage. Visible light is not absorbed by the nitrogen under pressure, therefore the protective effect cannot be considered a result of screening.

A66-80795
RADIOPROTECTIVE AND PHARMACOLOGICAL ACTION OF BETA MERCAPTOPROPYLAMINE [MATERIALY K RADIOZASHCHITNOMU I FARMAKOLOGICHESKOMU DEISTVIIU BETA-MERKAPTOPROPILAMINA].
V. A. Kozlov.
Radiobiologiia, vol. 5, no. 6, 1965, p. 892–895. 5 refs. In Russian.

β-mercaptopropylamine has proved to be a very effective radioprotector. It modified the course of the radiation sickness and prolonged by 57–80% the survival of mice, and by 65–75% that of rats. The effectiveness of the compound was noted only after parenteral injections and lasted 1.5 hours. The best results were achieved in cases of exposure to maximum tolerance doses. It lowered the metabolic rate, decreased the oxygen need, increased the tolerance to hypoxia, decreased body temperature in the experimental animals, and suppressed micturition.

A66-80796
METABOLISM OF ASCORBIC ACID IN RATE ADRENAL GLANDS DURING IRRADIATION WITHOUT RADIOPROTECTORS AND AFTER INJECTION OF MERCAMINE AND CYSTAMINE [METABOLIZM ASKORBINOVOI KISLOTY V TKANI NADPOCHECHNIKOV KRYS PRI VOZDEISTVII IONIZIRUIUSHCHEI RADIATSII BEZ PROTEKTOROV I PRI PRIMENENII MERKAMINA I TSISTAMINA].
L. I. Politkarpova (USSR, Acad. of Med. Sci., Inst. of Exptl. Med., Leningrad).
Radiobiologiia, vol. 5, no. 6, 1965, p. 896–898. 11 refs.

In acute radiation sickness the reconversion of ascorbic acid in tissues of adrenal glands is depressed, and dehydroascorbic acid accumulates. Subjecting rats to small doses of radiation (15–30 r) stimulated the reconversion of ascorbic acid after exposure to larger doses (800 r). Introduction of mercamine into healthy animals caused changes in ascorbic acid metabolism similar to those which are noted after exposure to ionizing radiation. Injections of mercamine before exposure to lethal radiation doses caused oxidation of ascorbic acid. Injections of mercamine into animals previously exposed to 30 r and 800 r did not cause ascorbic acid oxidation upon a second exposure to 800 r. Cystamine produced no effect in healthy or exposed animals.

A66-80797
ACTION OF RADIOPROTECTORS BY FRACTIONATED IRRADIATION. II. RADIOPROTECTIVE EFFECT OF DIFFERENT DOSES AND TIME RANGES OF IRRADIATION [DEISTVIE PROTIVOLUCHEVYKH SREDSTV V USLOVIIAKH FRAKTSIONIROVANNOGO OBLUCHENIIA. 2. ZASHCHITNYI EFFEKT PRI RAZNYKH DOZAKH I INTERVALAKH VREMENI MEZHDU OBLUCHENIIAMI].
S. P. Iarmonenko, V. G. Ovakimov, O. P. Ol'shevskaia, and E. I. Lavrenchik. (USSR, Acad. of Med. Sci., Inst. of Hyg. Labor, and Prof. Diseases, Moscow).
Radiobiologiia, vol. 5, no. 6, 1965, p. 899–906. 11 refs. In Russian.

Injections of 3 mg. doses of aminoethylisothiuronium dihydrobromide into white mice before single or repeated exposure to radiation resulted in conserving a fraction of karyocytes in the bone marrow of the femur. The degree of protection depended on the amount of the injected compound. During repeated exposures the protection increased with an increase in the interval time between exposures, due to recovery of the hemopoietic function. Injections of β-aminoethylthiophosphate together with 5-methoxytryptamine during repeated exposures increased the effectiveness as compared with injections of each compound separately.

A66-80798
PHOSPHOLIPIDS OF MITOCHONDRIA OF LIVER CELLS AND OF THE CELLS OF SMALL INTESTINES OF RABBITS SUBJECTED TO TOTAL BODY GAMMA IRRADIATION [FOSFOLIPIDY MITOKHONDRII KLETOK PECHENI I SLIZISTOI TONKOGO KISHECHNIKA KROLIKOV, PODVERGNUTYKH OBSHCHEMU GAMMA-OBLUCHENIIU].
V. V. Simonov.
Radiobiologiia, vol. 5, no. 6, 1965, p. 907–908. 13 refs. In Russian.

Paper chromatography studies of liver and intestinal mucosa of rabbits, exposed to 800 r dose of gamma radiation from a CO^{60} source, disclosed no change in the phospholipid fractions of liver cell mitochondria. In the mitochondria of intestinal mucosa cells, the lysocephalin fraction was decreased by 32%, and the amount of polyglycerophosphatids was increased by 50%.

A66-80799
STUDIES ON THE FUNCTION OF RAPID EYE MOVEMENT (PARADOXICAL) SLEEP IN HUMAN SUBJECTS.
William C. Dement (Stanford U. School of Med., Dept. of Psychiat., Palo Alto, Calif.)
IN: [ASPECTS ANATOMO-FONCTIONNELS DE LA PHYSIOL. DU SOMMEIL].
Edited by M. Jouvet.
(Centre Natl. de la Rech. Sci., 127e Colloq. Intern., Lyon, Sep. 9–11, 1963).
Paris, Centre National de la Recherche Scientifique, 1965, p. 571–608; discussion, p. 608–611. 35 refs.
Grants Natl. Inst. of Mental Health MY-3267 and MH-08185-01.

Studies on the function of sleep were performed in adult humans by observing what happened when it was prevented from occurring. In an early series of experiments, twenty adult subjects were "dream deprived" for two to seven nights by awakening them at the onset of each rapid-eye-movement (REM) period, as indicated by the occurrence of electroencephalographic activation and eye movement potentials. All subjects showed a progressive increase in frequency of REM episodes, and all but one showed an increase in dreaming on recovery nights. In another series, three subjects were deprived of REM sleep by awakening them at the onset of the cessation of suprahyoid electromyographic potentials. All three subjects showed a progressive, relentless increase in the frequency of REM episodes during the period of deprivation, and all three showed large increase in REM sleep on recovery nights. It was suggested that some hypothetical substance accumulates in the nervous system in the absence of REM sleep and that the normal function of REM sleep may be to get rid of the substance. It was further suggested that the psychological changes observed may have been due to some kind of auto-intoxication effect.

A66-80800
PHYSIOLOGICAL STRESS AND FATIGUE IN AERIAL MISSIONS FOR THE CONTROL OF FOREST FIRES.
Bruno Balke, Carlton E. Melton, Jr., and Clifford Blake (FAA, Civil Aeromed. Res. Inst., Oklahoma City, Okla.; and U. S. Forest Serv. Equipment Develop. and Testing Center, Missoula, Mont.)
Aerospace Medicine, vol. 37, Mar. 1966, p. 221–227. 11 refs.

In-flight heart rates and respiratory frequencies of Forest Service pilots were obtained via radiotelemetry in single 5-hour flights and on three consecutive days of 8-hour flights. Pre- and post-flight exercise tests were performed (a) for the establishment of the individual heart rate: metabolic rate relationship, and (b) for the detection of any "physical fatigue" effects. Also,

for the latter purpose, a simple orthostatic tolerance test was employed. According to the results, the physiological demands in the simulated 5-hour "bird dog" missions were not excessive. The in-flight metabolic rate of approximately twice the resting rate was not enough to cause measurable physical fatigue. During the 8-hour flights, the heart rates fluctuated between 24 and 39% increase above resting levels in the pilot, and between 37 and 65% increase in the observer. In the post-flight exercise tests physical fatigue became apparent especially on the third day as heart rate response to a relatively moderate work-load increased from a normal of 125 to 164 beats per minute. Conclusions drawn from this study indicate that the physiological demands of forest fire control missions engage nearly 33% of the pilot's maximum capacity. Actual flying time under such conditions should not exceed 5–6 hours daily on a 5-day per week schedule.

A66-80801
A VIRTUALLY CONTINUOUS MEASUREMENT OF HUMAN SYSTOLIC AND DIASTOLIC BLOOD PRESSURE TRANSIENTS WITHOUT DIRECT ARTERIAL PUNCTURE.
Michael T. Lategola, Hiley Harrison, and Charles Barnard (Civil Aeromed. Res. Inst., Biodyn. Branch, Oklahoma City, Okla.)
Aerospace Medicine, vol. 37, Mar. 1966, p. 228–233. 6 refs.

A system for virtually continuous measurement of both systolic and diastolic blood pressures without recourse to direct arterial puncture was effected by the modification of already-existing, standard equipment. This system entails the measurement of systolic blood pressure via a digital pressure cuff on one arm simultaneously with the measurement of diastolic blood pressure from a brachial 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 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 twenty per minute for protracted time periods. The system functions well under all resting-subject conditions and under some "body-movement" conditions.

A66-80802
CHEMICAL ANALYSIS OF PERMANENT AND ORGANIC GASES IN A 30-DAY MANNED EXPERIMENT.
William H. Toliver, Sr. and Melvin L. Morris (AF Systems Command, Aerospace Med. Div., Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 37, Mar. 1966, p. 233–238. 8 refs.

Chemical analyses of the permanent gases and the trace volatile organic constituents were performed on a 30-day manned experiment. This experiment was primarily concerned with the feasibility of providing a suitable atmosphere for three men. The primary instrumentation used was the gas chromatograph. The adjunct instrumentation was infrared spectrophotometry and mass spectrometry. Consideration is given to the sampling and analytical procedures used. Organic compounds unique to space cabin and evaluator studies are reported. Indications of future gas chromatography methodology are given.

A66-80803
LIMITATIONS AND RELIABILITY OF THE HUMAN OPERATOR OF CONTROL SYSTEMS TO PROCESS INFORMATION.
Jacek Szafran (Lovelace Found. for Med. Educ. and Res., Dept. of Exptl. Psychol., Albuquerque, N. Mex.)
(Aerospace Med. Assoc., 36th Ann. Meeting, New York, N. Y., Apr. 27, 1965).
Aerospace Medicine, vol. 37, Mar. 1966, p. 239–242. 35 refs.
Grant PHS HD-0518.

The theory of human skill is briefly reviewed. It is argued that, within certain well-defined limits, the extent to which man can extract information from sensory inputs is impressive, even if for some purposes intensive training has to precede efficient performance. It is concluded that one of the key notions in the appraisal of operational reliability of man in space should be endurance—in the sense of a capacity to adapt rapidly to changing requirements and strange conditions (including those of reduced "signal-to-noise" ratio), as well as a general willingness to plan the effort so as to maximize the likelihood of sustained performance.

A66-80804
EFFECTS OF CONTINUOUS EXPOSURE OF RATS TO 100 PERCENT OXYGEN AT 450 MM. Hg FOR 64 DAYS.
Gerald A. Brooksby, Robert W. Staley (NASA, Ames Res. Center, Biotechnol. Div., Moffett Field, Calif.), and Robert L. Dennis (San Jose Hosp., Calif.)
Aerospace Medicine, vol. 37, Mar. 1966, p. 243–246. 30 refs.

Young Sprague–Dawley rats were exposed, under constant uninterrupted conditions, to pure oxygen (99.8 ± 0.2%) at a total pressure of 450 mm. Hg for 64 days and compared with controls. Growth rates and food and water consumption were measured during the exposure period. All animals survived and appeared normal with no signs of distress during the experiment. At the conclusion of the 64-day exposure period, all animals were sacrificed and histological and hematological studies were performed. There were no significant differences in food and water consumption or demonstrable histological and hematological differences. It appears that the experimental conditions used were below the threshold level necessary to produce distress or pathology in this strain of rat.

A66-80805
HEMODYNAMIC RESPONSE TO G-SUIT INFLATION WITH AND WITHOUT GANGLIONIC BLOCKADE.
Robert H. Eich, Harold Smulyan, and William R. Chaffee (N. Y. State U., Upstate Med. Center, Med. Dept., New York City; and Veterans Admin. Hosp., Syracuse, N. Y.)
Aerospace Medicine, vol. 37, Mar. 1966, p. 247–250. 19 refs.

The acute hemodynamic effects of g-suit inflation were studied in 21 normal supine subjects. Suit inflation, while consistently increasing right atrial pressure, resulted in a fall in cardiac output, presumably on a reflex basis due to the simultaneous effect on arterial pressure. Following ganglionic blockade with trimethaphan, the cardiac output still failed to increase. The explanation for this may be that complete ganglionic blockade with the abolition of reflex control of the circulation is not practical in most normal subjects, or that peripheral resistance may play a role in regulating cardiac output independently of reflex control.

A66-80806
RESPONSE OF TISSUE CULTURE CELLS TO LOW MAGNETIC FIELDS.
Arthur E. Greene and Myron H. Halpern (South Jersey Med. Res. Found., Camden, N. J.; and Franklin Inst. Res. Labs., Philadelphia, Pa.)
Aerospace Medicine, vol. 37, Mar. 1966, p. 251–253. 9 refs.
Grants NIH CA-04953-06 and GM-10563-01.

Tissue cultures of HeLa, WI-38, KB, Chinese hamster, and chick embryo were exposed to magnetic fields of 0.0005 oersted, ambient (0.5 oersted), 350, 400, 500, 550, and 600 oersted for four days. In addition, HeLa cells were exposed repeatedly to 1200 oersted for the same period. Four consecutive serial passages of HeLa cells were grown in the experimental fields. On the fourth day of fourth passage, cells were counted. Cell counts of the experimental culture after exposure to the magnetic fields did not show any significant quantitative growth differences compared to controls. Based on these data, low magnetic fields appear to have no effect upon cells in tissue culture.

A66-80807
CARDIOVASCULAR EFFECTS OF ROTATION IN THE Z AXIS.
Charles W. Urschel and William B. Hood, Jr. (Aerospace Med. Res. Labs., Biophys. Lab., Multienvtron. Div., Environ. Stress Branch, Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 37, Mar. 1966, p. 254–256. 10 refs.

Rotation of the seated subject about the Z axis (Rz) results in a radial acceleration gradient impeding venous return thereby representing a cardiovascular stress. The cardiovascular responses of volunteer subjects instrumented with indwelling arterial and venous catheters were measured during four rotational profiles combining two rates of angular acceleration (0.1 and 0.8 radian per second per second) and two rotational speeds (60 and 120 r.p.m.). There was a three-minute plateau at peak velocity. Centripetal acceleration at hand/foot radius (0.5 meter) was 1.8 and 7.4 g at 60 and 120 r.p.m., respectively. Rotation at 60 r.p.m. represented no significant stress. Three-minute 120 r.p.m. runs however caused progressive tachycardia, narrowing of pulse pressure, and a drop in mean arterial pressure, thus inferentially a drop in cardiac output. Tolerance would thus be expected to be limited by the ability of the circulation to maintain venous return.

A66-80808
VARIATIONS IN THE QT INTERVAL DURING AND AFTER MUSCULAR EXERCISE. [VARIAZIONI DELL'INTERVALLO QT DURANTE E DOPO ESERCIZIO MUSCOLARE].
P. Turchetto, L. Coltro, and P. M. Terribile (Padova U., Ist. di Med. del Lavoro, Italy).
Lavoro e Medicina, vol. 14, Sep.–Oct. 1965, p. 106–108. 22 refs. In Italian.

Modifications of electrocardiographic QT intervals were measured during and after physical exercise on a bicycle ergometer, on 15 healthy subjects. Correlation and function of regression between QT and frequency were calculated. A linear function between the two variables was brought out. The behavior of the QT interval did not correspond to that reported by Bazzett (1920).

A66-80809
THE IMMEDIATE AFTER-EFFECTS OF INCREASED RESISTANCE UPON PHYSICAL PERFORMANCE.
Alan J. Stockholm (Allegany Community Coll., Cumberland, Md.) and Richard C. Nelson (Pa. State U., University Park).
Research Quarterly, vol. 36, Oct. 1965, p. 337–341. 5 refs.

The purpose of investigation was to evaluate the immediate effects of overload upon vertical jumping performance. Forty-four college men participated in two identical 3-day testing periods during which three levels of overload (no overload, 5% and 10% of subject's body weight) were applied on

a rotational basis. The test sequence involved five pre-overload, three overload, and five post-overload jumps. Paired t tests comparing pre-overload mean scores with post-overload scores indicated non-significant changes for the two experimental conditions but a statistically significant ($P < .05$) decrement in performance for the control condition. Further analysis of the difference scores (post-overload minus pre-overload) resulted in significant difference ($P < .05$) between the two experimental conditions and the control. The hypothesis that the application and removal of an overload will lead to an immediate improved performance in vertical jumping is not supported.

A66-80810
BIOLOGICAL EFFECTS OF RADIATIONS.
Daniel S. Grosch (N. C. State U., Raleigh).
New York, Blaisdell Publishing Co., 1965, 293 p. Many refs.
$3.50

This book is an attempt to present an organized picture of many experiments in which living material was exposed to radiation. After a historical consideration of different types of radiations, their characteristics, direct and indirect effects on living matter, radiation resistance and sensitivity, histopathological and biochemical changes on these levels of biological complexity in both plants and animals are discussed: cell, tissue, organ, and organism. Some of the practical applications of radiation include pest control, food treatment, and water and sewage treatment. The major principles and problems of radiation biology are presented in an orderly framework with references appended, and the subject matter is written at the level of advanced college undergraduates or beginning graduate students.

A66-80811
FATIGUE: MECHANISM AND MANAGEMENT.
S. Howard Bartley (Mich. State U., East Lansing).
Springfield, Ill, Charles C. Thomas, 1965, xv+ 96 p. 63 refs.
$5.00.

Physiological and psychological aspects of fatigue are examined in terms of typically fatigue-producing situations (pacing, prolonged or demanding activity, remoteness of goals, etc.); clinical syndromes (hypothyroidism, hypochondria, neurasthenia, diabetes, etc.); physical, physiological, homeostatic, and sensory-cognitive organism-environment relationships as mechanisms underlying fatigue; role of body chemistry in fatigue and inadequacy; pharmaceutical agents used to relieve fatigue (analgesics, caffeine, central nervous system stimulants, anabolic energizers, vitamins, minerals, etc.); and methods of long-term fatigue management.

A66-80812
ACUTE PROBLEMS IN RESUSCITATION AND HYPOTHERMIA.
Edited by V. A. Negovskii.
(Proc. of a Symp. on the Appl. of Deep Hypothermia in Terminal States, Sep. 15–19, 1964).
New York, Consultants Bureau, 1965, 91 p.
$15.00. Translation.

Some of the compelling problems in resuscitation of lower animals and man, the possibility of using hypothermia for the prevention and treatment of terminal states, and biological aspects of deep hypothermia were discussed and supplemented with experimental data and case histories. Until an apparatus is available to produce both general and cerebral hypothermia as quickly as anesthesia, there is little likelihood of hypothermia being widely used in resuscitation. The use of the analgesic chlorpromazine in conjunction with hypothermia was debated; the drug was found not to be useful in all cases.

A66-80813
SURVIVAL.
C. B. Colby.
New York, Coward-McCann, Inc., 1965, 48 p.
$2.52.

Survival training instruction is designed to prepare personnel to live off the land in arctic, mountain, swamp, or desert climate until they can be rescued or until they can make their way back to friendly civilization. Methods of finding or building a shelter against the elements, finding water, locating, catching, and preparing food, taking care of sick and injured, evading hostile or enemy units, getting along with friendly natives, and navigating to safety are described and illustrated.

A66-80814
DRUGS IN AEROSPACE MEDICINE.
Carlos J. G. Perry (School of Aerospace Med., Brooks AFB, Tex.)
Clinical Pharmacology and Therapeutics, vol. 6, Nov.–Dec. 1965, p. 771–787. 102 refs.
USAF School of Aerospace Med. supported research.

Primary variables of aerospace are altitude, radiation, motion, thermal extremes, and weightlessness. With respect to drug studies, only the first four have been explored directly. Secondary variables include the general nonspecific stress of the aerospace situation and operational performance considerations. These have been studied with respect to pharmacologic questions. Finally, another variety of compounds has been tested under one or more aerospace variables. Therapeutic and prophylactic usefulness for conditions unrelated to environmental stress have made this broad group of drugs available for inclusion in this review.

A66-80815
SIMPLE APPARATUS TO MEASURE EUSTACHIAN TUBE FUNCTION.
Eugene Bortnick (U.S. Army Hosp., Dept. of Surg., Otorhinolaryngol. Sect., Fort Sill, Okla.)
Archives of Otolaryngology, vol. 83, Jan. 1966, p. 38–39.

An instrument is described and illustrated, modified from one by Miller (1965), for the quantitative measurement of the ability of the eustachian tube to equalize artificially induced negative and positive pressure in the tympanum. The pressure is induced by a calibrated syringe attached to a Foley catheter. Only subjects who have a hole in their tympanic membrane can be tested.

A66-80816
EFFECTS OF A COMBINATION OF CHLORCYCLIZINE HYDROCHLORIDE AND CINNARIZINE ON THE LINEAR ACCELERATION TEST.
W. J. Oosterveld and S. Zeitg (Hadassah U. Hosp., Jerusalem, Israel).
Acta Physiologica et Pharmacologica Neerlandica, vol. 13, Nov. 1965, p. 348–354. 15 refs.

Three different combinations of chlorcyclizine hydrochloride and cinnarizine were tested as to their effect upon the amplitudes of the eye movements stimulated by linear acceleration on the parallel swing. The test was carried out in 25 human subjects as a double blind test with the three different combinations and a placebo. The authors found a significant (depressive) effect of the combinations of the drugs on the sensitivity of the otolithic part of the vestibular apparatus. The combination of the drugs was advantageous because it combined a faster onset and prolonged action as compared with the effect of each drug used separately.

A66-80817
HEMATOLOGIC RESPONSE TO MEDIUM ALTITUDE.
J. Thomas Okin, Albert Treger, Hugh R. Overy, John V. Weil, and Robert F. Grover (Colo. U., Med. Center, Dept. of Med., High Altitude Res. Lab., Leadville; and State of Colo. Dept. of Public Health, Denver).
Rocky Mountain Medical Journal, vol. 63, Jan. 1966, p. 44–47. 8 refs.
Grant PHS HE-06895; and State of Colo. Dept. of Public Health supported research.

Data for hematocrit, hemoglobin, red blood cell counts, and red cell indices from normal individuals in Denver (altitude 5,300 ft.) and Leadville (altitude 10,200 ft.), Colorado, are presented with suggested ranges of normal for each parameter. No significant age factor was found. The range of normal for hematologic values increased with altitude. The data suggest the presence of a nonhomogeneous population in Leadville.

A66-80818
DIVING BRADYCARDIA IN MAN.
P. E. Harding, D. Roman, and R. F. Whelan (Adelaide U., Dept. of Human Physiol. and Pharmacol., Adelaide, Australia).
Journal of Physiology, vol. 181, Nov. 1965, p. 401–409. 9 refs.

The heart rates and arterial blood pressures of adult male subjects were measured in the upright position before, during and after a 45-sec. voluntary apnea, performed both in air and while fully immersed in water. Holding the breath in air caused a fall in blood pressure resembling the response to the Valsalva maneuver, and a tachycardia. The response was reversed when the breath was held when immersed; the blood pressure rose and a bradycardia occurred with the water level above the xiphisternal joint. No difference was found between those accustomed and those unaccustomed to skin diving.

A66-80819
CALCIUM HOMEOSTASIS IN THE THYROPARATHYROIDECTOMIZED DOG.
Roy L. Alexander, Jr. (Natl. Inst. of Health, Natl. Heart Inst., Bethesda, Md.)
Endocrinology, vol. 77, Dec. 1965, p. 985–990. 17 refs.

Normal and thyroparathyroidectomized dogs were subjected to acute hypocalcemia stress by intravenous infusion of ethylene diamine tetraacetic acid (EDTA). Changes in serum calcium levels during and immediately following the infusion were determined by serial analyses, and the response obtained was used as a measure of the animal's ability to maintain calcium homeostasis. The greater skeletal reactivity and consequent better homeostatic regulation of calcium in the normal immature animal over that of the mature was confirmed in experiments on the dog and rat. Loss of regulation of calcium levels and a reduced calcium buffer capacity in the thyroparathyroidectomized dog was also confirmed. Immature thyroparathyroidectomized dogs demonstrated a some-what greater loss of regulation than mature thyroparathyroidectomized animals. No improvement in homeostatic control of calcium was observed when serum calcium levels in the mature thyroparathyroidectomized dog were restored to normal or above by increasing the amount of calcium in the diet. Thyroparathyroidectomized dogs in which

serum calcium levels were restored to normal by increased vitamin D therapy demonstrated improved regulation of calcium homeostasis in comparison to untreated dogs; however, regulation was still not equivalent to that found in the normal dog.

A66-80820
STUDIES ON ACUTE STIMULATORY EFFECT OF COLD ON THYROID ACTIVITY AND ITS MECHANISM IN THE GUINEA PIG.
Takashi Yamada, Akio Kajihara, Toshimasa Onaya, Isao Kobayashi, Yoshihiro Takemura, and Kojiro Shichijo (Gunma U., School of Med., Dept. of Internal Med., Maebashi, Japan).
Endocrinology, vol. 77, Dec. 1965, p. 968–976. 31 refs.

In an attempt to study an acute thyroid response to cold and the mechanism through which cold is effective, ^{131}I was injected intraperitoneally and changes of plasma PB^{131}I were measured in guinea pigs acclimatized to various room temperatures, and in guinea pigs receiving thyroid, thyroid plus thyrotrophin (TSH), and animals with hypothalamic lesions or large lesions in other parts of the brain. It was demonstrated that plasma PB^{131}I was significantly higher at 2 hr., maximal at 4 hr., and remained high for up to 48 hr. after exposure to cold, and that this increase of PB^{131}I subsided markedly within 4 hr. after removing animals from the cold. The rapidity and magnitude of thyroid response to cold was largely governed by the temperature to which the animals were acclimatized previously. In addition to the secretion of organic iodine, a significant amount of iodide was also secreted very rapidly after exposure to cold. A similar increase of iodide secretion was found after TSH administration. It is suggested that the thyroidal response to cold may be necessary for the acute phase of cold adaptation. The essential role of the hypothalamus in producing thyroid hyperactivity in the cold is discussed.

A66-80821
ASTRONAUT SELECTION AND TRAINING.
Warren J. North (NASA, Manned Spacecraft Center, Flight Crew Support Div., Houston, Tex.)
(N. Y. Acad. of Sci., Conf. on Civilian and Mil. Uses of Aerospace, Jan. 11–14, 1965).
Annals of the New York Academy of Sciences, vol. 134, Nov. 22, 1965, p. 366–375.

A brief summary of the Gemini and Apollo astronaut programs is presented. Astronaut selection and crew preparation activities are discussed with emphasis on the use of flight simulators for crew integration and operational readiness.

A66-80822
HUMAN PERFORMANCE FOR MILITARY AND CIVILIAN OPERATIONS IN SPACE.
Walter F. Grether (USAF Behavioral Sci. Lab., Wright-Patterson AFB, Ohio).
(N. Y. Acad. of Sci., Conf. on Civilian and Mil. Uses of Aerospace, Jan. 11–14, 1965).
Annals of the New York Academy of Sciences, vol. 134, Nov. 22, 1965, p. 398–412. 9 refs.

Laboratory and flight research on problems of human performance to be faced by future astronauts is reviewed. The problems reviewed include those of moving about and working both inside and outside of an orbiting vehicle, performance of long-term missions, and visual guidance for an orbital rendezvous. Results suggest that astronauts should be able to perform with the same high degree of skill exemplified by flight crews in high performance aircraft.

A66-80823
BLAST INJURIES: PROBLEMS OF ANESTHESIA AND REANIMATION [LES LESIONS DUES AU SOUFFLE. PROBLEMES D'ANESTHESIE ET DE REANIMATION].
G. Duchesne, G. Perot, and P. Radiguet de la Bastaie (H.M.I., Serv. de réanimation-anesthésie, Val-de-Grâce, France).
Revue des Corps de santé des armées terre, mer air, vol. 6, Dec. 1965, p. 733–745. 31 refs. In French.

Blast-caused shock, clinical symptoms, and lesions of head, thorax, and abdomen are reviewed. Therapeutic measures may include rest, oxygen, hyperbaria, surgery, blood transfusions, tracheotomy, and other measures. In cases of surgery, anesthesia without depression of ventilation is necessary since maintenance of spontaneous ventilation is essential.

A66-80824
PROFESSIONAL DEAFNESS DUE TO SOUND INJURIES [LA SURDITE PROFESSIONNELLE PAR TRAUMATISME SONORE].
M. Wayoff (Hôp., Fac. Laryngol., Nancy, France).
Lärmbekämpfung, vol. 9, Dec. 1965, p. 114–120. In French and German.

The physical, pathological, and legal problems of professional deafness are examined, and the clinical progress of deafness in a coppersmith is described. Common symptoms, auditory lesions, characteristics of deafness-inducing noise (frequency, rhythm, length of exposure, general working conditions), and individual susceptibility are reviewed. According to clinical manifestations, the deafness may be evolutive, asymmetrical, due to infracritical level of exposure of long duration, by vibration or ultrasound or by blast injury. Preventive measures should include careful screening of personnel before hiring, technical abatement of noise, protection of individuals by ear defenders and masks, and a transfer of position if necessary.

A66-80825
EEG FREQUENCY AND REACTION TIME—A SEQUENTIAL ANALYSIS.
Lenore K. Morrell (Stanford U. School of Med., Div. of Neurol., Palo Alto, Calif.)
Neuropsychologia, vol. 4, Feb. 1966, p. 41–48. 12 refs.
NASA Grant NsG 215-62 S1.

In a prolonged simple vigilance task with normal subjects who were not sleep deprived, trial-to-trial oscillations in electroencephalogram background frequency characteristics were noted. These are related to serial changes in reaction time to an aperiodic photic stimulus. Sequential analysis of the background frequency affords prediction of the probability of increased or decreased speed of response on successive trials, as well as an estimation of the likelihood of response failure.

A66-80826
ELECTROCARDIOGRAPHIC CHANGES AFTER EXERCISE TEST IN ATHLETES WITH PARTICULAR REGARD TO THE UNIPOLAR PRECORDIAL LEADS [VARIAZIONI DELL'ELETTROCARDIOGRAMMA DOPO PROVA DA SFORZO NELL'ATLETA CON PARTICOLARE RIFERIMENTO ALLE DERIVAZIONI PRECORDIALI].
F. Gobbato and P. M. Terribile (Padova U., Ist. di Med. del Lavoro, Italy).
Lavoro Umano, vol. 17, Nov. 1965, p. 498–508. 21 refs. In Italian.

The unipolar precordial electrocardiographic changes were analyzed after exercise tests in 111 athletes (90 men and 21 women). The following results were obtained: (1) No remarkable change in recording was observed after exercise in any case. (2) The changes observed were due exclusively to physiological factors such as increased heart rate and sympathetic tonus, and positional changes of the heart. (3) All physiological changes were much less evident in athletes than in normal, non-trained subjects. The changes should be considered as an index of the efficiency conditions of the cardiac muscle.

A66-80827
RENAL FUNCTIONAL RESPONSE TO HYDRAZINE AND 1,1-DIMETHYLHYDRAZINE.
Edward T. Wong (USAF School of Aerospace Med., Brooks AFB, Tex.)
Toxicology and Applied Pharmacology, vol. 8, Jan. 1966, p. 51–56. 6 refs.

Alterations in renal function were determined in dogs after an acute exposure to hydrazine or to unsymmetrical 1,1-dimethylhydrazine (UDMH). In the control group, the creatinine clearances and Tm_G (maximal rate of tubular resorption ofg glucose) remained relatively constant despite prolonged hyperglycemia. Creatinine clearance and Tm_G showed a prompt fall within minutes after hydrazine injection (20 mg./kg.), and continued to fall throughout the period of observation (240 min.). After UDMH (45 mg./kg.), Tm_G did not differ from the values of the control group; but creatinine clearance showed a slight but statistically significant increase. Both drugs produced increased salivation, hyperventilation, occasional vomiting and diarrhea, and increased neuromuscular activity. The reduction in creatinine clearance and Tm_G indicate that hydrazine produces a decreased glomerular filtration rate and an impairment in proximal renal tubular function. It seems safe to assume that UDMH (at 45 mg./kg.) does not produce a deleterious change in renal function.

A66-80828
INFLUENCE OF DIET AND PHYSICAL ACTIVITY ON BLOOD SERUM CHOLESTEROL OF YOUNG MEN.
Donald E. Campbell (Tex. U., Phys. Educ. Res. Lab., Austin).
American Journal of Clinical Nutrition, vol. 18, Feb. 1966, p. 79–85. 9 refs.
Contract PHS PH 62-346.

The experiment was carried out to determine the influence of a known amount of physical activity (treadmill running) on 86 young men who were divided into six population groups including active and inactive lean, muscular, and obese individuals. The variance analysis two-way classification with replicated measurements indicated a significant difference between active and inactive subjects and between groups. The greatest mean reduction in serum cholesterol occurred in the obese active subjects. A dietary check list completed before and after a ten-week period did not provide evidence of significant dietary variations which would explain serum cholesterol changes in the six subgroups. No significant weight changes occurred in the subgroups. It is concluded that the mean changes in serum cholesterol found in the study were significant reductions and were independent of dietary influences and weight changes.

A66-80829
MYOCARDIAL ISCHEMIA AFTER MAXIMAL EXERCISE IN HEALTHY MEN: ONE YEAR FOLLOW-UP OF PHYSICALLY ACTIVE AND INACTIVE MEN.
Allen E. Doan, Donald R. Peterson, John R. Blackmon, and Robert A. Bruce (Seattle-King County Dept. of Public Health, Wash.; and Wash. U., Dept. of Med., Div. of Cardiol., Seattle).
American Journal of Cardiology, vol. 17, Jan. 1966, p. 9–19. 14 refs.
Grant Natl. Heart Inst. H908C13; and Wash. State Heart Assoc., Wash. State Dept. of Health, and Heart Disease Control Program supported research.

After two examinations of 212 middle-aged YMCA members, one year apart, there was no significant difference in the prevalence of electrocardiographic (ECG) segmental S-T depression between 106 active men and 106 inactive men. There was 95% reproducibility of asymptomatic ECG evidence of myocardial ischemia after the maximal exercise capacity test (19 of 20 men). Comparison of active and inactive men by individual clinical, epidemiologic, and ECG characteristics offered no clues to important differences between the groups. Nevertheless, the mean durations of the maximal exercise capacity tests did separate the groups. Sensitivity of the maximal exercise capacity test for detecting potential coronary heart disease remains high. Safety of the test is assured, provided adequate clinical evaluation precedes the test and adequate professional monitoring is continued during and after the test.

A66-80830
CORTICOSPINAL INFLUENCES ON PRIMARY AFFERENTS DURING SLEEP AND WAKEFULNESS.
A. R. Morrison and O. Pompeiano (Pisa U., Ist. di Fisiol.; and Consiglio Nazl. delle Ric., Centro di Neurofisiol. e Gruppo d'Elettrofisiol., Pisa, Italy).
Experientia, vol. 21, 1965, p. 660–661. 6 refs.
Grant PHS NB-02990-04.

Experiments were performed on cats to determine (1) whether the phasic enhancement in the pyramidal activity occurring during the bursts of REM (rapid eye movement) could be observed after unilateral ablation of the motor cortex; and (2) whether, in the same animal, primary afferent depolarization could still be produced by pyramidal stimulation following degeneration of the corticospinal motor fibers. Ablation of both motor and sensory areas of the cortex prevented the appearance of pyramidal activity changes related to different states of sleep and wakefulness, indicating that during desynchronized sleep there is a phasic increase in the corticofugal discharge which also originates from the somatosensory areas of the cortex. Outbursts of pyramidal activity still occurred synchronously with the REM after degeneration of the corticospinal fibers arising in the motor cortex, suggesting that presynaptic inhibitory volleys originate from sensory areas S_I and S_{II} during REM periods of desynchronized sleep.

A66-80831
ON THE HEPATO-PROTECTIVE EFFECT OF SELENIUM IN CARBON TETRACHLORIDE POISONING IN ALBINO RATS.
G. Fodor and G. L. Kemény (Med. and Pharm. Inst., Tîrgu-Mures, Rumania).
Experientia, vol. 21, 1965, p. 666–667. 9 refs.

The hepato-protective effect of selenium (in the form of sodium selenite, 1 gamma/100 g. body weight) was investigated in rats before, during, and after carbon tetrachloride administration. The most severe histopathological changes were noted in animals which were given carbon tetrachloride before selenium. The changes consisted of hydropic and lipid degeneration of parenchymatous cells, and confluence of lipid substance to form fatty droplets. The cells showing the most severe modifications were found in the peripheral areas of the lobules. Only a small number of hepatic cells suffered necroses. The lesions were significantly slighter in the liver of animals which had received selenium, either simultaneously with, or prior to, carbon tetrachloride administration.

A66-80832
VESTIBULAR INFLUENCES ON VEGETATIVE FUNCTIONS DURING THE RAPID EYE MOVEMENT PERIODS OF DESYNCHRONIZED SLEEP.
A.R. Morrison and O. Pompeiano (Pisa U., Ist. di Fisiol.; and Consiglio Nazl. delle Ric., Centro di Neurofisiol. e Gruppo d'Elettrofisiol., Pisa, Italy).
Experientia, vol. 21, 1965, p. 667–668.
Grant PHS NB-02990-04.

An investigation was conducted on cats to establish whether the vegetative changes characteristic of the rapid eye movement state (REMS) of desynchronized sleep depend on the vestibular nuclei. Bilateral lesion of the vestibular nuclei produced an abolition of the short-lasting and pronounced pupillary dilations which in intact animals appeared in conjunction with REMS. Destruction of the vestibular nuclei abolished the phasic vegetative effects of deep sleep.

A66-80833
THE EFFECT OF HYPERCAPNIA ON BRAIN PERMEABILITY TO PROTEIN.
Robert W. P. Cutler and Charles F. Barlow (Children's Hosp. Med. Center, Neurol. Serv.; Peter Bent Brigham Hosp.; and Harvard Med. School, Dept. of Neurol., Boston, Mass.)
Archives of Neurology, vol. 14, Jan. 1966, p. 54–63. 33 refs.
Grants Natl. Inst. of Neurol. Diseases and Blindness NB-05172 and NB 1282-02; and George Harrington Trust supported research.

The effect of hypercapnia on the permeability and distribution of iodinated (I^{131}) human albumin in the guinea pig brain was studied. Pathological penetration of plasma protein in the brain occurred in a distinct regional pattern with involvement of diencephalic and brain stem structures and sparing of telencephalon and cerebellum. The magnitude of protein entry was related to the length of time of carbon dioxide exposure and to the degree of elevation of P_{CO_2}. No penetration was observed in animals with mild hypercapnia or in those with metabolic acidosis. Albumin was excluded from the brain when administered ten minutes after carbon dioxide inhalation had been discontinued, indicating that the effects on vascular permeability were readily reversible. By separate measurements of vascular volume and extravascular protein penetration in nine brain areas, an inverse relationship between vasodilation and altered permeability was found. By ultracentrifugation, a significant proportion of total homogenate radioactivity was associated with mitochondrial and microsomal fractions.

A66-80834
THE ROD DARK ADAPTATION CURVE MEASURED ABOVE CONE THRESHOLD.
W. A. H. Rushton (Cambridge U., Physiol. Lab., Great Britain).
Journal of Physiology, vol. 181, Dec. 1965, p. 641–644.
Grant Natl. Inst. of Neurol. Diseases and Blindness NB 03014-04.

An increment threshold curve obtained with a green flash on a red background is due mainly to rods. The same repeated within 5 min. of strong bleaching is due only to cones, and if measurements are made from right to left the curve is nearly that of full cone dark adaptation. Green-on-red incremental stimuli that lie below the threshold for resting cones but above that for resting rods are first seen at instants between 5 and 9 min. from the beginning of dark adaptation. From the magnitude of each such stimulus it is possible to infer the rod threshold at the instant when it is first seen, even though this threshold is above the absolute threshold for cones.

A66-80835
UNIDIMENSIONAL COMPENSATORY TRACKING WITH A VIBROTACTILE DISPLAY.
J. F. Hahn (Va. U., Charlottesville).
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 699–702.
Grant PHS NB-04177.

Accuracy of unidimensional compensatory tracking was compared for a visual and a vibrotactile display. Error was 2-1/2 times greater with the vibrotactile display which was estimated to have a gain 1/5 that of the visual display. Equalizing the gains would be expected to make the dynamic range of the vibrotactile display considerably smaller than that of the visual display.

A66-80836
LIFE INTO SPACE: AN INTRODUCTION TO SPACE BIOLOGY.
Charles C. Wunder (Iowa U., Dept. of Physiol., Iowa City).
Philadelphia, F. A. Davis Co., 1966. 324 p. Many refs.
$9.50.

This introduction to space biology is intended to supplement information found in ordinary textbooks on biochemistry, physiology, and pharmacology. The first part of the textbook examines general considerations of criteria and problems of space, history, altitude and temperature changes, and environment of other planets and solar systems. The second part reviews specific problems associated with changes of temperature and heat, pressures and vacuums, metabolic requirements, inertial fields and motion (acceleration, gravity, weightlessness, rotation, vibration), radiation and electromagnetic energy, biologistics, and extraterrestrial life.

A66-80837
ANALOG COMPUTER METHODS FOR SCORING CONTINUOUS PERFORMANCE RECORDS.
Don Trumbo, Merrill Noble (Kan. State U., Manhattan), and Fred Baganoff (McDonnell Aircraft Corp., St. Louis, Mo.)
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 707–714. 6 refs.
Contract AFOSR-526-564.

Methods for scoring continuous records of tracking performance with analog signal correlator and frequency analysis systems are described. An index of lead-lag obtained from the correlator output is compared with discrete lead-lag scores obtained by hand-scoring oscillographic records for three tasks which differ in amount of task coherence. The results indicate relatively high agreement between the two scoring methods and support the use of the correlator as the more efficient method. Sample data from the analog frequency analysis system are compared for operators with high and low integrated error scores. The results indicate consistently greater power

in the response than in the input at the fundamental for both good and poor subjects, indicating a tendency to overshoot the target with the primary movement, but relatively more power in the initial odd harmonics for the better subjects. Ratios of target spectra to response spectra provide transfer functions for the human operator.

A66-80838
INTERACTION OF ABILITY AND MOTIVATION IN PERFORMANCE.
Edwin A. Locke (Am. Inst. for Res., Washington Office, Pittsburgh, Pa.)
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 719–725. 7 refs.
Contract Nonr 4792(00).

Four studies are reported which attempted to replicate previous findings of significant interactions between ability and motivation in performance. In general, the previous findings were not strongly replicated, though there was some evidence that the effects of motivation on High Ability subjects are relatively greater than on Low Ability subjects. However, several significant motivation and ability effects were found for both Low Ability and Low Motivation subjects, respectively.

A66-80839
TIME ESTIMATION: DEPENDENCE AND INDEPENDENCE OF MODALITY-SPECIFIC EFFECTS.
D. R. Brown (Purdue U., Lafayette, Ind.) and Lloyd Hitchcock, Jr.
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 727–734. 11 refs.
Contract NADC 62269-2670.

Eighty subjects were required to reproduce nine time intervals, ranging from 1 to 17 sec. duration, under eight experimental conditions: the factorial arrangement of auditory and visual interval presentation, auditory and visual interval reproduction, and patterned and unpatterned stimulus filling the interval. Mode of stimulus presentation and of reproduction had no consistent effect on time estimation. Significant modifications occurred with repeated trials and reliabilities of duration estimations were consistently high.

A66-80840
EFFECTS OF INDUCING LUMINANCE AND AREA ON TEST-THRESHOLD LUMINANCE.
Shuko Torii and Yasuko Uemura (Tokyo U., Japan).
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 779–782.

Results for two subjects showed that threshold luminance of a disc-shaped test-field increased with increase in the inducing luminance and was slightly altered by larger area of the inducing field.

A66-80841
EFFECTS OF BODY POSITION ON JUDGMENT OF THE POSTURAL VERTICAL.
George A. Gescheider (Hamilton Coll., Clinton, N. Y.) and John H. Wright (Wake Forest Coll., Winston-Salem, N. C.)
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 783–786. 12 refs.

Each of 60 male subjects made 20 judgments of the postural vertical in the absence of visual cues. Ten subjects were randomly assigned to each of the six experimental conditions defined by left or right lateral tilt in a prone, supine, or sitting body position. In all conditions subjects consistently underestimated the postural vertical. Significantly larger errors were made by subjects tilted in the sitting position than by subjects tilted in the prone or supine positions. Performance in the prone and supine positions did not differ. No difference was obtained between tilting in the left and right quadrants for any of the body positions. Practice led to a significant decrease in error under all conditions.

A66-80842
PERCEPTION BIBLIOGRAPHY: XXIII. PSYCHOLOGICAL INDEX NO. 19, 1912.
C. H. Ammons and R. B. Ammons (Mont. U., Missoula).
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 787–790. 92 refs.

This is an alphabetical listing of 92 references to work in perception and related areas, selected from Psychological Index, No. 19, 1912.

A66-80843
EFFECT OF A FRAME ON AUTOKINETIC MOVEMENT INDUCED BY OCULOMOTOR STRAIN.
Gordon Stanley (Ind. U., Bloomington).
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 798.

Autokinetic movement was measured in ten subjects under the following conditions: (1) light alone, (2) light and a lighted square frame, (3) light after induced strain to the left, (4) light after induced strain to the right, (5) light and frame after induced strain to the left, and (6) light and frame after induced strain to the right. The frame conditions resulted in a significant reduction in autokinetic movement. It appears that the autokinetic movement produced by oculomotor strain behaves in a similar way to the classic effect.

A66-80844
PERCEPTION BIBLIOGRAPHY: XXIV. PSYCHOLOGICAL INDEX NO. 20, 1913.
R. B. Ammons and C. H. Ammons (Mont. U., Missoula).
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 823–826. 96 refs.

This is a selection of 96 articles and monographs dealing with perception from the Psychological Index, No. 20, 1913.

A66-80845
CONFIGURATION DETERMINANTS IN VISUAL PERCEPTION OF BINARY PATTERNS: SUPPLEMENTARY REPORT.
E. Rae Harcum and George Skrzypek (Coll. of William and Mary, Williamsburg, Va.)
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 860–862.
Grant PHS HD 00207-06.

This study corroborates and extends an earlier conclusion of Harcum (1964) that the discriminability of elements within tachistoscopic patterns is determined by an organizational process of memory, rather than by visual sensitivity per se. Since the distribution of errors among elements of a tachistoscopic pattern was affected by configuration changes in the spacing of the stimulus-elements, authors conclude that the role of mnemonic organizing processes has been demonstrated.

A66-80846
A TIME PERCEPTION TASK.
Dale S. Weber (Veterans Admin. Hosp., Tucson, Ariz.)
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 863–866. 7 refs.

The use of a novel method and apparatus for the study of time perception is described. This method of concurrent comparisons requires temporal discrimination among visual signals in the absence of appropriate exteroceptive cues. Seventy-two subjects were asked to identify from a panel of nine flashing lights the one light containing interflash intervals of fixed duration. Three intervals under 1.0 sec. were used. Sex differences and feedback were significant variables. Duration of interval, use of rhythm or kinesthetic cues, and practice had little effect on performance.

A66-80847
TIME OF DAY ESTIMATES AT SIX TIMES OF DAY UNDER NORMAL CONDITIONS.
Donald H. Thor and Robert O. Baldwin (Western Mich. U., Kalamazoo).
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 904–906. 12 refs.

Seventy-five adults were asked to estimate the correct time of day without reference to clocks at each of six times of day from 8:00 a.m. to 8:00 p.m. Significant group mean differences were found, with underestimation of correct time at mid-day and overestimation at early (8:00–10:00 a.m.) and later (6:00–8:00 p.m.) times of day.

A66-80848
INFORMATION TRANSMISSION IN A PATTERN DISCRIMINATION TASK AS A FUNCTION OF INITIAL TASK DIFFICULTY.
John Coules, Donald L. Avery (Elec. Systems Div., Decision Sci. Lab., Bedford, Mass.), and Alan Meskil (Northeastern U., Boston, Mass.)
Perceptual and Motor Skills, vol. 21, Dec. 1965, p. 927–939. 18 refs.

Information transmission measures were obtained with the method of absolute judgments, and learning effects were evaluated as the nature of the discrimination task varied. Two experiments were conducted using regular and irregular geometric forms which were tilted in various degrees from the line of sight. In Exp. I, the judgment task increased in difficulty from large to fine differences in tilt, whereas in Exp. II the discrimination task was difficult throughout the experiment. In both experiments the task increased in difficulty because stimulus uncertainty increased. Results showed that when the demands of the task are such that early and sustained high performance is required, it is better if the observers are presented with the difficult task from the start rather than gradually increase its difficulty. Geometric forms showed significant differences in the amount of information transmitted.

A66-80849
FIRST INTERNATIONAL SYMPOSIUM ON RADIOSENSITIZERS AND RADIOPROTECTIVE DRUGS, MILAN, 1964.
Edited by R. Paoletti and R. Vertua (Milan U., Inst. of Pharmacol., Italy).
Progress in Biochemical Pharmacology, vol. 1, 1965. x+ 750 p. Many refs.

Papers presented at the First International Symposium on Radiosensitizers and Radioprotective Drugs, held in Milan, Italy, in 1964, are organized under the following categories: effects on lower organisms, chemical systems, mammals, and experimental tumors; chemical and biological protection; chemical sensitization; and clinical investigations. Pertinent papers are abstracted separately.

A66-80850
THE ROLE OF POST-IRRADIATION REPAIR PROCESSES IN CHEMICAL PROTECTION AND SENSITIZATION.
P. Alexander, J. T. Lett, and C. J. Dean (Roy. Cancer Hosp., Inst. of Cancer Res., Chester Beatty Res. Inst., London, Great Britain).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 22–40. 29 refs.
NIH, Med. Res. Council, and Brit. Empire Cancer Campaigns supported research.

Evidence is reviewed which indicates that dose-modifying treatments may act by altering the capacity of cells to repair metabolically the radiochemical damage produced by ionizing radiation. It is postulated that the critical structure (probably desoxyribonucleic acid (DNA)), which initiates cell death, is capable of repair, but both DNA and the repair process are radiosensitive, although the radiosensitivity of DNA is less easily modified than that of the repair process. Physico-chemical mechanisms by which -SH compounds such as cysteamine and -SH poisons like iodo-acetamide alter the extent of radiation damage to the repair processes are discussed. Other treatments (e.g., bromouracil incorporation) sensitize by directly blocking repair processes. The implications of this hypothesis for the application of sensitizers in radiotherapy are discussed. The mechanism of the protectors in vivo is complex because cysteamine and related compounds produce a "biochemical shock" which profoundly alters the physiological state of cells. Protection is the result of this "biochemical shock".

A66-80851
EFFECT OF CYSTAMINE ON THE METABOLISM OF IRRADIATED YEASTS.
M. Botre and G. Giovannozzi-Sermanni (Rome U., Institute of Pharm. Chem., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 65–70. 6 refs.

The relation between cellular biochemistry and radioprotection was investigated in the yeasts Hansenula saturnus and H. suaveolens by growing H. saturnus in tritiated water alone, with cystamine alone, or with both together, and testing the effects of the metabolites liberated into the filtrate by noting their effects on the division rate, growth rate, respiratory quotient (R.Q.), and succinic thiokinase of H. suaveolens. Cystamine had clear-cut effects on the metabolism of H. saturnus: H. suaveolens grown in H. saturnus filtrate showed greatly inhibited succinic thiokinase indicative of a qualitative and quantitative difference in excretion products. Cellular density, growth rate, and R.Q. of H. saturnus were not altered by irradiation in the presence of cystamine. Results from cultures of H. suaveolens grown in H. saturnus filtrates lead to the conclusion that yeasts irradiated or treated with cystamine leave altered metabolites in the growth solution; and when the two treatments are combined, the results show intermediate values close to those for cystamine alone. It is suggested that the action of cystamine as a radioprotective agent is linked to its capacity to change the metabolism of cells.

A66-80852
A POSSIBLE MECHANISM FOR CHEMICAL PROTECTION AGAINST RADIATION DAMAGE.
W. Lohmann (Ark. U. Med. Center, Depts. of Physiol. and Radiol.; and VA Southern Res. Support Center, Little Rock).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 118–136. 47 refs.
Grant NIH RH 00-197.

It has been shown that radioprotective effect can be obtained with substances which form a metal–water–ligand complex. These substances modulate the energy-charge transfer to the active site of a macromolecule, thus having profound biological significance. The effectiveness in energy-charge transfer depends on the type of ligand. The specific systems considered include those containing glycerol, iron, copper, or manganese ions, and sulfur-containing substances. The mode of protection cited need not be an exclusive one.

A66-80853
MERCAPTAN-DISULFIDE INTERCHANGE AND RADIOPROTECTION.
G. Gorin (Okla. State U., Dept. of Chem., Stillwater).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 142–151. 24 refs.
Contract DA-49-193-MD-2251; and Grant HEW RH 00305-01.

Equations representing mercaptan-disulfide reactions are furnished and examined. A summary of results obtained by various investigators for the equilibrium constants of mercaptan-disulfide reactions conducted in aqueous buffered medium are tabulated. In test animals, the mechanism of radioprotection probably involves reactions between mercaptan or disulfide and body proteins. The components are probably linked by disulfide groups. Formation of the combination products should be favored at times when, and in places where, the concentration of protector is high; and reversal of the reaction might be expected to occur when and where the concentration of protector is low. In this way, the protein-protector compounds can serve as reservoirs of protector and determine the concentration maintained in various tissues as well as the duration of protection. On the basis of the considerations, it is expected that mercaptan-disulfide interchange reactions will be of importance in radioprotection, regardless of the mechanism by which radiation damage is prevented or repaired.

A66-80854
METAL BINDING AS A MECHANISM OF RADIOPROTECTION BY THE MERCAPTAN BASES.
W. O. Foye and J. Mickles (Mass. Coll. of Pharm., Dept. of Chem., Boston).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 152–160. 23 refs.
Contract DA-49-193-MD-2029.

The possibility of complexation within animal cells of metalloenzymes by MEA (2-mercaptoethylamine, cysteamine) and MEG (2-mercaptoethylguanidine) was investigated by administration of preformed metal complexes of MEA and MEG to mice prior to lethal doses of X-radiation. In accordance with predicted behavior, the zinc complexes afforded radiation protection, but copper and iron complexes were essentially inactive. Oil/water partition coefficients indicated that no essential differences in the distribution of the complexes in vivo may be expected. Spectrophotometric measurements indicated complexation by metal-binding radioprotective agents of the enzymes catalase and lactic dehydrogenase.

A66-80855
PROTECTION OF LACTATEDEHYDROGENASE BY D-LACTATE.
K. Dose (Max Planck Inst. of Biophys., Frankfurt/Main, West Germany).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 161–166. 6 refs.

The radioprotective effects of the tertiary complex formed by the enzyme lactate dehydrogenase (LDH) incubated in the presence of reduced diphosphopyridine nucleotide (DPNH) and D- or L-lactate was investigated by measuring the enzyme activity after 275 kilorads X-rays and ultraviolet light energy of 5 to 100 moles quanta per molecule. The increased enzyme activity (1.4 times that of the control) after X-irradiation in the presence of DPNH and D-,L-lactate was probably not due to the tertiary complex since the apparent radioactivation remained unchanged in the absence of DPNH. D-lactate alone was more effective in preserving enzyme activity than L-lactate alone, and the conversion of lactic to pyruvic acid was also more enhanced by D- than by L-lactate. Other additives (pyruvate, D-,L-alamine, acetate, cysteamine, etc.) had no appreciable radioprotective effect during X-irradiation and were only slightly effective in ultraviolet irradiation. There was no pronounced ultraviolet-ray protection by D-lactate.

A66-80856
RADIOPROTECTIVE EFFECTS OF MYCELIUM DERIVED OLIGOPOLYNUCLEOTIDES.
R. D. Barnard and M. D. Freeman (Lindsay Labs., Brooklyn, N. Y.)
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 167–172. 12 refs.

A review is made of the use of fungal extracts for radioprotection, especially desoxyribonucleic acid (DNA), desoxyribonuclease (DNAse) digests of fungal DNA concentrates, and one DNAse-resistant DNA fragment of 50,000 m.w. Several previously reported experiments on rats are examined.

A66-80857
CARDIOVASCULAR DAMAGE BY X-IRRADIATION AND THE POSSIBLE CHEMOPROTECTION AGAINST THIS.
H. B. Lamberts (Groningen U., Dept. of Radiopathol., The Netherlands).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 235–241.

Experimental and therapeutic X-irradiation can cause appreciable damage to arteries and to the heart, leading to severe occlusion of the vessels, to myocardial fibrosis, and even heart infarction. The post-mortem findings of two cases of fatal radiotherapy-linked cardiac damage in humans are examined. Intravenous sodium thiosulfate injection in a rabbit protected the carotid artery from radiation damage. Other substances (colloidal sulfur, Evans blue dye, cyclohexanol succinate (Radioplex), and inositol) which were tested for vascular radioprotective properties were ineffective or only very slightly protective.

A66-80858
RADIOPROTECTION AND MITOSIS: AN INVESTIGATION ON REGENERATING RAT LIVER.
M. Iaddaga and P. Leonori (Pisa, U., Gen Pathol. Inst. and Radiol. Inst., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 242–248. 10 refs.

The effects of intraperitoneal injection of cysteamine on mitotic index and mitotic abnormalities of regenerating rat liver cells after a 2000-roentgen dose of ionizing radiation and partial hepatectomy were studied. No significant differences were noted in abnormal mitosis production in irradiated and protected animals. Cysteamine administration just prior to irradiation produced an earlier reduction of mitotic inhibition of hepatic cell regeneration from partial hepatectomy 5 days after irradiation. The protective effect disappeared when cysteamine was administered after irradiation, before hepatectomy. The observed effect seems to consist in a quicker recovery of the induced lesion in the hepatic cell.

A66-80859
PROTECTIVE ACTION OF AET (BETA-2-ISOTHIURONIUM BROMIDE) IN DISTURBANCES OF SODIUM AND WATER METABOLISM IN THE SO-CALLED "GASTROINTESTINAL SYNDROME".
Z. Zsebok and G. Petranyi, Jr. (U. Med. School, Radiol. Res. Lab., Budapest, Hungary).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 257–261. 15 refs.
The most important factor in "gastrointestinal syndrome" or "intestinal death" as a result of irradiation appears to be the shifting of the body-electrolytes toward a pathologic distribution away from the intestinal tract, rather than a pure decrease of the total sodium pool. The protective effects of AET (beta-2-isothiuronium bromide) on the sodium resorption from the small intestine, the total and interchangeable sodium values, and the Inulin space of rats were studied after 1250 r whole-body X-irradiation. The mean survival time of the controls was 3.6 days, but animals pretreated with AET survived 5.4 days. The death of the protected animals could not be considered as caused by disorders in the sodium balance in the small intestine; the death was apparently due to exhaustion of other systems.

A66-80860
THE INFLUENCE OF HYPOTHERMIC CONDITIONS ON THE RADIOPROTECTIVE ACTION OF BETA-MERCAPTOETHYLAMINE (MEA).
E. Magdon (Ger. Acad. of Sci., Robert-Rossle-Clin., Dept. of Radiation Biol. and Reg. Tumor Therapy, Berlin, East Germany).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 262–268. 14 refs.
The influence of the known radioprotectors, hypothermia and MEA (beta-mercaptoethylamine) (cysteamine), alone and in combination was investigated in mice. The protection shown by hypothermia alone was lower than the protection by MEA alone. The combination of hypothermia and MEA showed no potentiating or additive effect. The failure to demonstrate a significant additive protective action of MEA and hypoxia (through hypothermia) implies that MEA and hypoxia act at some stage through a common pathway for radioprotection. It is suggested that MEA competes with oxygen in such a way that the radical peroxydation is prevented. To test the possibility of the reaction, further studies were made on Ehrlich ascites tumor cells and solid tumor cells. Aerobically irradiated ascites cells showed significant radioprotection with MEA, but the reverse was true for anaerobic irradiation. MEA had no significant radioprotective effects on irradiated solid tumors. On the contrary, MEA seemed to have radiosensitizing effects, depending on temperature; the possibility of using MEA in radiation therapy is discussed.

A66-80861
RADIOBIOLOGICAL EFFECT OF SOME DRUGS STIMULATING OR DEPRESSING THE CENTRAL ACTIVITY WHEN ADMINISTERED IN THE MOUSE BEFORE PANIRRADIATION.
C. Stuart, G. Cittadini, and G. Tomiselli (Siena U., Inst. of Radiol. and Phys. Therapy, Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 269–276. 31 refs.
Alterations of the evolution of the total body irradiation syndrome in mice by means of central nervous system depressant and stimulating drugs were investigated. Of the depressant drugs, morphine demonstrated a radioprotective effect, but Nembutal was ineffective at doses of 35 and 69 μ g./g. and a sensitizer at 25 μ g./g. Of the stimulants, Cardiazol was ineffective and Remeflin was a sensitizer.

A66-80862
CHEMICAL RADIOPROTECTION AND TUMORS.
S. Greco, G. Gasso, and A. Billitteri (Catania U., Inst. of Radiol. and Inst. of Gen. Pathol., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 277–305. 25 refs.
The effects of the drugs cysteamine (beta-mercaptoethylamine), AET (beta-2-isothiuronium), DTPA (diethyl-triamine-pentoxide-acetic acid), and GA7 (a newly synthesized compound of empirical formula $C_9H_8NS_2Na$) on the differential sensitivity to X-rays between healthy tissues and tumors was investigated. The best survival rates were obtained with cysteamine and AET, but GA7 also afforded some protection. Treatment with cysteamine and AET before sarcoma tumor irradiation provided a delay and less reduction of the tumor mass, a lack of ulceration on the skin surface over the tumor, and less necrosis in the tumor. In the tumors treated with the drugs, there was an initial lack of the fall rate of DNA (desoxyribonucleic acid) and RNA (ribonucleic acid), as manifested by reduced P^{32}-uptake into RNA. Subsequently, the P^{32}-uptake into tumoral DNA increased while that in RNA remained low. The initial increase in respiration after irradiation was abolished by the radioprotective drugs, and the subsequent decrease at the level of the irradiated tumor was moderated. The action on respiration was of almost equal intensity in both normal and neoplastic tissue.

A66-80863
QUINOXALINE-DI N-OXIDE, RADIOPROTECTOR AND RADIOSENSITIZER.
T. J. Haley, W. E. Trumbull, and J. A. Cannon (Calif. U., School of Med., Dept. of Surg., Dept. of Biophys. and Nucl. Med., Lab. of Nucl. Med. and Radiation Biol., Los Angeles).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 359–365. 9 refs.
Contract AEC AT(04-1)GEN-12.
Quinoxaline-di-N-oxide was shown to decrease radiation mortality in mice receiving 550 r (LD_{100}/30 days) whole-body X-irradiation by 50% when administered for three days prior to irradiation. The compound did not prevent the radiation-induced leukopenia but did prevent the usually fatal post-irradiation enteric organism bacteremia. The compound acted as a radical trap, thus reducing the intra- and extracellular damage from the oxidizing radicals produced by whole-body X-irradiation. However, when the drug was administered orally to dogs for two days prior to giving 500 r (LD_{100}/30 days) no radioprotection was observed; in fact, the drug sensitized the animals to the lethal effects of irradiation. The sensitization mechanism involved stimulation of the bone marrow with the production of a marked leukocytosis in which the total circulating leukocytes were increased by a factor of three over the pre-drug value. The phenomenon may be species specific for the dog; if not, quinoxaline-di-N-oxide could prove to be a valuable drug for the treatment of drug- or radiation-induced bone marrow depression.

A66-80864
MECHANISM OF CHEMICAL PROTECTION IN INTACT ANIMALS.
D. W. van Bekkum (Radiobiol. Inst. TNO, Rijswijk, The Netherlands).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 406–417. 29 refs.
The techniques employed to estimate the protective action of chemical substances, including so-called screening procedures, and the requirements for quality and standardization of animals, animal care before and after exposure, and radiation exposure conditions are evaluated. Among the many different chemical compounds which have been found to possess radioprotective activity, only a limited number can be considered to provide an important degree of protection. The substances include biological amines (histamine, epinephrine, tryptamine, 5-hydroxytryptamine), cyanide, dithiocarbamates, dimethyl sulfoxide, and SH-compounds (cysteine, cysteamine, AET (beta-2-isothiuronium bromide)). Various methods are discussed to express quantitatively the protective properties of a drug. It is generally agreed that no drug has emerged which can be safely employed to protect humans against whole-body irradiation damage, and in view of the toxicity of the group of SH-compounds and the anoxic mechanism of action of the others, the chances do not seem to be very good.

A66-80865
ON THE INFLUENCE OF EXTERNAL FACTORS UPON THE EFFICACY OF RADIOPROTECTIVE SUBSTANCES.
H. Langendorff, M. Langendorff, and H. J. Melching (Freiburg, U., Inst. of Radiol., West Germany).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 418–426.
A group of biological, chemical, and physical factors influencing radioprotection in mammals is tabulated and some are discussed by reviewing previously performed experiments with AET (beta-2-isothiuronium bromide), serotonin, cysteamine, and others. The factors discussed include dose rate of both radioprotector and radiation, possible fractionation of radiation dose, means of administration (intravenous, intraperitoneal, subcutaneous, intramuscular, or oral), time of administration of radioprotector before irradiation, and pH of radioprotector when administered.

A66-80866
THE RADIOPROTECTIVE ACTION OF DIFFERENT RADIOPROTECTORS FOR DOSES BELOW 100 R.
R. Koch (Freiburg, U., Radiol. Inst., West Germany).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 427–431. 9 refs.

Fe^{59}-uptake by mouse bone marrow cells was measured after total-body irradiation of 25 to 75 r. A total-body irradiation dose of 30 r was the threshold dose for male mice to influence Fe^{59}-uptake by bone marrow cells. In a second series of experiments, the chemical protective agents cysteamine, serotonin-creatinine sulfate, histamine, pyridoxal-5-phosphate, and 5'-AMP (5'-adenosine monophosphate) injected before irradiation were investigated. Both histamine and cysteamine reduced the radiation effect of 75 r to an effect of 30 r (dose reduction factor 2.5), but the serotonin, 5'-AMP, and pyridoxal-5-phosphate effects were not so strong (dose reduction factor 1.5).

A66-80867
RADIOPROTECTIVE AGENTS DERIVED FROM THIOGLYCOLLIC ACID.
F. L. Rose and A. L. Walpole (Imp. Chem. Ind. Ltd., Pharm. Div., Alderley Park, Macclesfield, Great Britain).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 432-441.

Thioglycollic hydrazide, which contains the skeleton common to several other radioprotective agents, was investigated in the form of four closely related but more stable derivatives. N-acetylthioglycollic hydrazide was less effective than N,:N^4-diacetyldithioglycollic dihydrazide in protecting mice against the lethal action of mustard gas, but the two compounds, given intraperitoneally in the same fraction of their respective median lethal doses, produced about the same increase in the LD_{50} of whole-body X-irradiation (from 655 rads to 895 and 880 rads, respectively).

A66-80868
RADIOBIOLOGICAL STUDIES WITH FAST NEUTRONS ON THE EFFECTIVENESS OF RADIOPROTECTIVE SUBSTANCES, WITH SPECIAL REGARD TO OPHTHALMOLOGICAL CHANGES.
W. Straub, E. H. Graul, W. Rüther, H. Hundeshagen, H. Neubauer, K. W. Jacobi, and H. Krüger (Marburg U., Ophthalmol. Clin. and Inst. of Radiobiol. and Isotope Res., West Germany).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 447-460. 24 refs.

Several thio-derivatives, serotonin, and a serotonin antagonist were tested for radioprotection properties in rabbits' eyes bombarded with either neutrons of mean energy of 15 MeV or cobalt gamma irradiation. Cysteamine, AET (beta-2-isothiuronium bromide), serotonin, and vitamin B_6 were effective in reducing conjunctivitis, keratitis, blepharitis, lens opacity, and epilation around the eyes. The combined use of agents with different points of action greatly increased the final protective effect. The combination was very active against gamma irradiation, but was effective only over a limited dose range of MeV neutrons.

A66-80869
INVESTIGATIONS ON THE NEW POSSIBILITIES OF RADIOPROTECTION.
A. Danysz (Med. School, Dept. of Pharmacol., Bialystok, Poland).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 461-466.

The anabolic androgen metandrostandiol (Dianabol) was tested for possible use as a radioprotective agent. The compound decreased the mortality rate of mice and rats irradiated with LD_{100}, the postradiation leukopenia, the histopathological changes in internal organs, and characteristic increases in number of destroyed leukocyte nuclei in the blood; and it prevented the fall in body weight, the decrease in muscular strength, the fall in liver desoxyribonucleic acid, and the decrease in water content of blood. To test the hypothesis of the radioprotective effect of proteolytic enzyme inhibitors, a second series of experiments was conducted on Iniprol and epsilon-amino pothesis of the radioprotective effect of proteolytic enzyme inhibitors, a second series of experiments was conducted on Iniprol and epsilon-aminocaproic-acid. Both compounds demonstrated radioprotective activity when given 2 hours before and 4 days after irradiation.

A66-80870
RADIATION-PROTECTION CAPACITY OF SOME PROCAINAMIDES AND THEIR NITRATED PRECURSORS.
G. Arnaud, H. Frossard, J.-P. Gabriel, A. Bichon, J.-M. Saucier (French Navy, Atomic Study Group, Radiobiol. Lab., Cherbourg, France), J. Bourdais, and A. Guillerm (Fac. of Med., Pharmacol. Inst., Paris, France).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 467-471. 6 refs.

Fourteen aminated and 25 nitrated derivatives of procainamide were tested for their radioprotective effects against 880 r of X-radiation in mice. No radioprotective effect was observed among the 14 aminated nitrated derivatives nor among 19 of the nitrated derivatives. Of the 6 remaining nitrated derivatives, 5 revealed negligible to slight radioprotective attributes, and only one (the bromoethylate on NR_2 = morpholine, from the nitrated compound of which R' = $-CH_2-C_6H_5$) delayed mortality of the mice. The comparative study of the nitrated derivative formulas implies the following characteristics for a radioprotective molecule: (1) presence of the morpholine cycle on quarternary nitrogen, (2) presence of a $(CH_2)_3$ chain (like that found in the active phenothiazines), and (3) presence of the (R) chain on the first nitrogen, equal to $C_6H_5-CH_2-$.

A66-80871
PHYSICOCHEMICAL AND BIOLOGICAL INVESTIGATIONS ON THE ACTIVITY OF SOME PROPHYLACTIC RADIOPROTECTORS.
C. Nicolau, S. Grigorescu, and C. Nedelcu (Min. of Health, Res. Centre, Bucharest, Rumania).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 472-478. 8 refs.

The radioprotective effects of beta-mercaptoethylamine (cysteamine), beta-2-isothiuronium bromide (AET), adrenaline, cysteine, and adrenocorticotropic hormone (ACTH) were investigated in three series of experiments on reaction kinetics in solution and P^{32}- and S^{35}-methionine-incorporation in bones of rats. Cysteamine and AET distinctly inhibited P^{32}-incorporation in bone, while cysteine, adrenaline, and ACTH clearly inhibited S^{35}-methionine incorporation for 12 hours. It is suggested that the compounds act by inhibiting the activity of some enzymatic systems, possibly by reacting with some intermediary radicals.

A66-80872
THE INFLUENCE OF CORTISONE ON THE RADIATION EFFECT OF BONES.
A. Zuppinger (Berne, U., Inst. of Radiol., Switzerland).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 479-488.
Swiss Natl. Found. for Sci. Res. supported research.

Clinical observations had previously shown that radiation effects were diminished when cortisone was applied before X-irradiation. Experiments on calcium-45 uptake in rat leg bones showed that irradiation after ten days of cortisone medication was followed by a strong reduction of calcium uptake and a strong reduction of the radiation effect. The effects were only temporary. Cortisone application after irradiation showed only a slight reduction of calcium uptake and no diminution of the radiation effect. There is evidence that radiation neutralized temporarily the cortisone effect in osteoblasts. Sex-linked differences in calcium uptake and radiation effect were noted in the rats.

A66-80873
IN VIVO AND TISSUE CULTURE STUDIES ON RADIOPROTECTIVE ACTION OF ORGANOPHOSPHORUS COMPOUNDS SYNTHETIZED AT THE PHARMACOLOGICAL INSTITUTE.
M. Adolphe, J. Cheymol, G. Deysson, and P. Chabrier (Paris, U., Inst. of Pharmacol., France).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 501-506. 11 refs.

The radioprotective properties of 14 newly synthetized derivatives of phosphoric acid were investigated in irradiated (LD_{100}) mice and on animal (HeLa) cell cultures. Of the 14 compounds, only four had a weak radioprotective power; two showed in vivo as well as in vitro protection, and two protected only in vitro. When radioprotective properties were compared with anticholinesterase and antimitotic activities, a clear parallelism between the activities was not obvious.

A66-80874
NEW THIODERIVATIVES WITH RADIO PROTECTIVE ACTIVITY.
F. Cugurra and E. Balestra (Genoa U., Inst. of Radiol. and Inst. of Pharmacol., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 507-514. 10 refs.

The possible radioprotective effects of two new compounds of thiolic structure, meso-2-3-dithiosuccinic acid (DTS) and dl-2-3-dithiosuccinic acid (DL), were investigated in mice and guinea pigs. In guinea pigs, DTS exerted a marked protective action against X-irradiation (LD_{50}) when injected one hour after irradiation. DL did not show similar activity. In mice, the radioprophylactic activity of the two compounds was evident after a 700-r dose. The radiotherapeutic activity appeared only after a 500-r dose. In another series of experiments, tumor-bearing mice treated with DTS or cysteine survived longer than did other animals treated with either DL or non-irradiated. It is suggested that the compounds protect healthy tissues against radiation and thereby preserve the natural resistance of the animal against the tumor and this prolongs the survival time.

A66-80875
STUDIES ON THE COMPARISON OF THE RADIOPROTECTIVE EFFECT OF AET AND ITS CYCLIC ANALOGUES.
L. Sztanyik, V. Varteresz, Anna Doklen (Frederic Joliot-Curie' Natl. Res. Inst. for Radiobiol. and Radiohyg., Budapest, Hungary), and K. Nador (Hung. Acad. of Sci., Inst. for Exptl. Med., Budapest, Hungary).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 515–521. 8 refs.

An attempt was made to establish some relationship between the free SH-group content of 12 isothiouronium derivatives and their reductive capacity, inhibition of tissue respiration, toxicity, and radioprotective effect. Only the aminoalkylisothioureas showed a reliable radioprotective effect in mice after a 730-r dose of X-radiation. The other compounds provided slight or no radiation protection. It is concluded that the release of the potential SH-groups of the compounds considered, their reductive capacity, and their tissue respiration inhibiting activity may better determine their toxicity than their radioprotective characteristics.

A66-80876
SOME METABOLIC ASPECTS OF CYSTAMINE-TREATED MICE.
P. Ciccarone (C. S. N.-Casaccia, Lab. of Animal Radiation Biol., Rome, Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 522–527. 8 refs.

A systematic investigation was conducted on the metabolic conditions of mice which had received a dose of cystamine (170 mg./kg.) to protect them from a radiation dose lethal to untreated controls. Oxygen uptake connected with pyruvate utilization was measured on liver homogenates, and ketoacids were determined at various time intervals after the cystamine injections. All data collected so far agree with the hypothesis that cystamine-treated mice show a slowing-down of metabolism. The inhibition of ketoacid utilization which had been previously found in vitro was paralleled by the accumulation of these substances in vivo. The metabolic conditions of the animals indicated an over-all decreased efficiency of the Krebs cycle, but the significance of these conditions for the mechanism of radiation protection is difficult to establish.

A66-80877
GUINEA-PIG SKIN AND VICIA FABA IN TESTS OF CHEMICAL PROTECTION AGAINST X-IRRADIATION.
A. Maggiora, H. Lozeron, E. Bujard, and W. Jadassohn (Geneva, U., Dept. of Dermatol., Switzerland).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 528–532. 13 refs.

The influence of serotonin, 11 substances allied to serotonin, cysteamine, cysteine, oxyphenbutazone (Tanderil), cortisone acetate, and hydrocortisone hemisuccinate on effects of X-rays was studied in guinea pigs and Vicia faba. Tests on guinea pigs concerned transitory and persistent epilation, hypertrophy of the epidermis, and hyperpigmentation of the flank, and mitotic flare-up of the male guinea pig nipple. Serotonin preserved guinea pigs from transitory epilation, transformed persistent epilation to transitory epilation, and diminished epidermal hypertrophy, hyperpigmentation, and the inhibitory activity of X-rays on mitotic flare-up. Of the other substances tested, bufotenin and cysteamine provided some measure of protection. Serotonin permitted the growth of almost normal secondary roots in V. faba in spite of irradiation, and the radioprotective effects of cysteamine and cysteine were confirmed.

A66-80878
X-RAY PROTECTION BY MEANS OF PANTOTHENIC ACID.
I. Szorady, G. Toth, and I. Gazdag (U. Med. School, Pediat. and Radiol. Clin., Szeged, Hungary).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 533–536. 22 refs.

The prevention of whole-body X-ray damage in mice by injection of pantothenic acid was investigated. Pantothenic acid administered one week before irradiation produced a 20% increase in survival time of the animals. Administration immediately followed by irradiation afforded protection only for the first 12 days after irradiation; during the 13th to the 30th day, mortality approached that of the control group. When the pantothenic acid was administered after irradiation it did not influence the survival period.

A66-80879
PROLONGATION OF THE RADIO-PROTECTIVE EFFECT OF SEROTONIN.
I. Belokonski and E. Manoloff (Inst. of Radiol. and Radiation Hyg., Sofia, Bulgaria).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 537–541. 6 refs.

Experiments with guinea pigs, hamsters, rats, and rabbits were made in order to test the radioprotective effect of oil- and water-and-wax suspensions of serotonin creatine sulfate against X-rays. When guinea pigs were irradiated 30 min. after serotonin application, no protective effect was observed. Depot-serotonin showed a maximum radioprotective effect when applied 5 hr. before irradiation; survival reached 85%. There was no protective effect at the longer intervals of 12 and 14 hr. Depot-serotonin had a good radioprotective effect upon hamsters (60%) and rabbits (30%), while with rats the effect was considerably smaller and was manifested when the preparation was applied 2 hr. before irradiation. Serotonin-P-toilie sulfamide had no radioprotective effect. Also, the addition of phenamine to the water-and-wax suspension of serotonin led to an abrupt decrease or to a complete disappearance of the radioprotective effect. The data show that the ability of serotonin to depress both the conditioned reflex activity and the motor activity and to decrease the oxygen consumption of the animals has a decisive role in radioprotection, while its vasoconstrictive effect on the peripheral blood vessels is unrelated to this effect.

A66-80880
ON THE RADIOPROTECTIVE PROPERTIES OF HETEROCYCLIC NITROGENOUS COMPOUNDS.
R. Rinaldi and Y. Bernard (Centre d'Etudes Nucl. de Grenoble, Lab. de Radiobiol., Grenoble, Isère, France).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 542–549.

Study of the radioprotective properties of 15 imidazole derivatives of compounds belonging to the nitrogenous heterocyclic series revealed that benzimidazole, when administered intraperitoneally to mice before lethal irradiation, obtained a 90% survival among the mice treated. Although protective action was maximum if injected 5 min. before irradiation, 45% of the animals survived when injected one hour before exposure. Although the reduction of body temperature by benzimidazole was substantial, no correlation appeared between this factor and radioprotective activity. Derivatives resulting from the presence in the imidazole ring of the mercapto, methyl, carbonyl, or benzyl groups were inactive; the substances appeared to destroy the significant radioprotective activity of the imidazole.

A66-80881
LATE CHANGES IN ANIMALS SURVIVED SIC WITH THE HELP OF RADIOPROTECTIVE DRUGS AFTER LETHAL IRRADIATION.
L. Dimitrov (Higher Med. Inst., Sofia, Bulgaria).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 550–553.

Protection from X-rays by administration of serotonin, 5-hydroxytryptamine and two thio compounds was tested in mice. The following results were obtained: (1) Serotonin exerted protective effect after exposure up to 800 r. (2) Combined application of 5-HT-AET-MEA (5-hydroxytryptamine, beta-2-isothiuronium bromide, cysteamine) increased the resistance of white mice to exposure of more than 800 r. (3) Body weight alterations, histologic alterations, and studies of DNA (desoxyribonucleic acid) synthesis showed that the compounds tested did not permit a complete survival after X-irradiation in a considerable number of animals. Deviations from the normal were more frequent after single administrations of serotonin.

A66-80882
PROTECTION AGAINST IONIZING RADIATIONS BY COMPOUNDS FROM THE SERIES OF PHENYL-HYDROXYBENZOPYRONE.
J. M. Gazave, D. C. Modigliani, and G. Ligny (Paris U., Fac. of Med., France).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 554–557. 15 refs.

Hydrosoluble and non-hydrosoluble 5–7 dihydroxyisoflavone were tested in mice as preventive and curative agents against 700 r X-irradiation. Intraperitoneal administration provided no protection; but percutaneous administration of both compounds gave excellent preventive as well as curative protection.

A66-80883
VARIATIONS OF THE LEUKOPENIC EFFECTS OF CYCLOPHOSPHAMIDE ASSOCIATED WITH PANIRRADIATION IN RAT, IN RELATION TO THE USE OF RADIOPROTECTIVE DRUGS.
C. Martinenghi, I. M. Stoppa, and G. Agati (Turin U., Inst. of Radiol.; and Milan, U., Inst. of Nucl. Med., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 558–563.

Variations in post-irradiation leukopenia in rats were investigated by administering, in conjunction with irradiation and cyclophosphamide, other drugs such as diphosphopyridine nucleotide (DPN), cysteamine, ascorbic acid, Albema, and Steranabol (4 chlorotestosterone-acetate). With cyclophosphamide and irradiation alone, there was a fall of leukocyte number with irregular but progressive recovery after 72 hours. DPN treatment slightly

attenuated the lymphocytic fall after irradiation, and no leukocytic nor lymphocytic fall successive to the cyclophosphamide treatment was observed. Cysteamine induced a retardation in the fall of leukocytes, both after irradiation and after intraperitoneal injection of cyclophosphamide; the successive leukocytic phase of recovery was not notably modified in comparison with the control group. Treatment with ascorbic acid, Albema, and Steranabol had no effect on the leukocytic fall; but a clear increase of successive leukocytic recovery was noted, which was comparable for all three drugs.

A66-80884
RADIATION PROTECTION EFFECT OF CHLOROTRIANISENE (TACE).
K. Flemming (Heiligenberg Inst., Dept. of Radiobiol. and Pharmacol., Heiligenberg/Baden, West Germany).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 564–567. 7 refs.

The radioprotective effect of the synthetic estrogen chlorotrianisene (Tace, Merbentul) was investigated in mice after whole-body X-irradiation. Quantitatively, 0.2 mg. was as effective as 2.0 mg., but an increased dose to 20 mg. was less effective. The radioprotective effect of Tace was similar in both male and female mice, and it was effective against both lethal and sub-lethal X-ray doses. The effect of Tace was already clearly marked five days after irradiation, and protection was still evident after 20 days. A correlation is suggested between the radioprotective effect and the reticulo-endothelial system stimulating effect of Tace.

A66-80885
THE INTERACTION OF AMPHETAMINE AND LOW DOSE IRRADIATION.
C. D. Barnes (Ind. U., Dept. of Anat. and Physiol., Bloomington).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 568–573. 25 refs.
Grant PHS 2M7032.

Because of the similarity of behavioral and electroencephalogram actions elicited by administration of Benzedrine (amphetamine) and low-dose radiation, an experiment was performed on mice to ascertain whether low-dose radiation had a sensitizing effect on amphetamine toxicity. The lethality of amphetamine was significantly greater for the irradiated than the sham-irradiated group. In both groups, 89% of the deaths occurred during the first hour after injection of amphetamine. It is concluded that low-dose irradiation sensitized mice to the lethal effects of amphetamine, but the specific mode of action of amphetamine is not known.

A66-80886
THE RADIATION PROTECTING ACTION OF SODIUM 4-HYDROXYBUTYRATE AND RELATED COMPOUNDS.
H. Laborit, M. Dana, and P. Carlo (Res. Center for Physiol. and Pharmacol. Lab. of Eutonol., Paris, France).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 574–579. 11 refs.

Many substances known to protect mammals against ionizing radiation seem to act as reducing agents inhibiting the free radicals formed. Drugs to promote turnover of $NADP{\cdot}H_2$ (reduced nicotinamide-adenine dinucleotide phosphate, formed almost exclusively in the first two steps of the pentose pathway) were administered in an effort to provide protection for mice against X-irradiation. The X-ray dose reduction factor with 4-OHB (sodium-4-hydroxybutyrate) was 1.25 to 1.3. Combination of results of two experiments, one at 850 r and the other at 900 r, indicated that protection was proportional to the amount of drug administered. BL (butyrylactone-CH_2-CH_2-CH_2-$\underset{O}{\underset{|}{}}$-CO) and 6-FG(6-phosphogluconolactone) provided protective action comparable to 4-OHB, but somewhat less. Since certain alcohols have radioprotective properties, 4-OHB was compared, under identical experimental conditions, to ethyl alcohol and glycerol at the identical OH-group concentrations found in 1 g./kg. of 4-OHB; no significant protection was observed.

A66-80887
RADIOPROTECTIVE ACTION OF PROCHLORPERAZINE IN EXPERIMENTAL TOTAL BODY IRRADIATION WITH A Co^{60} SOURCE.
R. Bergonzini, L. Vendrame, D. de Maria, and M. Morini (Modena U., Inst. of Radiol., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 580–585. 6 refs.

Prochlorperazine was evaluated in mice and compared with cysteamine for radioprotective use against total-body irradiation (700–850 r from cobalt-60). With 0.5 mg. prochlorperazine, mice showed 85% survival from 700 r; but with lower doses of the drug, lethality rose again (survivals 15–35%). The drug had no significant radioprotective effect after 800 and 850 r. On the contrary, with cysteamine, even after 850 r, mortality was limited to 25%. It is suggested that cysteamine acts by blocking the free radicals produced by radiation, while prochlorperazine interferes through its gangliоplegic action with tissue metabolism, lowers oxygen consumption, and perhaps induces a cytological hypoxia.

A66-80888
RECOVERY FROM X-IRRADIATION AS PROMOTED BY THE ADMINISTRATION OF DNA.
M. Tubiana and C. Paoletti (Inst. Gustave Roussy, Villejuif, Seine, France).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 591–598. 20 refs.

The recovery effect of desoxyribonucleic acid (DNA) was studied in mice following 700 r of X-rays (whole-body exposure). AET (beta-2-isothiuronium bromide) plus thiogel, a combination to selectively protect the digestive tract, was given orally before irradiation to two groups of mice. DNA was injected intraperitoneally (1 mg./mouse) after irradiation, in one of the groups. A third group received only DNA, and a fourth group received only saline, injected intraperitoneally after irradiation. The other mice served as non-irradiated controls. In the irradiated groups, the "untreated" mice and mice treated only with DNA died within 20 days of irradiation. In the groups treated with AET plus thiogel, recovery as judged by number of leukocytes and by body weight occurred significantly earlier in the group which also received DNA. The late lethality was also slightly less in the DNA-treated group.

A66-80889
RADIOPROTECTIVE ACTIVITY OF AN ETHEROLOGUS ACCELLULAR SPLEEN EXTRACT.
V. Muto, S. Cifaldi, and P. De Franciscis (Naples U., 2nd Chair of Human Physiol., and Radiol. Inst., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 599–603. 10 refs.
Contract DA-91-591-EUC 2795.

Cell-free calf spleen homogenates were fractionated and tested in mice for radioprotective action against 600 r total-body X-irradiation (dose nearly 100% lethal). Two fraction eluted with 0.02 and 0.04 M phosphate buffer in one preparation and the fraction eluted with 0.02 M buffer in another preparation showed a striking protective action by reducing post-irradiation mortality.

A66-80890
LYSOZYME AND OTHER BASIC PROTEINS ACTING AS PROTECTORS ON THE BONE MARROW OF ANIMALS IRRADIATED AND OF ANIMALS TREATED WITH RADIOMIMETIC SUBSTANCES.
M. Teti (Catholic School of Med., Rome, and Messina U., Insts. of Med. Microbiol., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 604–615. 24 refs.

Investigations on rabbits and guinea pigs showed the value of pretreatment at low doses (10 mg./kg., twice each day for 7 days) with lysozyme and other basic proteins to protect animals either from the damage or from the cytotoxic action of cytostatic drugs. In association with Radioplex (cyclohexanol succinate), basic proteins were particularly effective. Radioplex had a clearly radiosensitizing action; used in high doses (600 mg./kg.) it caused a bone marrow maturative block both of the granuloblastic and erythroblastic series. The phenomenon did not appear when small doses were administered (200 mg./kg.) although radiosensitivity was induced. If, before radiotherapy or cytostatic treatment, basic proteins and Radioplex are administered, a protective action on the bone marrow is ensured at the same time as radiosensitization. This may allow the same cytostatic doses used in therapy to exhibit a stronger action with lesser damage (protective action of the basic proteins on the bone marrow).

A66-80891
RECOVERY EFFECT OF HIGHLY POLYMERIZED DEOXYRIBONUCLEIC ACID ON LETHALLY IRRADIATED ORGANISMS.
A. Bećarević, D. Kanazir, S. Petrović, and V. Jankovic (Boris Kidrich Inst. of Nucl. Sci., Lab. of Radiobiol., Belgrade, Yugoslavia).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 616–621. 10 refs.

The effect of highly polymerized desoxyribonucleic acid (DNA) was tested on the metabolism of nucleic acids of lethally irradiated rats. The increase of specific activity of pyrimidines of liver ribonucleic acid (RNA) obtained when DNA was injected immediately after irradiation suggests that DNA represses metabolic activity of liver RNA, or perhaps all metabolic activity of liver cells. Radiation affected the production of cytidilic acid of different RNA fractions of liver cells and the Up/Cp (2, and 3,-monophosphates of uridine and cytidine) specific activity ratio augmented after radiation. After treatment with DNA, the Up/Cp specific activity ratio was almost normal in all RNA fractions, and the specific activities of pyrimidines in all RNA fractions were lower than normal but higher than rats only irradiated. On the ninth day after irradiation, the specific activities of intestinal RNA purines in the irradiated-DNA-treated rats were almost the same as in the non-irradiated controls, while the specific activities of irradiated animals were considerably higher.

A66-80892
THE MODE OF ACTION OF BACTERIAL ENDOTOXIN AS A RADIOPROTECTIVE AGENT IN MICE EXPOSED TO LETHAL WHOLEBODY X-IRRADIATION.
R. Wilson, G. D. Ledney, and T. Matsuzawa (Notre Dame U., Lobund Lab., Ind.)
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 622–626. 11 refs.
Grant PHS RH-00239-01.

A comparative study was made of the protective action of endotoxin in germfree and conventional mice inoculated intraperitoneally with 10 μg. Escherichia coli endotoxin 24 hr. before total-body X-irradiation. In both germfree and conventional mice, the $LD_{50(30)}$ was raised about 100 r by endotoxin. Metabolically, the administration endotoxin produced a distinct reduction of blood flow, probably as a result of vasoconstriction leading to tissue hypoxia. The tissue hypoxia presumably conferred radioprotection.

A66-80893
RADIOFROTECTIVE EFFECTS AGAINST RADIATION BY NUCLEOPROTEINS OF LYOPHILIZED SPLEEN AND BONE MARROW.
G. Reggiani, G. Pipino, and A. M. Podestà (Genoa U., Inst. of Radiol. and Inst. of Clin. Surg., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 627–633. 14 refs.

Lyophilized extracts of bone marrow, spleen, and thymus gland were tested as radioprotectors against 850 r whole-body irradiation in rats. On the 60th day after panirradiation, bone marrow extracts produced 58% survival; thymus gland extracts gave 50% survival; while 67% survival was evident after administration of spleen extracts. A histological examination of the spleen of panirradiated rats which died on the 12th day following irradiation showed an almost complete disappearance of normal structure. In rats killed on the 12th day, splenic pulp with well-preserved cellular structure was seen. The spleens of panirradiated and protected rats, killed between the 30th and 60th day, showed progressive cellular repopulation according to the length of time after irradiation, with complete restoration of the splenic cells between the 50th and 60th day. The protected rats never presented any disorder or disturbance of the digestive system. In a supplementary investigation, the administration of extracts plus desoxyribonuclease produced essentially the same results as extracts alone.

A66-80894
PROTECTIVE AND THERAPEUTIC ACTION OF DPN.
L. Oliva (Siena U., School of Med., Dept. of Radiol., Italy).
(First Intern. Symp. on Radiosensitizers and Radioprotective Drugs, Milan, 1964).
Progress in Biochemical Pharmacology, vol. 1, 1965, p. 651–655. 7 refs.

Diphosphopyridine nucleotide (DPN) served as a radioprotector in rats against 800 r total-body irradiation whether administered before or following irradiation, but slightly better results were obtained when DPN was given following irradiation. The survival percentage increased with increased dosage. Even in animals which died in spite of DPN treatment, the survival time was almost twice as long as that of the controls. DPN treatment was also effective in treating radiation sickness already present in humans and in producing a beneficial effect on radiation sickness when administered with X-ray therapy.

A66-80895
RESPONSE OF THE PULMONARY VASCULATURE TO HYPOXIA AND H^+ ION CONCENTRATION CHANGES.
Abraham M. Rudolph and Stanley Yuan (Albert Einstein Coll. of Med., Dept. of Pediat., New York, N. Y.)
Journal of Clinical Investigation, vol. 45, Mar. 1966, p. 399–411. 24 refs.
Grant PHS HTS5532 and HE08378 and Contract City of N. Y. 1-210; and Westchester Heart Assoc. supported research.

The pulmonary vascular responses to variations in blood oxygen tension (P_{O_2}) and hydrogen ion concentration (pH) levels were studied in the newborn calf by means of an electromagnetic flowmeter. When arterial P_{O_2} was 100 mm. Hg or above, reduction of pH below 7.30 resulted in a small increase in pulmonary vascular resistance. A progressive and more dramatic increase in vascular resistance occurred as pH dropped to lower levels. At normal levels of blood pH (above 7.35) reduction of arterial P_{O_2} produced by inhalation of low oxygen gas mixtures resulted in minimal increases in pulmonary vascular resistance when arterial P_{O_2} fell to 18–20 mm. Hg. When pH was lowered, reduction of P_{O_2} produced an increase of pulmonary vascular resistance which was of significant degree when P_{O_2} fell below about 50 mm. Hg. Further reductions of P_{O_2} resulted in very marked increases in pulmonary vascular resistance. A curvilinear relationship between pulmonary vascular resistance and P_{O_2} was established, with extreme sensitivity of pulmonary vascular resistance to P_{O_2} changes in the range 18–20 mm. Hg. The lower was the pH, the greater was the pulmonary vascular resistance response to P_{O_2} reduction.

A66-80896
UNUSUAL ABDOMINAL INJURIES DUE TO SEAT BELTS.
Roy Gerritsen, Alfred S. Frobese, and Pio J. Pezzi (Abington Mem. Hosp., Pa.)
Journal of the Albert Einstein Medical Center, vol. 14, Jan. 1966, p. 63–66. 6 refs.

Two patients suffered similar abdominal injuries in the same accident probably due to loosely-tied seat belts. Both sustained contusions of the lower abdominal wall, small bowel, and mesenteries. Mesenteric lacerations with associated acute severe blood loss were also present. The mechanisms possibly involved in intra-abdominal injury caused by shearing stress and compression exerted by the lap-type seat belt are reviewed. Caution is advised in attributing the symptoms or signs in the abdomen to contusion of the abdominal wall alone. Had the patients not been wearing seat belts, they readily would have been killed by being thrown out through the vehicle's doors.

A66-80897
HUMAN REACTIONS TO EXTREME ENVIRONMENTAL STRESS.
Frederick Hocking (Monash U., Dept. of Med., Victoria, Australia).
Medical Journal of Australia, vol. 2, Sep. 18, 1965, p. 477–483. 67 refs.
Myer Found. and Felton Bequest supported research.

The psychological effects of undernutrition are reviewed. Semi-starvation for an extended period is known to produce apathy, depression, irritability, emotional instability, and impairment of concentration and memory. It is probable that it also sensitizes individuals to the effects of other types of stress, such as social isolation, sensory deprivation, natural disasters, and war. Extreme stress may result in permanent psychological disability, and pre-existing personality characteristics may do no more than determine how long an individual can withstand prolonged extreme stress.

A66-80898
A STUDY OF UNIALGAL CULTURES OF SCENEDESMUS INCUBATED IN NATURE AND IN THE LABORATORY.
Francis R. Trainor (Conn. U., Dept. of Botany, Storrs).
Canadian Journal of Botany, vol. 43, Jun. 1965, p. 701–706. 10 refs.
Grant NSF GB 1856.

Two Scenedesmus species were studied in culture in the laboratory and incubated in a pond in nature. When the organisms were suspended in sterile Büchner funnels or dialysis sacs in nature, results were similar to those obtained in the laboratory. In nature, there was suppression of spine production in one species; similar results were obtained with older laboratory cultures. With the second species of Scenedesmus, unicells were commonly produced in nature, as well as in several media in the laboratory.

A66-80899
CATECHOLAMINES IN TISSUE OF GUINEA PIGS SUBJECTED TO HYPOXIA.
A. Richtarik, H. Hift, and E. Valdivia (Wis. U., Med. School, Dept. of Med. and Dept. of Pathol., Madison).
Archives internationales de Pharmacodynamie et de Thérapie, vol. 159, Jan. 1966, p. 44–47. 21 refs.
Grant NIH HE-06523.

Norepinephrine and epinephrine determinations were made in tissues of guinea pig controls and in animals exposed to high altitude stress. Changes in catecholamines were noted, but significant increases were found only in the left ventricle and kidney. This pathophysiologic response was the result of the acute hypoxia to which the animals had been subjected.

A66-80900
EFFECT OF POSTURE ON NORMAL ARTERIAL BLOOD GAS TENSIONS IN THE AGED.
Richard J. Ward, Andrew G. Tolas, Ronald J. Benveniste, John M. Hansen, and John J. Bonica (Wash. U., Schools of Med. and Dentistry, Depts. of Anesthesiol. and Oral Surg., Seattle).
Geriatrics, vol. 21, Feb. 1966, p. 139–143. 16 refs.
Contract DA-49-193-MD-2231.

Alterations of blood gas tensions due to the age or posture of the subjects have not been described quantitatively. On a study of 100 patients over the age of 60, 50 in the sitting posture and 50 in the supine posture, the following values were obtained: sitting—PaO_2 85 mm. Hg, $PaCO_2$ 37 mm. Hg, pH 7.35; supine—PaO_2 77 mm. Hg, $PaCO_2$ 34 mm. Hg, pH 7.38. These are statistically significant differences. It has also been shown that the over-60 age group shows a lower PaO_2, $PaCO_2$, and pH than does the young adult population that was used to establish the presently accepted average values.

A66-80901
THE EFFECT OF ETHYL ALCOHOL ON MAN'S ELECTROENCEPHALOGRAPHIC SLEEP CYCLE.
Richard B. Yules, Daniel X. Freedman, and Kenneth A. Chandler (Yale U., School of Med., New Haven, Conn.)
Electroencephalography and Clinical Neurophysiology, vol. 20, Feb. 1966, p. 109–111. 7 refs.
Grants PHS MH 07075 and K3-16566.

One g. ethyl alcohol per kg. of body weight administered before sleep exerted a systematic effect on electroencephalographic sleep patterns. In three human subjects over 13 consecutive nights (four control, five alcohol, and four recovery nights), the most consistent pattern of change from night to night was seen in stage I rapid eye movement (REM). On the first night of alcohol, the mean REM time dropped from the mean control value; over the next four consecutive nights on alcohol mean REM time increased steadily to a peak value on the fifth night. In four recovery nights, REM time dropped back to control levels. Latency or time to the first REM was constant in control and post-alcohol nights but varied unsystematically during nights of alcohol administration. Stages III and IV remained constant while stage II "absorbed" the shift demonstrated in stage I.

A66-80902
REPETITIVE AUDITORY STIMULI AND THE DEVELOPMENT OF SLEEP.
Barbara Tizard (Inst. of Psychiat., Dept. of Exptl. Neurol., London, Great Britain).
Electroencephalography and Clinical Neurophysiology, vol. 20, Feb. 1966, p. 112–121. 11 refs.

A comparison was made of the amount of sleep recorded during periods of auditory stimulation and during a control period to see whether this amount was affected by instructions to ignore or to pay attention to the stimuli. Two different intensities of sound were used during the two experimental sessions, a week apart. Sleep was assessed from the electroencephalographic record and skin potential changes were also recorded. There was no significant difference between the amount of sleep and the number of spontaneous changes of skin potential recorded during control and "ignore sound" periods. Significantly less sleep was recorded during "attend to sound" periods, and there were significantly more spontaneous changes in skin potential. Intensity of sound was not a significant variable, but there was a large increase in the amount of sleep recorded in the second week.

A66-80903
EVOKED CHANGES IN EEG AND ELECTRODERMAL ACTIVITY DURING THE WAKING AND SLEEPING STATES.
Barbara Tizard (Maudsley Hosp., Inst. of Psychiat., Dept. of Exptl. Neurol., Denmark Hill, London, Great Britain).
Electroencephalography and Clinical Neurophysiology, vol. 20, Feb. 1966, p. 122–129. 14 refs.

Electroencephalographic (EEG) and skin potential responses to repeated auditory stimuli of two different intensities were studied. Significantly more evoked skin potential changes occurred in the "attend to sound" periods than in the "ignore sound" periods, but this variable did not affect the rate of habituation. Transient EEG responses such as V waves and K complexes did not habituate and their number was not affected by instructions to the subject, although significantly more occurred when the stimulus was loud. There was a tendency for changes in EEG activity to increase in number during the experimental period. There was a significant correlation, positive or negative, between the number of responses recorded and the degree of drowsiness at the time, as assessed by the amount of 4–7 c./sec. activity. There was also a significant association between the frequency with which responses were evoked and the stage of sleep obtaining at the time.

A66-80904
COMPARISON OF THE ROLES OF THE SUBTHALAMUS AND OF VARIOUS BULBO-MESENCEPHALIC STRUCTURES IN THE MAINTENANCE OF VIGILANCE [COMPARAISON ENTRE LE ROLE DU SUBTHALAMUS ET CELUI DES DIFFERENTES STRUCTURES BULBOMESENCEPHALIQUES DANS LE MAINTIEN DE LA VIGILANCE].
R. Naquet, M. Denavit, and D. Albe-Fessard (Centres Nerveux, Lab. de Physiol., Paris, France).
Electroencephalography and Clinical Neurophysiology, vol. 20, Feb. 1966, p. 149–164. 29 refs. In French.
Grant AF-EOAR-63-13.

During localized cooling of different levels of the brainstem of cats, electroencephalogram, electromyogram, electrocardiogram, and arterial pressure recordings were made. Depending on the region cooled, and the temperature to which it was cooled, cortical activities were either slowed or accelerated. If the temperature of the cooling probe did not fall below + 5° C., the most constant effects were the slowing of cortical activity and behavioral sleep. Cooling of the mesencephalic reticular formation to the same temperature produced some cortical acceleration and behavioral arousal. Cooling of the subthalamus from –5° to –50° C. produced a slowing down of cortical activity. For all temperatures below –5° C., cooling of the bulbar level evoked cortical as well as behavioral arousal. The role of the subthalamus in wakefulness, as well as those of mesencephalic and bulbar reticular formations, are discussed.

A66-80905
SPECTRAL COMPONENTS IN PREPYRIFORM ELECTRICAL ACTIVITY AND CHANGES AT HIGH ALTITUDE.
D. E. Woolley, B. A. Barron, and P. S. Timiras (Calif. U., Dept. of Physiol., Berkeley).
Electroencephalography and Clinical Neurophysiology, vol. 20, Feb. 1966, p. 175–180. 9 refs.
Grant NIH GM-09267.

Spectral analysis of spontaneous electrical activity (SEA) and of the averaged evoked potentials (AEP) of the prepyriform cortex was performed in awake, unrestrained rats chronically implanted with electrodes in the lateral olfactory tract (LOT) for stimulation and in the prepyriform cortex for recording. Similar spectral components were found in both SEA and AEP. Three principal components in SEA spectra, in order of frequency of occurrence, appeared in the 35–55, 1–5, and 15–20 c./sec. frequency ranges. At low intensity stimulation of the LOT, the major peak in spectra of the AEP also occurred in the 35–55 c./sec. frequency range. With increasing intensity of stimulation, the principal component of AEP spectra increased in amplitude and shifted to 15–20 c./sec. Exposure to simulated 18,000-ft. altitude for two hours markedly decreased the amplitude of the fastest waves and waves of intermediate frequency. The lowest frequency was either changed very little or increased in SEA spectra. Simulated altitude decreased the amplitude and frequency of the highest frequency component in AEP spectra. Exposure to 12,500 ft. decreased the frequency, but not the amplitude, of the AEP spectra.

A66-80906
CARDIOVASCULAR EFFECTS OF CHANGE OF POSTURE.
Richard J. Ward, Fred Danziger, John J. Bonica, Gerald D. Allen, and Andrew G. Tolas (Wash. U., Schools of Med. and Dentistry, Depts. of Anesthesiol. and Oral Surg., Seattle).
Aerospace Medicine, vol. 37, Mar. 1966, p. 257–259. 7 refs.
Contract DA-49-193-MD-2231.

Twenty healthy subjects were studied while supine, standing, and sitting. Cardiovascular parameters investigated include continuous arterial blood pressure, cardiac rate measurements, cardiac output, stroke volume, and total peripheral resistance determinations performed while supine, and five minutes after the subjects changed from supine to standing and supine to sitting. Standing caused peripheral pooling of blood, a stroke volume decrease of 45%, a cardiac output decrease of 27%, and an increase of cardiac rate, mean arterial pressure, and total peripheral resistance. Postural change from supine to sitting caused half as much peripheral pooling as the change from supine to standing. Stroke volume was reduced 20%, but an 18% increase in cardiac rate reduced the cardiac output fall to only 10%. Mean arterial pressure did not change. Four of the twenty subjects fainted while standing. All showed mean arterial pressure decrease. Three of the four showed cardiac rate increases. Cardiac output measurements in two of these subjects showed no cardiac output change during faint, but a stroke volume fall which was less than the stroke volume fall of the other subjects who did not faint. It is postulated that fainting was due to a loss of total peripheral resistance plus peripheral pooling of blood, which caused an intolerable reduction in cerebral blood flow.

A66-80907
COMPARISON OF EFFECTIVENESS OF SOME ANTIMOTION SICKNESS DRUGS USING RECOMMENDED AND LARGER THAN RECOMMENDED DOSES AS TESTED IN THE SLOW ROTATION ROOM.
Charles D. Wood, Ashton Graybiel, and Robert S. Kennedy (U.S. Naval School of Aviation Med., Pensacola, Fla.)
Aerospace Medicine, vol. 37, Mar. 1966, p. 259–262. 13 refs.
NASA supported research.

In a previous study the recommended doses of some antimotion sickness drugs were tested in the slow rotation room (human centrifuge). In the present study increased doses of these same drugs were used to investigate any possible increase in efficiency. Twice the dose of hyoscine (1.2 mg.) failed to increase its effectiveness; however, when it was used in combination with d-amphetamine the total number of tolerated head movements exceeded the sum of that with these drugs when they were tested alone. A marked increase in effectiveness of d-amphetamine (20 mg.) was noted over that in the earlier study in which a dose of 10 mg. was used. Meclizine (Bonamine 150 mg.), thiethylperazine (Torecan 30 mg.), trimethobenzamide (Tigan 750 mg.), and prochlorperazine (Compazine 15 mg.) all were less effective than in the previous study when one-third of these doses was used. The combination of hyoscine and d-amphetamine was the most effective drug, followed by hyoscine, d-amphetamine, and meclizine, in that order.

A66-80908
DIURNAL CHANGES IN LIVER AND PLASMA LIPIDS OF CHOLINE-DEFICIENT RATS.
Bruno Rosenfeld and Jessie M. Lange (Toronto U., Banting and Best Dept. of Med. Res., Ontario, Canada).
Journal of Lipid Research, vol. 7, 1966, p. 10–16. 28 refs.
Nutr. Found., Inc. supported research.

Early effects of choline deficiency were studied in rats. Nonphospholipid ("neutral lipid") and phospholipid were measured in plasma and in three fractions of a liver homogenate: sediment, supernatant fraction, and "floating fat". A single choline-deficient meal caused significant aberrations from the typical diurnal changes observed in the lipid fractions of the controls. These changes occurred in the following sequence: (1) failure of phospholipid to increase, after feeding, in the sediment fraction; (2) increase of neutral lipid, compared with controls, exclusively in the floating fraction; and (3) failure of neutral lipid to return to control levels. The rate of accumulation of neutral lipid increased during the first 4 days of deficiency. The occurrence of (reduced nicotinamide-adenine dinucleotide) NADH-cytochrome c dehydrogenase in the floating fat and the absence of succinate dehydrogenase activity point to microsomal origin of the floating fat. Early effects of choline deficiency on plasma lipids were limited to phospholipid, and occurred later than changes in the liver. Plasma nonphospholipid levels were unchanged during the first 2 days; this does not support impaired secretion or transportation of glyceride as the cause of fatty liver in the early stages of choline deficiency.

A66-80909
ON THE CHANGES OF NYSTAGMUS CAUSED BY ULTRASOUND-PRODUCED FOCAL LESIONS IN THE BRAIN-STEM.
Tsuneo Sasaki (Nitigata U., School of Med., Dept. of Otolaryngol., Japan).
Acta Oto-Laryngologica, vol. 60, Nov. 1965, p. 394–406. 25 refs.

Stereotaxic localized destruction of the brain-stem in the rabbit was produced by means of focused high-intensity ultrasound and the changes of the nystagmic reaction caused by focal lesions of the brain-stem were observed. Results obtained are summarized as follows: (1) The presence of both the medial longitudinal fasciculus and ponto-mesencephalic reticular formation is of vital importance in the evocation of normal nystagmic reactions. (2) The ponto-mesencephalic reticular formation has the nystagmic controlling mechanism which produces a phasic rhythmic neural activity. The reticular formation at the level of nucleus motorius nervi trigemini plays an important role in vestibular nystagmus. The author infers that a nystagmic eliciting center is located in it. (3) Optokinetic fiber tracts have no direct connection with vestibular tracts in the brain-stem. (4) The destruction of the reticular formation just below the nucleus trochlearis causes optokinetic inversion.

A66-80910
THERMAL COMFORT IN ANTARCTICA.
D. J. Lugg (Antarctic Div., Dept. of External Affairs, Melbourne, Australia).
Medical Journal of Australia, Oct. 30, 1965, p. 746–750. 17 refs.

A study of the thermal comfort of a group of nine men in Antarctica showed that the men were comfortable at all dry-bulb temperatures between 42° F. and 81° F., but the preferred indoor temperature was 57.5° F. These results are compared with those for tropical and temperate areas. The absence of thermal discomfort and the low value of the preferred temperature were shown to be due to adjustments of clothing; this finding reflects the tendency of isolated groups to disregard conventional habits of dress. Clothing was shown to play a larger part in determining the thermal sensation than the indoor air temperature. The amount of clothing worn outdoors did not increase as winter approached, yet the men maintained a higher level of thermal comfort. A comparison of the thermal comfort and the clothing worn, both indoors and outdoors, in periods before and after midwinter strongly suggests that acclimatization to cold had occurred.

A66-80911
NYSTAGMUS INDUCED BY ELECTRIC STIMULATION OF AMPULLARY NERVES.
Bernard Cohen, Jun-Ichi Suzuki, and Morris B. Bender (Mount Sinai Hosp., Dept. of Neurol., New York City, N. Y.)
Acta Oto-Laryngologica, vol. 60, Nov. 1965, p. 422–436. 31 refs.
Grant Natl. Inst. of Neurol. Diseases and Blindness NB-00294; and Daztan and Abramson Founds. supported research.

Ampullary nerves were electrically stimulated with square waves in alert or lightly sleeping cats. This stimulus bypassed the ampullary receptor and permitted study of the response of the central vestibulo-oculomotor system to step increases in ampullary nerve frequency. In these animals such stimulation induced typical jerky nystagmus. The pattern of nystagmus was characteristic for each canal nerve stimulated. When two or more canals were simultaneously stimulated, the nystagmus from individual canals summated and nystagmus could be produced in any spatial plane. The sequence of changes in the slow phase contraction rate or amplitude of the nystagmus produced by a step increase in ampullary nerve frequency was similar to that of nystagmus produced by a step increase in angular acceleration. The electrically-induced nystagmus could also be summated with nystagmus induced by damaging the semicircular canals to slow, abolish, or reverse it. Despite differences in the types of stimulation, nystagmus induced by electrical stimulation appears to qualitatively and quantitatively resemble nystagmus induced by angular acceleration or caloric stimulation.

A66-80912
ACOUSTIC TRAUMA IN THE GUINEA PIG. I. ELECTROPHYSIOLOGY AND HISTOLOGY.
H. A. Beagley (Washington U., Scho of Med., Central Inst. for the Deaf and Dept. of Otolaryngol., St. Louis, Mo.)
Acta Oto-Laryngologica, vol. 60, Nov. 1965, p. 437–451. 13 refs.
Grants PHS NB 00966 and B 3856; and Wernher Mem. Travelling Fellowship in Otol. (Eng.) supported research.

Guinea pigs were exposed to a 500-c.p.s. tone at 128 dB. SPL (Sound Pressure Level) for 20 minutes. On the acute animals, electrophysiological recordings were taken by differential cochlear electrodes before and after exposure. The cochlear microphonic from Turn 3 showed (on average) a threshold shift of 51 dB. and reduction of maximum voltage of 12 dB., while Turn 1 showed a shift of 20 dB. and a reduction of voltage of 6 dB. Hair cell injury was proportional to the threshold shift (range 25–85 dB.), but inversely related to a split sometimes seen between the Hensen's and Deiters' cells in Turn 3. Such a split apparently protected the organ of Corti. In the recovery animals measurements were made 14 days after exposure and compared with normal values. Appreciable recovery occurred. Losses in Turn 1 were smaller but showed less recovery.

A66-80913
THE EFFERENT VESTIBULAR SYSTEM: ELECTROPHYSIOLOGICAL RESEARCH.
Oscar Sala (Padua U., Oto-rhino-laryngol. Clin., Italy).
Acta Oto-Laryngologica, supplementum 197, 1965, p. 1–34. 96 refs.

Experiments were performed to study the modifications induced by the stimulation of the efferent vestibular system (e.v.s.) on the afferent vestibular activity recorded at the level of the vestibular nerve (v.n.) and of the vestibular receptors in cats. The results lead to the conclusion that the e.v.s. is capable of performing a modulating activity on the vestibular impulses, with an excitatory and inhibitory effect, according to the functional state of the receptors. The efferent vestibular centers of the brain stem and efferent fibers reaching labyrinthine receptors are to be considered the terminal part, more peripheral and anatomically more easily demonstrable, of a specific polysynaptic system, as it was demonstrated for the olfactory and auditory efferent systems. These preliminary results permit us to consider under a new light some common observations in human pathology and constitute the physiological basis for the psychosomatic interpretation of some troubles of the labyrinthine function.

A66-80914
ACOUSTIC TRAUMA IN THE GUINEA PIG. II. ELECTRON MICROSCOPY INCLUDING THE MORPHOLOGY OF CELL JUNCTIONS IN THE ORGAN OF CORTI.
H. A. Beagley (Washington U., School of Med., Central Inst. for the Deaf and Dept. of Otolaryngol., St. Louis, Mo.)
Acta Oto-Laryngologica, vol. 60, Dec. 1965, p. 479–495. 31 refs.
Grants PH , NB 00966 and B 3856; and Wernher Mem. Travelling Fellowship in Otol. (Eng.) supported research.

Guinea pigs exposed to a pure tone of 500 cycles per second at 128 dB. Sound Pressure Level yielded no great ultrastructural changes until threshold shifts in excess of 80 dB. were encountered. Above this level gross hair cell injuries were observed. Rupture of the hair cells was apparently preceded by a progressive destruction or loss of the vesiculated membranes from beneath the plasma membrane. There was no evidence of damage to nerve tissues. Cell junctions of the organ of Corti are described. Fused junctions along the Hensen–Deiters' border appeared to have separated in animals with a low threshold shift. The functions in the reticular lamina were completely resistant.

A66-80915
A METHOD FOR THE SIMULTANEOUS MEASUREMENT OF Eh, pH AND TEMPERATURE OF THE SKIN.
Agnese M. T. Kelly (Roy. Victoria Hosp., Dept. of Dermatol., Belfast, Great Britain).
British Journal of Dermatology, vol. 77, Jun. 1965, p. 322–325. 8 refs.

A technique is described for recording simultaneously the hydrogen ion concentration (pH), oxidation-reduction potential (Eh), and temperature of the skin, in animals and man. It consists of: a direct reading pH meter, a recorder for direct Eh reading, and a thermistor. It is particularly useful in a study of these parameters in patients suffering from skin disorders.

A66-80916
SIMULTANEOUS UPTAKE AND RELEASE OF INDIVIDUAL FREE FATTY ACIDS IN HUMAN FOREARM MUSCLE DURING EXERCISE.
L. Hagenfeldt and J. Wahren (Karolinska Inst., Serafimerlasarettet, Dept. of Clin. Chem. and Dept. of Clin. Physiol., Stockholm, Sweden).
Life Sciences, vol. 5, Feb. 1966, p. 357–364. 15 refs.
Grant Statens Med. forskningsrad 19X-722-01; and Adolf Robberts fond, Svenska Läkaresällskapet supported research.

A gas chromatographic method for the separate determination of mass and specific activity of the plasma free fatty acids (FFA) palmitic, oleic, and linoleic acid was applied to the study of human forearms during work with a hand ergometer at an intensity of 10 kpm./min. There was a simultaneous uptake and release of FFA. The net uptake of linoleic acid was about half as large as that of the other two acids, but its fractional uptake was higher than the others due to its lower arterial concentration. Palmitic and oleic acid were consumed to an equal extent, in conformity with previous reports of similar turnover rates both at rest and during exercise.

A66-80917
THE ANATOMICAL INTERRELATIONSHIPS OF THE COCHLEAR NERVE FIBERS.
Isamu Sando (Mass. Eye and Ear Infirmary; and Harvard Med. School, Boston).
Acta Oto-Laryngologica, vol. 59, May 1965, p. 417–436. 25 refs.
Grant PHS NB 04953-01; and Mass. Eye and Ear Infirmary supported research.

The anatomical interrelationships of the dendritic and axonal fibers of the cochleae of cats were determined by the method of isolated surgical lesions of the Corti organ. The related dendritic and axonal units were defined by stains selective for degenerating fibers two to six weeks after injury. The twisting and bifurcations of the nerves are described. Previous studies on frequency localization within the cochlea make it possible now to predict the spatial distribution of frequency-oriented neural units in the cochlear nerve and nuclei.

A66-80918
EXISTENCE AND ACTIVITY OF THYROCALCITONINE IN MAN [EXISTENCE ET ACTIVITE DE LA THYROCALCITONINE CHEZ L'HOMME].
Gérard Milhaud, Mohsen S. Moukhtar, Jacques Bourichon, and Anne-Marie Perault (Inst. Pasteur, Lab. des Isotopes, Paris, France).
Comptes Rendus des séances de l'Académie des sciences, vol. 261, Nov. 22, 1965, p. 4513–4516. 8 refs. In French.

Thyrocalcitonin extracted from human thyroid glands was assayed in rats and monkeys; it brought about hypocalcemia and depletion of the body's calcium pool. Thyrocalcitonin from pork thyroid glands was well tolerated by humans and provoked a significant hypocalcemia (2.7 mg./l. in 30 min. and 4.0 mg./l. in 60 min.).

A66-80919
FUNCTIONAL MECHANISM OF THE LABYRINTHINE EPITHELIUM. III. CONSEQUENCES OF MY OWN THEORY, THEORETICAL AND PRACTICAL; REFUTATION OF OBJECTIONS.
S. H. Mygind. (Skovringen 7, Vedbaek, Copenhagen, Denmark).
Archives of Otolaryngology, vol. 83, Jan. 1966, p. 29–35. 59 refs.

A theory of labyrinthine structure and function is defended, which discounts the generally accepted conception that stimulation depends on a gliding of the membranes bending the sensory hairs. Based on comparative anatomy of humans and other vertebrates, it is proposed that the individual cells of each sensory vestibular epithelium give rise to individually different sensations, always in the axis of the stimulated cell and against the direction of the pressure. The theory explains known anatomical, physiological, clinical, and experimental facts and agrees closely with the principles governing the reactions of other position-regulating sense organs, including their sharply restricted stimulation areas.

A66-80920
EFFECT OF THYROCALCITONIN ON CALCIUM EXCHANGE IN RAT TISSUES.
Arthur Chausmer, Peter Weiss, and Stanley Wallach (N. Y. State U., State U.-Kings County Hosp. Med. Center, Dept. of Med., Brooklyn; and Will Rogers Hosp., Res. Inst., Saranac Lake, N. Y.)
Endocrinology, vol. 77, Dec. 1965, p. 1151–1154. 10 refs.
Grant Natl. Inst. of Arthritis and Metab. Diseases 2A-5347.

One hour tissue and cellular exchangeable pools of calcium of various soft tissues and tibial bone were measured in thyrocalcitonin-treated and control rats using Ca^{47} as a tracer. Thyrocalcitonin consistently caused a small, insignificant decrease in the exchangeable pools of pancreas, liver, kidney, skeletal muscle, and bone and a significant 30% decrease in the exchangeable pool of myocardium. These data indicate that the action of thyrocalcitonin to lower extracellular calcium concentrations is not mediated by increased soft tissue uptake of calcium. An enhanced osseous uptake of calcium also does not appear to be involved in thyrocalcitonin action.

A66-80921
THE AUDITORY FUSION FREQUENCY OF INTERMITTENT SOUNDS.
Richard A. Smiarowski and B. L. Kintz (Ohio U., Dept. of Psychol., Athens).
Journal of General Psychology, vol. 74, Jan. 1966, p. 129–143. 18 refs.
Ohio U. supported research.

Studies on the auditory fusion frequency (AFF) are reviewed along the following aspects: (1) prethreshold phases, (2) perceptual decay of loudness, (3) fusion threshold, and (4) future research. AFF may be used as an index of auditory sensitivity or as an indicator of functional status outside the auditory system, e.g., fatigue, cortical ablation, mental stress, etc.

A66-80922
THE EFFECT ON CHOICE-REACTION TIME OF STIMULUS INFORMATION VARIED INDEPENDENTLY OF TRANSMITTED INFORMATION.
I. M. Schlesinger and Rachel Melkman (Hebrew U., Dept. of Psychol., Jerusalem, Israel).
Journal of General Psychology, vol. 74, Jan. 1966, p. 165–172. 14 refs.

It was hypothesized that performance in a reaction-time task is affected not only by the amount of information transmitted but also by the perceptual task resulting from characteristics of the stimulus display. The problem of varying stimulus information independently of transmitted information without increasing the "confusability" of the stimuli was solved in the following way: subject was required to respond to either light in one set of two lights by depressing one pushbutton and to respond to either light in a second set of lights by depressing a second pushbutton. The relative frequencies with which the two lights (linked to one response) appeared varied for different experimental conditions. The following proportions were employed: 9-1, 7-3, and 5-5. Stimulus information was increased from one experimental condition to the next in the order given, whereas transmitted information was held constant for all conditions; i.e., there were always two equiprobable responses. Both reaction time and the number of errors increased with stimulus information, and reaction time was almost a perfect linear function of the amount of stimulus information.

A66-80923
DARK ADAPTATION AND INCREMENT THRESHOLD IN A ROD MONOCHROMAT.
C. B. Blakemore and W. A. H. Rushton (Cambridge U., Physiol. Lab., Great Britain).
Journal of Physiology, vol. 181, Dec. 1965, p. 612–628. 35 refs.
Grant Natl. Inst. of Neurol. Diseases and Blindness NB 03014-04.

Threshold measurements were made by a rod monochromat in various states of adaptation using various criteria for threshold. The criteria used were either the detection of 1-sec. flashes subtending an angle that ranged between 6° and 5', or the resolution of gratings of various pitches. The conditions of adaptation were either dark adaptation following exposure to a bright light that bleached about 50% of the rhodopsin, or increment threshold where the test flash fell upon a background of variable luminance. For any particular test flash used, it was possible to find the background that raised the threshold to the same value that it had at any given moment of dark adaptation. In this way a dark adaptation curve could be plotted not as log threshold against time but as log equivalent background against time. The dark adaptation curve plotted as log threshold against time has a shape that depends greatly upon the kind of test flash used, and therefore cannot represent directly the regeneration of rhodopsin. When plotted as log equivalent background against time the shape is the same no matter what kind of test is used. This, then, is the excitability measurement that is related directly to the amount of rhodopsin bleached. This confirms the conclusions of Crawford (1947), and extends them.

A66-80924
THE ROD INCREMENT THRESHOLD DURING DARK ADAPTATION IN NORMAL AND ROD MONOCHROMAT.
C. B. Blakemore and W. A. H. Rushton (Cambridge U., Physiol. Lab., Great Britain).
Journal of Physiology, vol. 181, Dec. 1965, p. 629–640. 8 refs.
Grant Natl. Inst. of Neurol. Diseases and Blindness NB 03014-04.

This paper investigates the way in which equivalent and real backgrounds combine to define the resultant threshold in a case where after bleaching the test flash falls upon a luminous background. This was investigated on the rod-monochromat over a millionfold range of rod thresholds. It was found that, independent of the criterion of threshold used, equivalent and real backgrounds added together, and the observed threshold was the increment threshold to a real background equal to that sum. The most sensitive observation in testing the additivity of real and equivalent backgrounds is when they contribute in equal parts to the total background. This was tested in the normal eye by a special arrangement. During dark adaptation, as the equivalent background decreased, the real background was also decreased so that the two remained equal. The threshold throughout had the value corresponding to the sum of these equal real and equivalent backgrounds.

A66-80925
BLEACHED RHODOPSIN AND VISUAL ADAPTATION.
W. A. H. Rushton (Cambridge U., Physiol. Lab., Great Britain).
Journal of Physiology, vol. 181, Dec. 1965, p. 645–655. 15 refs.
Grant Natl. Inst. of Neurol. Diseases and Blindness NB 03014-04.

The relation between the bleaching of rhodopsin and the rise in rod threshold is reviewed. Bleaching an area affects adaptation as though a luminous background covered the area. Bleaching an area leaves an afterimage that Barlow and Sparrock (1964) have shown has actually the brightness of the 'equivalent background'. Are bleached rods then sending signals similar to those in response to a luminous background? This attractive idea is shown to be quite wrong by using a background consisting of an array of

luminous points, and comparing the spatial interaction when this background is an after-image or external light. With real backgrounds the rise in log threshold is the log of the average background; with after-images it is average of the logs—a very different thing. The discussion leads to the following schema. A signal B, proportional to the average bleaching, regulates the gain mechanism that controls the size of the output signal V for a given light signal I. The output also feeds back and adds to B, so that the gain is controlled by (V + B). This signal, travelling also to the brain, gives rise to the sensation of brightness from light (V) and after-images (B).

A66-80926
RENAL FUNCTION DURING OXYGEN INHALATION [FUNKTSIIA POCHEK PRI INGALIATSIONNOM VVEDENII KISLORODA].
B. IA. Varshavskii (Altai Med. Inst., Dept. of Pharmacol., Altai, USSR).
Farmakologiia i Toksikologiia, vol. 28, Nov.–Dec. 1965, p. 727–730. 6 refs.
In Russian.

In normal rats and dogs oxygen intensified diuresis and at the same time increased excretion of sodium and potassium. Hypoxia provoked in rats by inhalation of air containing 0.2% carbon monoxide caused depression of diuresis and of sodium and potassium excretion. Simultaneous inhalation of oxygen helped to normalize the elimination of water and electrolytes.

A66-80927
CHANGES IN HEARING ACUITY OF NOISE-EXPOSED WOMEN.
Sidney Pell and T. H. Dickerson (E. I. du Pont de Nemours and Co., Med. Div., Wilmington, Del.)
Archives of Otolaryngology, vol. 83, Mar. 1966, p. 207–212.

Changes in hearing thresholds over an eight- to nine-year period in 422 noise-exposed women were compared with changes in 569 women with about the same age distribution who worked in relatively quiet areas. The data suggest that the exposed women suffered little or no hearing loss as a result of noise exposure during the study period. No substantial change in hearing threshold occurred in either group at 2,000, 3,000, and 4,000 c.p.s., but at 6,000 c.p.s. each group showed an average hearing loss of about 8 db., probably as a result of presbycusis and, possibly to some degree, nonoccupational noise exposure. The findings of this study should not be extrapolated beyond the time interval of the study period, nor should the findings be applied to men, because of possible sex differences in resistance to noise-induced hearing loss.

A66-80928
EYE AIMING BEHAVIOR DURING THE SOLUTION OF VISUAL PATTERNS.
Warren H. Teichner (Harvard U., Cambridge, Mass.) and Leah M. Price, (Tufts U., Medford, Mass.)
(Eastern Psychol. Assoc., Atlantic City, N. J., Apr. 1965).
Journal of Psychology, vol. 62, Jan. 1966, p. 33–38.
NASA Contract NsG-718.

Eye movements were recorded serially by a Mackworth Eye Camera in 10 subjects while they were solving problems involving letter sequences under three experimental conditions: a) unlimited time to inspect the display; b) mild speed stress—subjects were permitted only 10 sec. to view the display; c) blur with unlimited time. The results suggest a narrowed attentional field and a heightened attention to detail with slight blurring and with mild speed stress. They suggest the same process as associated with correct solutions even in absence of stress. There is also a systematic change in the problem-solving strategy from information-gathering in the early time period to memory-refreshing and verification in the later one.

A66-80929
AN EVALUATION OF HUMAN PERFORMANCE DURING EXPOSURE TO ELEVATED HEAT AND HUMIDITY.
Richard J. Ward, Eugene J. Powell, Mark H. Schorzman, and Ronald J. Benveniste (Wash. U., School of Med., Dept. of Anesthesiol., Seattle; and U. S. Army Hosp., Fort Lawton, Wash.)
Journal of Psychology, vol. 62, Jan. 1966, p. 83–87. 12 refs.

Forty-four soldiers participated in an evaluation of performance during exposure to increased heat and humidity. Determination of performance capability was made by measuring the flicker-fusion frequency (FFF) of each subject. Subjects were initially tested under comfortable environment conditions. Group I (15 subjects) and Croup II (14 subjects) were placed for three hours in a room with a temperature of 82° F. and 70% relative humidity. At the end of two hours, Group I subjects were given an unannounced difficult civics test and told that the results of the test would be important to them. At the end of the third hour, the final FFF was measured in both groups. Group III was given the same unannounced civics test, in normal environment (74° F. and 40% humidity). Group I had a mean FFF decrease of 2.03 flash per second (fps). Group II had a mean FFF decrease of 1.29 fps. Group III had a mean FFF decrease of .57 fps. It is concluded that one's mental capabilities are blunted by mental stress and hot, humid environmental conditions. This blunting exceeds that found after medication with commonly prescribed soporifics. The adverse environmental conditions themselves caused moderate depression of function. Mental stress alone caused clinically insignificant depression of function.

A66-80930
ABSORPTION AND EXCRETION OF MERCURY IN MAN. IX. PERSISTANCE OF MERCURY IN BLOOD AND URINE FOLLOWING CESSATION OF EXPOSURE.
Leonard J. Goldwater (Columbia U., School of Public Health and Admin. Med., New York, N. Y.) and Antonio Nicolau.
Archives of Environmental Health, vol. 12, Feb. 1966, p. 196–198. 8 refs.
Grant PHS OH-61.

A limited study was made of ten hatters who had been exposed to mercury for from 18 to 46 years, the exposure terminating from three to six years prior to the study. All of these hatters showed mercury in their urine or blood or both. A group of 12 co-workers with no known mercury exposure was studied for comparison. Only three of the "control" group showed mercury in their urine. The findings suggest that following occupational exposure to mercury nitrate, measurable amounts of mercury may persist in the blood and urine for as long as six years after exposure has ended.

A66-80931
VALIDITY AND RELIABILITY OF THE SAL TECHNIQUE.
George R. Simon, Jerry L. Northern, and Robert F. Balas (Veterans Admin. Hosp., Denver, Colo.)
Journal of Auditory Research, vol. 5, Oct. 1965, p. 279–284. 11 refs.

Sensorineural acuity level (SAL) scores were determined by Bekesy discrete-frequency audiometry for 20 normal ears under test-retest conditions of normal and plugged listening, the latter with the use of earplugs. Narrow bands of noise centered at each of five octaves 250–4000 c.p.s. were used for masking. SAL scores were calculated using average masked threshold rather than masking as the normative data. The SAL technique allows for valid and highly reliable determination of the sensorineural sensitivity under both listening conditions. The data support the use of the SAL test as a clinical procedure.

A66-80932
THE EFFECT OF CENTRAL MASKING ON THRESHOLD FOR SPEECH.
Frederick N. Martin, H. A. T. Bailey, Jr. and James J. Pappas (Ark. U., School of Med., Fayetteville).
Journal of Auditory Research, vol. 5, Oct. 1965, p. 293–296. 7 refs.

In ten normal-hearing subjects a threshold shift produced for cold running speech by a thermal noise in the contralateral ear was demonstrated. An appropriate correction factor of four to eight db. may be employed when SRTs are measured in the presence of contralateral masking.

A66-80933
DYNAMICS OF THE PUPIL DURING BINOCULAR RIVALRY.
Stanley W. Lowe and Kenneth N. Ogle (Mayo Clin. and Mayo Found., Sect. of Biophys.; and Mayo Graduate School of Med., Rochester, Minn.)
(Midwestern Sect. of Assoc. for Res. in Ophthalmol., Rochester, May 8, 1965 and Fourth Colloq. on Pupillography, Washington, D. C., May 11, 1965).
Archives of Ophthalmology, vol. 75, Mar. 1966, p. 395–403. 14 refs.
Grant PHS B-2003.

Dissimilar targets were presented to the two eyes to cause binocular rivalry by means of a haploscopic system which was mounted on the electronic infrared pupillograph coupled to a Visicorder. Under conditions of equal target luminances, no differential in the extent of pupillary constriction could be found when a light stimulus was presented to the fovea in the area of rivalry in the suppressed or in the perceiving eye, or as a control in a monocularly viewing eye. Without light stimulation when the targets for rivalry were unequally illuminated, a small pupillary constriction occurred whenever the perceiving image changed from the dimmer to the brighter target. The magnitude of this pupillary constriction generally increased with increase in difference between the two luminances. There were individual differences in the pattern of response, as well as differences depending on whether the perceived image shifted from the right eye to the left or from the left eye to the right. No relationship to dominance was evident from our six subjects. Several theories involving afferent fibers from the cortex to the pupillary systems are suggested in view of these results. A binocular averaging of the unequal luminances insofar as pupillary responses are concerned provides a possible explanation.

A66-80934
EFFECT OF '100%' OXYGEN BREATHING ON MIXED VENOUS OXYGEN PRESSURES.
G. J. Addis (Southern Gen. Hosp., Glasgow, Scotland).
Scottish Medical Journal, vol. 10, May 1965, p. 215–217. 16 refs.

A negligible change in the mixed venous oxygen tension and a fall in cardiac output were found in 15 normal subjects on breathing 100% oxygen. Evidence is produced from the literature to support these findings. It is suggested that a homeostatic mechanism regulates the tissue oxygen tension and causes the effects observed.

A66-80935
SOME ASPECTS OF THE CHEMICAL CONTROL OF RESPIRATION IN MAN.
J. Murray Young.
Journal of the Royal Naval Medical Service, vol. 51, Summer and Autumn 1965, p. 165–177; discussion, p. 177–178. 13 refs.

The chemical control of respiration depends upon the partial pressure of carbon dioxide and oxygen and the hydrogen ion concentration of the blood. The effects on ventilation of carbon dioxide and hydrogen ion are independent and additive but the effect of hypoxia is multiplicative. There is a linear relationship between ventilation and P_{CO_2} over the upper part of the response curve, above a threshold value of P_{CO_2}. The relationship between ventilation and the chemical stimuli over the linear part of the response curve can be described by the equation $V = D1 + A/(P_A,CO_2 - B)$. This equation and the determination of its parameters have been used to investigate the changes in ventilation that occur under various conditions such as alteration of the acid-base state of the body, alteration of body temperature, and infusion of noradrenaline. Research is in progress to determine the shape of the carbon dioxide response curve below the threshold value of P_{CO_2}, an area of importance in aviation and in the study of altitude acclimatization.

A66-80936
HUMAN ENDURANCE IN INTOLERABLE CLIMATES.
J. D. Walters.
Journal of the Royal Naval Medical Service, vol. 51, Summer and Autumn 1965, p. 208–220; discussion, p. 220–221, 10 refs.

The need for a reliable, easily calculated Index of Environmental Warmth is discussed along with a brief review of some Indices available at the present time. An experiment to determine tolerance times of men exposed to intolerably hot climates is described and the method of construction of curves enabling safe tolerance times to be predicted using a simple weighted dry bulb/set bulb Index such as the WBGT (wet bulb-globe temperature) Index as a measure of climatic severity is discussed.

A66-80937
COMPOSITION OF LIPIDS IN HUMAN SERUM AND ADIPOSE TISSUE DURING PROLONGED FEEDING OF A DIET HIGH IN UNSATURATED FAT.
Seymour Dayton, Sam Hashimoto, Wilfrid Dixon, and Morton Lee P arce (Wadsworth Hosp., Med. Serv.; Veterans Admin. Center, Domiciliary and Res. Serv.; and Calif. U., School of Med., Depts. of Med. and Prevent. Med., Los Angeles, Calif.)
Journal of Lipid Research, vol. 7, 1966, p. 103–111. 28 refs.
Grants PHS HE-04900 and FR-3 and Los Angeles County Heart Assn.241; Arthur Dodd Fuller Found. supported research.

Elderly institutionalized men were assigned at random to two groups, one of which received a conventional diet (40% fat) while the other was fed a diet in which unsaturated fat was substituted for all saturated fat. Changes in serum lipids and adipose tissue over periods up to five years are described. In control subjects, mean serum cholesterol rose 4% over the first 20 months, then fell during the next 40 months to a level 10% below the starting concentration. In the experimental group there was an immediate drop, followed by further changes roughly parallel to those in the control subjects. The mean difference between the control and experimental group was 14.0% of the starting level. Concentration of serum linoleic acid was increased, with marked increase in triglyceride. Adipose tissue linoleic acid rose in men on the experimental diet from 11% of total fatty acid at time zero to 32% at five years. The rise could be fitted to an exponential function with a half-time of 680 days. The rate of rise during the first year was correlated negatively with initial body weight and positively with weight gain; the influence of adherence to the diet was much less pronounced.

A66-80938
TOXIC EFFECTS OF NITROGEN OXIDES IN CONTINUOUS AND INTERMITTENT POISONING OF ANIMALS [TOKSICHESKII EFFEKT OKISLOV AZOTA PRI NEPRERYVNOI I PRERYVISTOI ZATRAVKE ZHIVOTNYKH].
V. P. Paribok (USSR, Acad. of Sci., Inst. of Cytol., Lab. of Radiation Cytol., Leningrad) and F. A. Ivanova (Novokuznetsk Pedagogical Inst., USSR).
Farmakologiia i Toksikologiia, vol. 28, Jul.–Aug. 1965, p. 484–488. 7 refs In Russian.

Nitrogen oxides produced in rats and mice a toxic effect, both in high (death of animals) and in low (disturbed intensity of the unconditioned reflex) concentrations. The extent of pulmonary edema and accumulation of methemoglobin became more marked with exposure to intermittent poisoning as against continuous one, provided the dosage levels of the intoxicant were similar for the whole duration of the experiment.

A66-80939
SIGNS INDICATIVE OF HYDROGEN SULFIDE POISONING FOLLOWING ITS ENTRY INTO THE ORGANISM VIA THE SKIN [POKAZATELI OTRAVLENIIA SEROVODORODOM PRI POSTUPLENII EGO V ORGANIZM CHEREZ KOZHU].
N. M. Petrun' (Kiev Inst. of Hyg. Labor and Prof. Diseases, Biochem. Lab., Kiev, UkrSSR).
Farmakologiia i Toksikologiia, vol. 28, Jul.–Aug. 1965, p. 488–490. 6 refs. In Russian.

The entrance of hydrogen sulfide into the body of the rabbit through the skin effected inhibition of the blood carboanhydrase and cholinesterase activity, reduced erythrocyte respiration rate, certain changes in the gaseous composition of the blood, and diminished hemoglobin content. In all instances the mechanism of hydrogen sulfide poisoning is the same, quite irrespective of the route of its entrance into the organism.

A66-80940
HYDROGEN SULFIDE OXIDATION WITH THE BLOOD AND TISSUES [OB OKISLENII SEROVODORODA KROVYIU I TKANIAMI].
S. P. Korochanskaia (Kuban Med. Inst., Dept. of Biochem., Krasnodar, USSR).
Farmakologiia i Toksikologiia, vol. 28, Jul.–Aug. 1965, p. 490–492. 7 refs. In Russian.

Experiments made on rabbits demonstrated that after introduction of hydrogen sulfide its bulk accumulates in the liver, with a smaller proportion gaining access to the kidneys and lungs. The ability of the blood to oxidize H_2S is low.

A66-80941
BIOPHYSICAL ANALYSIS OF THE PRIMARY BIOLOGICAL EFFECT OF RADIATION [BIOFIZICHESKII ANALIZ PERVICHNOGO BIOLOGICHESKOGO DEISTVIIA RADIATSII].
N. V. Luchnik (USSR, Acad. of Med. Sci., Inst. of Med. Radiol., Obninsk, USSR).
Vestnik Akademii Meditsinskikh Nauk SSSR, no. 9, 1965, p. 14–18. 19 refs. In Russian.

The paper presents a brief essay on the present-day situation with regard to the issue of primary mechanisms underlying the biological action of radiation. New data on the nature of primary chromosome injuries, on injuries of the DNA molecules, and on the significance of free-radicals mechanisms are cited. The obtained results are discussed from the standpoint of their significance for certain problems of radiobiology and medical radiology.

A66-80942
DISTRIBUTION OF BARBITURATES IN THE ORGANISM UNDER CONDITIONS OF ARTIFICIAL HYPOTHERMIA [O RASPREDELENII BARBITURATOV V ORGANIZME V USLOVIIAKH ISKUSSTVENNOI GIPOTERMII].
L. B. Nurmand, S. G. Pervik, and R. A. Piarna (Tartu State U., Dept. of Pharmacol., USSR).
Farmakologiia i Toksikologiia, vol. 28, Sep.–Oct. 1965, p. 534–535. 9 refs. In Russian.

In hypothermia the penetration of thiopental into the fatty tissue of rats was retarded, while that of amytal sodium remained unchanged. The entrance of thiopental and amytal sodium into other tissues of the organism showed no essential changes. In hypothermia the destruction of both barbiturates in the organism was retarded.

A66-80943
SOME PROPERTIES OF THE BLOOD IN ANIMALS PROTECTED FROM IONIZING RADIATION BY CYSTEINAMINE [O NEKOTORYKH SVOISTVAKH KROVI ZHIVOTNYKH, ZASHCHISHCHENNYKH OT IONIZIRUIUSHCHEI RADIATSII TSISTAMINOM].
R. B. Strelkov and L. M. Topchiian (USSR, Acad. of Med. Sci., Inst. of Exptl. Pathol. and Therapy, Lab. of Radiol., Sukhumi).
Farmakologiia i Toksikologiia, vol. 28, Sep.–Oct. 1965, p. 558–561. 12 refs. In Russian.

Bacq's hypothesis on the action of 2-aminoethanethiol (cysteinamine disulfide), as a stimulator for the secretion of histamine and histamine-like substances into the blood, was tested. The blood of animals protected by cysteinamine and that of control animals was studied with respect to effectiveness on isolated guinea pig intestine (according to Magnus). A conclusion is drawn that, following administration of cysteinamine, no changes occur in the concentration of histamine and histamine-like substances in blood. Consequently, the hypothesis of the mode of action of cysteinamine as a stimulator for the secretion into the blood of histamine-like substances finds no experimental confirmation.

A66-80944
OXYGEN POTENTIAL IN THE BRAIN TISSUE OF RATS UNDER THE EFFECT OF TRANSVERSELY DIRECTED ACCELERATIONS [NAPRUZHENIIA KISNIU V TKANYNI MOZKU BILYKH SHCHURIV PID VPLYVOM POPERECHNO SPRIAMOVANYKH PRYSKORENY].
I. F. Sokolianskyi (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Kiev).
Fiziolohichnyi Zhurnal, vol. 11, Nov.–Dec. 1965, p. 743–747. 27 refs. In Ukrainian.

Radial acceleration of ten units caused a 7.6% decrease in oxygen tension of brain tissue in rats. Acceleration of twenty units caused a decrease of 17.2% and a decrease in respiration. Thirty to forty units produced a disturbance in respiration, from shallow and fast at the beginning of the experiment,

to deep and slow, and ending with depression. In this case the oxygen tension in the brain tissue decreased by 26.2–32.4%. These results indicate progressive development of hypoxia during increased radial acceleration.

A66-80945
EFFECT OF ADRENALECTOMY ON THE PROTEIN COMPOSITION OF THE SERUM IN DOGS AFTER PHYSICAL WORK [VPLIV ADRENALEKTOMII NA BILKOVYI SKLAD SYROVATKY KROVI U SOBAK PISLIA FIZYCHNOGO NAVANTAZHENNIA].
T. K. Valueva, and H. H. Filipova (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Kiev).
Fiziolochichnyi Zhurnal, vol. 11, Nov.–Dec. 1965, p. 761–766. 25 refs. In Ukrainian.

Injections of cortisone and desoxycorticosterone acetate (DOCA) after bilateral adrenalectomy helped to maintain the normal level of blood serum proteins after physical exercise in dogs. Injections of DOCA alone caused an increase in the albumin–globulin ratio. Omission of the substitute therapy caused a slight increase in total proteins and albumin–globulin ratio. In some cases a reverse effect was noted.

A66-80946
A COMPARISON OF TWO TYPES OF EXTINCTION FOLLOWING FIXED-RATIO TRAINING.
Norman W. Weissman and Edward K. Crossman (NASA, Ames Res. Center, Moffett Field, Calif.)
Journal of the Experimental Analysis of Behavior, vol. 9, Jan. 1966, p. 41–46. 13 refs.

Five groups of pigeons were food reinforced on various schedules. Half of each group were extinguished in the normal manner; the others were presented with a stimulus change, previously paired with reinforcement, each time they completed their respective fixed ratios (FR). Response rate in training was an increasing negatively accelerated function of the FR. Increasing the FR produced transitory rate changes, the amount of which yielded a quantitative index of ratio strain. Cumulative records of extinction performance revealed that the stimulus change exerted discriminative control by maintaining the cohesiveness of FR response units. Nevertheless, neither the absolute number of extinction responses nor extinction response units differed appreciably for the two extinction procedures.

A66-80947
INFERENCES ABOUT VISUAL MECHANISMS FROM MONOCULAR DEPTH EFFECTS.
Fred Attneave and Richard K. Olson (Ore. U., Eugene and Portland).
Psychonomic Science, vol. 4, Feb. 5, 1966, p. 133–134.
Grant AFOSR 973-66.

Two depth "cues", radial patterning and relative length, were presented in sufficiently pure form to permit inferences about underlying data-processing operations. In 18 observers, the former property yielded a strong depth impression, the latter a weaker one. Depth effects from dot patterns were dependent on perceptual grouping of dots into radial lines.

A66-80948
VIBROTACTILE SENSITIVITY AND THE FREQUENCY RESPONSE OF THE PACINIAN CORPUSCLE.
Ronald T. Verrillo (Syracuse U., N. Y.).
Psychonomic Science, vol. 4, Feb. 5, 1966, p. 135–136. 12 refs.
NIH supported research.

Threshold responses to vibratory stimuli are compared for psychophysical and electrophysiological experiments. There is a striking similarity between the two sets of data. The hypothesis that a duplex mechanism for taction is supported and there is compelling evidence that the Pacinian corpuscle is the neural transducer of vibratory stimuli.

A66-80949
EFFECTS OF LEADERSHIP STYLE UPON GROUP PERFORMANCE AS A FUNCTION OF TASK STRUCTURE.
Marvin E. Shaw and J. Michael Blum (Fla. U., Gainesville).
Journal of Personality and Social Psychology, vol. 3, Feb. 1966, p. 238–242. 10 refs.
Contracts ONR 170-266 and Nonr-580(11).

Fiedler's contingency model (1964) holds that directive leadership is more effective when the group-task situation is either highly favorable or highly unfavorable for the leader, whereas nondirective leadership is more effective in the intermediate ranges of favorability. An experiment was conducted to test the generality of this hypothesis. Five-person groups attempted three tasks under either directive or nondirective leadership. Leadership behavior was manipulated by instructions. The three tasks were selected to vary along the solution multiplicity dimension, hence presumed to reflect different levels of favorability for the leader. The results indicated that the directive leader was more effective than the nondirective leader only when the group-task situation was highly favorable for the leader, thus only partially supporting the hypothesis.

A66-80950
CHORIORETINAL LESIONS PRODUCED BY LASER ON MONKEYS AND RABBITS.
Raul Santos, and Sadi de Buen (Mex. U. Med. School, Dept. of Histol. and Mex. Registry of Pathol., Mexico City), and Robert K. Abraham (Calif. Coll. of Med., Dept. of Surg., Ophthalmol. Sect., Los Angeles).
American Journal of Ophthalmology, vol. 61, Feb. 1966, p. 230–240.
Optica Lux and David Michael Eye Found. supported research.

A ruby laser with a direct ophthalmoscope head was used to produce chorioretinal lesions in 10 monkeys and 50 rabbits. The energy output varied from 0.01 to 0.03 joule. The beam divergence changed from 4.5 to 90 milliradians. The chorioretinal lesions obtained in monkeys showed a variety of intensities and a close similarity to the reactions of human eyes. By controlling the energy output and divergence, it was possible to obtain clinically useful lesions. Histologic study showed chorioretinal adhesion with no disturbance of the vitreous in lesions of medium intensity. Rabbit eyes proved more sensitive; threshold intensities always produced chorioretinal lesions. Alteration of the pigment epithelium was a constant finding in all cases. The characteristics of the lesion were those of a thermal burn. It was not possible to prove any other effect, as has been suggested for high energy lasers. Long-range studies are required to rule out late effects. In the selected human cases of retinal detachment treated, a follow-up of four months showed that satisfactory results were obtained.

A66-80951
RELATIONSHIPS BETWEEN FLICKER-FUSION THRESHOLD AND TWO PARAMETERS OF VISUAL MOTION AFTER-EFFECT.
Ingmar Dureman (Uppsala U., Psychol. Lab., Sweden).
Scandinavian Journal of Psychology, vol. 6, 1965, p. 254–256.
Swed. Med. Res. Council supported research.

Four separate studies were conducted which yielded correlations between normal baseline values for critical flicker fusion (CFF) and the duration and velocity of the visual motion after-effects (VMAE). Motion after-effect was induced by rotation of a black and white Archimedes spiral for 30 seconds. The first group included 21 subjects, the second group had 14 subjects, and groups 3 and 4 consisted of 12 subjects each. A functional relationship was confirmed between CFF threshold on one hand and the two parameters of the VMAE. There was a low correlation between the apparent duration and velocity of VMAE.

A66-80952
ADAPTATION EFFECTS AND AFTER EFFECTS OF MOVING PATTERNS VIEWED IN THE PERIPHERY OF THE VISUAL FIELD.
Ronald L. Cohen (Uppsala U., Psychol. Lab., Sweden).
Scandinavian Journal of Psychology, vol. 6, 1965, p. 257–264. 7 refs.

Different patterns of figures moving behind a window were viewed by subjects while fixating a point 8.5–11° visual angle NW of the display. With prolonged viewing and small figures, the motion appeared to stop completely. With moving figures which stretched the whole way across the field, perpendicular to the direction of motion, a pulsating or wave motion was experienced. A reduction in the number of moving figures was also reported with all the patterns. When the stimulus motion was stopped, the expected after effect of motion in the opposite direction was usually experienced, although in many cases the stopping of the stimulus motion led to an immediate disappearance of the stimulus figures.

A66-80953
CHANGES OF GLUTAMINE, GLUTAMIC ACID AND GABA IN CORTICAL AND SUBCORTICAL BRAIN STRUCTURES OF HIBERNATING AND FULLY AROUSED GROUND SQUIRRELS (CITELLUS CITELLUS).
L. T. Mihailović, L. Križalic, and D. Cupić (Belgrade U., Fac. of Med., Inst. of Pathol. Physiol., Yugoslavia).
Experientia, vol. 21, Dec. 15, 1965, p. 709–710. 5 refs.
Med. Res. Found. of S. R. Srbija supported research.

Changes in the cerebral content of glutamine, glutamic acid, and GABA (gamma-aminobutyric acid) were measured in ground squirrels during hibernation and after arousal. During hibernation, GABA increased significantly in the hypothalamus (28.4%), thalamus (25.1%), and the frontal cortex (23.8%). This was associated with an equally significant decrease of glutamic acid in the frontal cortex, caudate nucleus, and hypothalamus. Arousal produced a remarkable decrease of GABA in the hypothalamus (13.9%) and caudate nucleus (22.1%), a return to control levels in the thalamus and frontal cortex, and a highly significant increase in the pons (31.5%) and spinal cord (22.1%). Glutamic acid content increased in the pons and spinal cord, decreased in the caudate nucleus, and remained at levels determined in hibernation at 5° C. for all other cerebral regions. Glutamine was practically unchanged throughout.

A66-80954
THE ACTION OF ADRENERGIC BETA-RECEPTOR BLOCKING AGENTS ON SUSCEPTIBILITY TO CARDIAC ARRHYTHMIAS IN HYPOTHERMIA AND HYPOXIA.
L. Szekeres, J. Papp, and W. Forster (Pécs U. Med. School, Dept. of Pharmacol., Hungary; and Magdeburg, U. Med. School, Dept. of Pharmacol., East Germany).
Experientia, vol. 21, Dec. 15, 1965, p. 720–722. 9 refs.

When five adrenergic beta-receptor blocking sympatholytics (dichloroisoproterenol, Alderline, Inderal, and two new compounds) were tested on the increased tendency to arrythmia due to hypothermia and hypoxia in cats, the sympatholytics proved to be useful in preventing hypothermic and hypoxic increase of susceptibility to arrythmias.

A66-80955
EFFECTS OF FREQUENCY OF KNOWLEDGE OF RESULTS.
Edgar M. Johnson and M. Carr Payne, Jr. (Ga. Inst. of Technol., Atlanta).
Journal of Applied Psychology, vol. 50, Feb. 1966, p. 33–34. 13 refs.

For an hr. subjects observed an oscilloscope on which eight signals appeared per 15 mins. which they were to report. Knowledge of results (KR) was given after 0%, 25%, 50%, 75%, or 100% of the signals. Significant differences occurred between the number of targets detected by the 0% and 25% groups, the 25% and 50% groups, but none between the 50%, 75%, and 100% groups. The vigilance decrement was not significantly affected by frequency of KR.

A66-80956
EFFECTS OF DISCRETE TRANSFORMATIONS ON CONTROLLER OUTPUTS ON HUMAN TRACKING PERFORMANCE.
Darwin P. Hunt (Dayton U., Ohio).
Journal of Applied Psychology, Vol. 50, Feb. 1966, p. 35–40. 9 refs.
Contract AF-33(616)-7863.

Four groups of 8 subjects each performed a compensatory tracking task using an acceleration control system. Each group employed a different controller output transformation: 3-, 5-, 7-category, or continuous. Each subjects used 4 gain (G) levels. Both tracking accuracy and economy were measured. The number of output categories (C) significantly affected the economy ($p < .05$) but not the accuracy of performance. The G effects were significant for both accuracy ($p < .001$) and economy ($p < .001$). Accuracy improved and economy decreased monotonically over the lower 3 gains so that there was a accuracy and economy were degraded. Although inspection of the accuracy data suggests that as the number of output categories increases the optimal gain becomes higher, the G X C interaction was not significant.

A66-80957
EFFECTS OF BODY AND HAND COOLING ON COMPLEX MANUAL PERFORMANCE.
John M. Lockhart (U. S. Army Natick Labs., Pioneering Res. Div., Natick, Mass.)
Journal of Applied Psychology, vol. 50, Feb. 1966, p. 57–59.

Twelve United States Army enlisted men were tested on 3 manual tasks, knot-typing (KT), block-stringing (BS), and block-packing (BP), under 4 conditions: (a) Control-Mean Weighted Skin Temperature (MWST) 90.0° F., Hand Skin Temperature (HST) 93.0° F., (b) Cold Body-MWST 69.0° F., HST 90.4° F., (c) Cold Hand-MWST 85.8° F., HST 45.7° F., and (d) Cold Hand-Body-MWST 68.5° F., HST 45.8° F. The 3 cooling conditions had a differential effect across the 3 tasks. Cold Body was the only condition that did not result in significant decrements for all tasks. Knot-typing was unaffected by body cooling. The results are interpreted in terms of the differential effect of cooling the hand or body upon various aspects of complex manual performance.

A66-80958
INFLUENCE OF DISPLAY, RESPONSE, AND RESPONSE SET FACTORS UPON THE STORAGE OF SPATIAL INFORMATION IN COMPLEX DISPLAYS.
William C. Howell and Jerry D. Tate (Ohio State U., Columbus).
Journal of Applied Psychology, vol. 50, Feb. 1966, p. 73–80. 16 refs.
Contract AF 30(602)-3066.

Immediate recall for spatial information was studied as a function of stimulus load under two display formats, two response formats, and two response set conditions. Four groups of ten subjects each served under 15 replications of all response-format, stimulus-load conditions; groups were distinguished on the basis of display format and set. Each subject viewed either a spatial or tabular display of 14–26 geometrical stimuli for 16 sec.; he was then required to report—on either a tabular or spatial response form—the location of relevant stimuli. Correct responses and misplacement errors increased more rapidly for the spatial format as more stimuli were presented. Recoding from one display to the other response format did not yield serious decrements. Contrary to expectation, response set enhanced all conditions to a nearly equivalent degree. Results are interpreted in terms of the "chunking" hypothesis.

A66-80959
VESTIBULAR ASYMMETRIES IN RIGHT- AND LEFT-HANDED PEOPLE.
Bosko Milojevic and John L. Watson (Iowa State U., Coll. of Med., Dept. of Otolaryngol. and Maxillofacial Surg., Iowa City).
Acta Oto-Laryngologica, vol. 60, Oct. 1965, p. 322–330. 22 refs.
Grants PHS 2B-5282 and B-2779.

It was hypothesized that handedness may influence vestibulo-spinal and vestibulo-ocular reflexes. To investigate this hypothesis, 30 normal subjects (15 predominantly right-handed and 15 predominantly left-handed) were examined. The tests included were the walking test, stepping test, Romberg, Mann, caloric test and galvanic test. Nystagmus was registered by electronystagmography. Results of the walking and stepping tests showed that handedness did affect test results. The great majority of right-handed people deviated to the right and left-handed to the left when performing the walking and stepping tests. Comparison of the caloric test results between the two groups revealed no significant differences. There was, however, a directional preponderance noted in many subjects in both groups. This directional preponderance was to the left in all cases, and is in accordance with the reports of other investigators. It is suggested that this phenomenon may need to be taken into consideration in electronystagmography. The galvanic test was within normal limits, and no difference was found between right- and left-handed subjects.

A66-80960
ON THE INFLUENCE OF LINEAR ACCELERATION ON OPTOKINETIC NYSTAGMUS.
Val. B. Veenhof (Amsterdam U., Wilhelmina Gasthuis, E. N. T. Dept., The Netherlands).
Acta Oto-Laryngologica, vol. 60, Oct. 1965, p. 339–346. 33 refs.

Rabbits showed a strong enhancement of the number of nystagmus beats if a linear acceleration was combined with optokinetic stimulation. A parallel swing provoked the linear accelerations. On this apparatus the rabbit in prone position was submitted to optokinetic stimulation. Another phenomenon recorded in the experiments was the appearance of nystagmus in a situation where optokinetic stimulation normally fails to provoke nystagmus. Nystagmus was found when one eye was covered and the other was subjected to optokinetic stimulation from nasal to temporal and simultaneously linear acceleration was given. The nystagmus frequency in those cases was the same as in the cases in which the stripes were running in the opposite direction.

A66-80961
LASER AND THE LABYRINTH: SOME PRELIMINARY EXPERIMENTS ON PIGEONS.
J. Stahle and L. Högberg (Uppsala U., Dept. of Otolaryngol. and Dept. of Phys., Sweden).
Acta Oto-Laryngologica, vol. 60, Oct. 1965, p. 367–374. 19 refs.

The inner ears of pigeons were irradiated by means of a Q-switched ruby laser with an output pulse energy of about 0.3 joule. Atrophy of the epithelium and changes in the bony and membranous labyrinth were observed. The ability of the laser beam to penetrate thin slices of bone was tested. The biological effect of the laser beam seems to be mainly thermal, but ultrasonic waves created in the focal spot may contribute.

A66-80962
POSSIBLE ABIOGENIC ORIGIN OF SOME NATURALLY OCCURRING HYDROCARBONS.
Cyril Ponnamperuma and Katherine Pering (NASA, Ames Res. Center, Exobiol. Div., Moffett Field, Calif.)
Nature, vol. 209, Mar. 5, 1966, p. 979–982. 25 refs.

The gas chromatographic method failed to resolve hydrocarbons from three sources: (1) produced by spark discharges through methane, (2) naturally occurring in the Mountsorrel formation, and (3) found in Posidonian shale which contains fossils of marine organisms. The mass spectrography, however, showed that the Mountsorrel and spark discharge hydrocarbons were different in nature from the Posidonian samples. In the Posidonian shale, biological porphyrins, normal alkanes, and saturated branched-chain isoprenoid-type compounds such as pristane and phytane were present. On the basis of these findings it may be concluded that hydrocarbons from Mountsorrel formation were abiogenic in origin, while Posidonian compounds were probably biogenic.

A66-80963
SCIATIC NERVE ACTIVITY EVOKED BY SENSORY-MOTOR CORTEX STIMULATION DURING PARADOXICAL SLEEP.
Fausto Baldissera and Mauro Mancia (Consiglio Nazl. delle Ric., Impresa di Elettrofisiol., Milan; and Milan U., Ist. di Fisiol. Umana, Italy).
Nature, vol. 209, Mar. 5, 1966, p. 1030.

In cats with permanently implanted brain cortex electrodes, sensorimotor cortex area stimulation showed a spontaneous sciatic nerve activity during wakefulness. During synchronous sleep the amplitude was reduced, although

the latency and pattern did not change. When the animals reached the phase of paradoxical sleep, the amplitude was reduced with phasic marked increase synchronous with rapid eye movement (REM) bursts, and the average values were often higher than during wakefulness. The results indicate that the excitability of the corticospinal system was tonically depressed during synchronized and desynchronized sleep, while it increased during wakefulness and REM periods of desynchronized sleep. Because no sciatic nerve response to liminar pyramidal stimulation occurred during paradoxical sleep, the response to sensorimotor cortex stimulation may have been due to increased cortical excitability.

A66-80964
AEROSOL DEPOSITION IN THE LUNGS OF SPACE TRAVELLERS.
D. C. Muir (London U., London School of Hyg. and Trop. Med., Great Britain).
Nature, vol. 209, Feb. 26, 1966, p. 921.

In the absence of gravity, as in an orbiting spacecraft, one may anticipate that particles normally deposited in the lungs by sedimentation (principally those particles of 1–8 μ diameter) will be exhaled again with no deposition. Under the conditions of a reduced gravitational field as on the Moon an important distinction arises. While the deposition of particles in the range 1–8 μ diameter will be less than normal, the particles of this size which are deposited will do so in a deeper region of the airways than normal. One effect of a reduced gravitational field may thus be to allow the access of large particles to the nonciliated alveolar region of the lung. Particles of this size are important in the airborne spread of infection because they include the droplet nuclei carrying bacteria which are produced by the act of coughing or talking. The importance of this hazard to astronauts remains to be established.

A66-80965
CIRCADIAN RHYTHMS IN THE FEEDING BEHAVIOUR OF CBA MICE.
P. R. Wiepkema, L. de Ruiter, and J. Reddingius (Groningen U., Zool. Lab., The Netherlands).
Nature, vol. 209, Feb. 26, 1966, p. 935–936. 7 refs.

In a group of CBA mice kept for two generations under continuous light and constant ambient temperature (24° C.), with available water and dry food, the feeding behavior retained a marked circadian rhythm. Mice injected with aurothioglucose became strongly hyperphagic, but with some indication of peak periods. The animals' food intake gradually returned to normal, and they entered the static obese phase. During this phase their circadian rhythm appeared to be identical with that of the control group. These results indicate that the brain lesions caused by the aurothioglucose injections did not affect the circadian rhythm mechanism. After a 24-hr. period of food deprivation, the feeding rhythm depended on the phase of the rhythm when food was again available.

A66-80966
DREAMING SLEEP IN MAN: CHANGES IN URINE VOLUME AND OSMOLALITY.
A. J. Mandell, B. Chaffey, P. Brill, M. P. Mandell, J. Rodnick, R. T. Rubin, and R. Sheff (Calif. U., Center for Health Sci., Depts. of Psychiat. and Urol.; and Wadsworth Veterans Admin. Hosp., Los Angeles).
Science, vol. 151, Mar. 25, 1966, p. 1558–1560. 13 refs.
NASA Grant NsG 237-62 and Calif. U., Los Angeles supported research.

Epochs of dreaming sleep, as measured by rapid eye movements, consistently correlated with biphasic change in urine volume and osmolality in catheterized human subjects. Marked decrease in volume and increase in osmolality were followed by a hypotonic diuresis.

A66-80967
PSYCHOLOGICAL REACTIONS TO AIRCRAFT NOISE.
Karl D. Kryter (Stanford Res. Inst., Menlo Park, Calif.).
Science, vol. 151, Mar. 18, 1966, p. 1346–1355. 32 refs.

Methods of evaluating human acceptability of aircraft noise are discussed. Community reaction to noise in general can be evaluated on the basis of physical characteristics of sound, and by the physiological and psychological reactions. Studies indicate that community disturbances by aircraft noise can be calculated from spectral and temporal measurements of flyovers. Statistical studies have shown large variations in the reactions to noise by individuals of the same community. Investigations have revealed that with the advancement of supersonic aircraft the extent of noise disturbance may be even greater than from the sonic apparatus now in use.

A66-80968
SOME ASPECTS OF STRESS ON FOREARM AND HAND IN INDUSTRY.
E. R. Tichauer (Tex. Technol. Coll., Dept. of Ind. Eng., Lubbock).
(Am. Ind. Health Conf., Bal Harbour, Fla., Apr. 6, 1965).
Journal of Occupational Medicine, vol. 8, Feb. 1966, p. 63–71. 19 refs.
West. Elec. Co., Inc. supported research.

Manufacturing processes used only a few years ago applied stress to the body of the operator as a whole. Modern technologies have reduced total work load, concentrating it on small areas of the worker's anatomy. Gradual and cumulative overstrain of minute body elements, even when the work load is light, can lead to ailments and loss of manual dexterity. Professional cooperation between physician and engineer is required in order to design equipment not injurious to man, even in the case of such commonplace tools as pliers and screwdrivers. Often, quantitative evaluation of work stress and strain by physicians is possible only through work measurement by mechanical analogues of parts of the living body. Arm–shoulder analogues and extensor tendon models are particularly useful. Whenever man meets equipment, something happens to equipment, and something happens to man. Knowledge about the man–machine interface is essential both to engineers working with people and to physicians active in industry

A66-80969
DIFFERENT ACTION OF NICOTINE DURING DAY AND NIGHT ON SPONTANEOUS ACTIVITY (RUNNING ACTIVITY) IN THE RAT [DIFFERENTE ACTION DE LA NICOTINE AU COURS DE LA JOURNEE ET DE LA NUIT DANS L'ACTIVITE SPONTANEE (RUNNING ACTIVITY) DU RAT].
Filomena Bovet-Nitti and Daniel Bovet (Sassari U., Ist. di Farmacol., Italy).
Comptes rendus de l'Académie des sciences, vol. 262, Jan. 10, 1966, p. 316–320. 18 refs. In French.

The effect of nicotine (0.2 and 1 mg./kg. body weight injected subcutaneously) on rat locomotor activity was measured on an activity wheel during periods of sleep and wakefulness. When administered during the sleeping period, nicotine acted as a stimulant; but the animal was sedated by nicotine given during the period of wakefulness.

A66-80970
ADAPTATIONS TO COLD.
Laurence Irving (Alaska U., Inst. of Arctic Biol., College).
Scientific American, vol. 214, Jan. 1966, p. 94–101.

Mammals and birds exhibit a remarkable ability to adapt to cold environmental temperatures by generating body heat and by insulating the body by adipose tissue, fur, or feathers. For unprotected body parts such as feet, legs, and nose, there is a mechanism of reduction of heat loss through blood circulation which regulates the body temperature during overheating. In some animals blood circulating through the skin can be shunted away from the body surface during cold exposure without raising the metabolic rate. Adjustment to environmental changes obviously requires adaptation of various bod tissues, and yet the integrity of the organism as a whole must be maintained. The mechanism involved in this adaptation is not clearly understood.

A66-80971
EVIDENCE FOR MICROFOSSILS IN THE ALAIS AND ORGUEIL CARBONACEOUS METEORITES
Sam L. VanLandingham (Louisville U., Dept. of Biol., Ky.)
Nature, vol. 208, Dec. 4, 1965, p. 947–948. 17 refs.

Samples of the Alais and Orgueil carbonaceous chondrites, after suitable treatment, revealed the presence of some terrestrial contaminants, such as fungus spores and pollen grains. Among the acid-resistant material some indigenous forms were present which appeared to be identical with microstructures observed in previous studies. Although, it has been established that biological contaminants may be present in meteorites, it still does not seem likely that all microstructures can be considered as biological contaminants or mineral artefacts.

A66-80972
THE SEARCH FOR EXTRATERRESTRIAL LIFE.
N. H. Horowitz (Calif. Inst. of Technol. Jet Propulsion Lab., Biosci. Sect., Pasadena).
Science, vol. 151, Feb. 18, 1966, p. 789–792. 15 refs.

As compared with terrestrial conditions the Martian environment is considered harsh. The mean temperature is –55° C.; the atmosphere contains no detectable oxygen and only a small amount of water vapor. The rarefied atmosphere affords no protection against cosmic and solar radiation. Current theories of the history of the solar system suggest that conditions of the Martian environment may have been suitable for an independent origin of life. A number of devices are suggested for the detection of microbial life and the chemical analysis of products of microorganic activity on Mars.

A66-80973
DIURNAL VARIATION IN THE SPONTANEOUS EJACULATIONS OF THE MALE ALBINO RAT.
J. E. Kihlström (Uppsala U., Inst. of Zoophysiol., Sweden).
Nature, vol. 209, Jan. 29, 1966, p. 513–514.
Swed. Natl. Sci. Res. Council supported research.

Eight male albino rats were subjected to an artificial light–dark cycle (12–12 hr.). Twice during each light and dark period spontaneous seminal ejaculates were collected. The highest frequency of ejaculates occurred between 8 p.m. and 2 a.m., the lowest numbers were ejected between 8 a.m. and 2 p.m. The mean weights and specific densities of the plugs did not differ significantly between the periods.

A66-80974
EFFECT OF PROMETHAZINE HYDROCHLORIDE ON HAND–EYE CO-ORDINATION.
G. R. Molson, J. A. Mackey (Northampton Coll., Dept. of Ophthalmic Optics, London, Great Britain), J. V. Smart (Smith, Kline and French Labs., Ltd., Dept. of Statist., Res. and Develop., Welwyn Garden City, Herts, Great Britain), and Paul Turner (St. Bartholomew's Hosp., Med. Prof. Unit, London, Great Britain).
Nature, vol. 209, Jan. 29, 1966, p. 516.

The effect of 50 mg. of promethazine hydrochloride (Phenergan) on visual–motor coordination was investigated in male subjects. The antihistaminic produced a significant fall in hand–eye coordination compared with placebo at three hr., but no significant difference was seen at one and two hr.

A66-80975
EFFECT OF THYROCALCITONIN ADMINISTRATION ON THE PRINCIPAL PARAMETERS OF CALCIUM METABOLISM IN THE NORMAL RAT AND THE THYROPARATHYROIDECTOMIZED RAT [EFFET DE L'ADMINISTRATION DE THYROCALCITONINE SUR LES PRINCIPAUX PARAMETRES DU METABOLISME DU CALCIUM DU RAT NORMAL ET DU RAT THYROPARATHYROIDECTOMISE].
Gérard Milhaud, Mohsen S. Moukhtar, Georges Cherian, and Anne-Marie Pérault (Inst. Pasteur, Lab. des Isotopes, Paris, France).
Comptes rendus de l'Académie des sciences, vol. 262, Jan. 24, 1966, p. 511–514. 7 refs. In French.

Repeated injections of thyrocalcitonin (TCT) were given to normal and thyroparathyroidectomized (-T-P) rats. In normal rats, TCT caused lasting hypocalcemia with decreased bone catabolism and increased coefficients of intestinal calcium retention and absorption. In -T-P rats, TCT decreased calcemia, calcium pool, and bone calcium anabolism and catabolism. When measured during the first hour after injection, TCT significantly increased calciuria in normal rats, but no effect was noted in -T-P rats. TCT significantly increased phosphaturia during the first hour after injection into both normal and -T-P rats.

A66-80976
IONIZING RADIATION AND THE INTRACELLULAR OXIDATION-REDUCTION STATE.
Dana Jamieson (Cancer Inst. Board, Radiobiol. Res. Unit, Melbourne, Australia).
Nature, vol. 209, Jan. 22, 1966, p. 361–365. 48 refs.

Intracellular oxidation-reduction state as reflected in the level of oxidized and reduced pyridine nucleotides was measured up to one hr. after X-irradiation in rat kidney and ileal smooth muscle and mucosa in vivo and in ascites cell and rat thymocyte suspensions in vitro. The intracellular oxidation-reduction state of all cells and tissues studied was virtually unaltered even after 100-krad doses. Post-irradiation electron transport reactions appeared to function normally. It is concluded that changes reported in respiratory enzyme levels or coenzymes, assayed at later times after irradiation, are dependent on other forms of cellular damage and are not a primary radiation [illegible]

A66-80977
EFFECTS OF HYPERBARIC OXYGENATION ON EXCESS LACTATE PRODUCTION IN EXERCISING DOGS.
William P. Weglicki, Robert E. Whalen, Howard K. Thompson, Jr., and Henry D. McIntosh (Duke U., Med. Center, Dept. of Med., Cardiovascular Lab., Durham, N. C.).
American Journal of Physiology, vol. 210, Mar. 1966, p. 473–477. 20 refs. Grants NIH HE-07396-01, HE-07563-03, and H-4807; N. C. and Am. Heart Assns. and Council for Tobacco Res. supported research.

Two groups of dogs were exercised at 3 atm. absolute pressure while breathing oxygen; these two groups and a third group of dogs were also exercised at 1 atm. on air. Levels of pH, pCO_2, pO_2, and lactic and pyruvic acids were determined in arterial and mixed venous blood; excess lactate due to exercise (XL) was calculated. In group I (8 dogs exercised first at 1 atm. on air, then at 3 atm. on O_2) arterial XL decreased from + 1.52 mM. at 1 atm. on air to + 0.22 mM. at 3 atm. on O_2. In group II (8 dogs exercised first at 3 atm. on O_2, then at 1 atm. on air) arterial XL levels at 3 and 1 atm. were essentially the same (+ 0.44 mM. and + 0.32 mM., respectively). In group III (8 dogs exercised twice at 1 atm. on air) significant elevations in XL were observed during both exercise periods. The significantly decreased levels of XL in groups I and II at 3 atm. are attributed to hyperbaric O_2. In group II, prior exposure to hyperbaric O_2 caused lowered XL levels during subsequent exercise at 1 atm. on air.

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