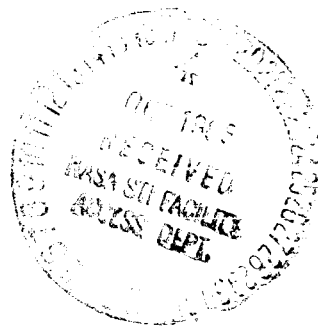




Aerospace Medicine
and Biology
A Continuing
Bibliography
with Indexes

NASA SP-7011(275)
September 1985



Aerospace Medicine and Biology

DA-000 074 910

September 1985

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AEROSPACE MEDICINE AND BIOLOGY

**A CONTINUING BIBLIOGRAPHY
WITH INDEXES**

(Supplement 275)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in August 1985 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA)*.

NASA SP-7011 and its supplements are available from the National Technical Information Service (NTIS). Questions on the availability of the predecessor publications, Aerospace Medicine and Biology (Volumes I - XI) should be directed to NTIS.

This supplement is available as NTISUB/123/093 from the National Technical Information Service (NTIS), Springfield, Virginia 22161 at the price of \$7.00 domestic; \$14.00 foreign.

INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 321 reports, articles and other documents announced during August 1985 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

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 of 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 is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1985 Supplements.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A85-10000 Series)

All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies of accessions are available at \$8.50 per document. Microfiche⁽¹⁾ of documents announced in *IAA* are available at the rate of \$4.00 per microfiche on demand. Standing order microfiche are available at the rate of \$1.45 per microfiche for *IAA* source documents.

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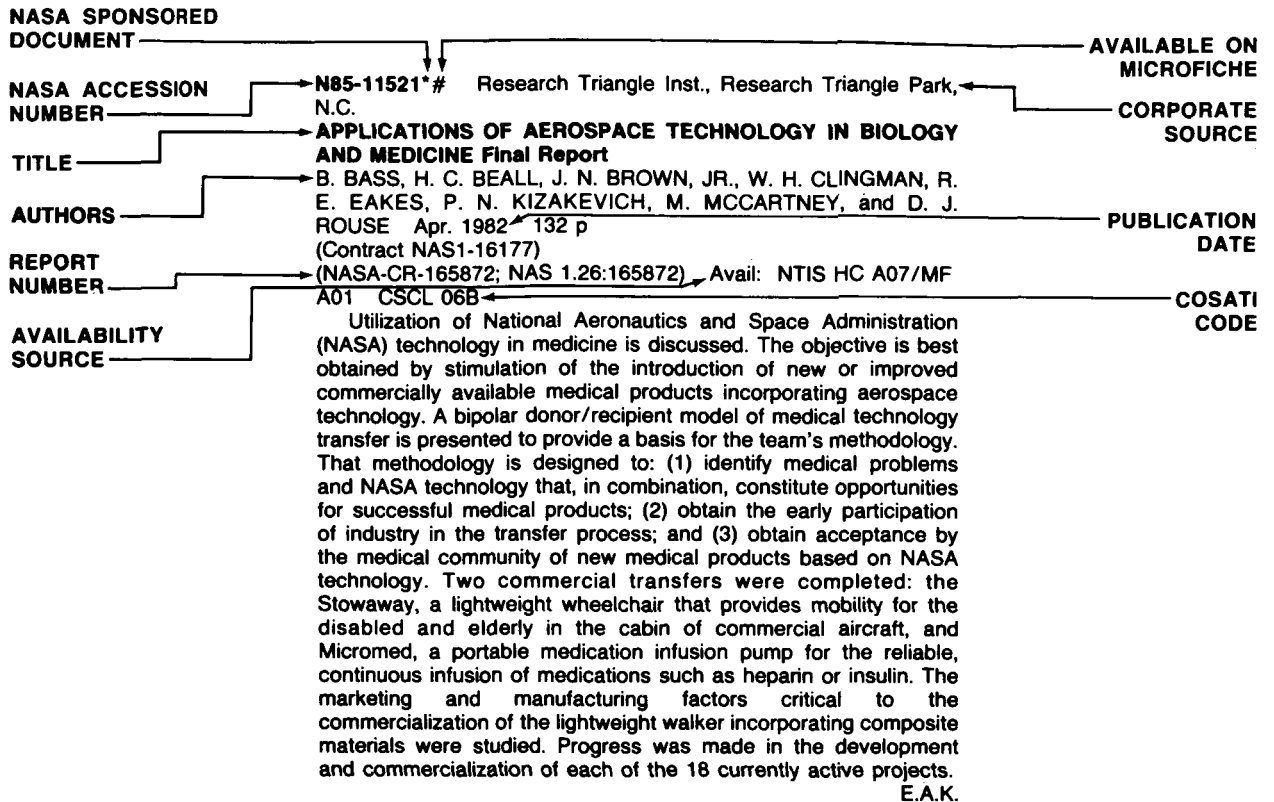
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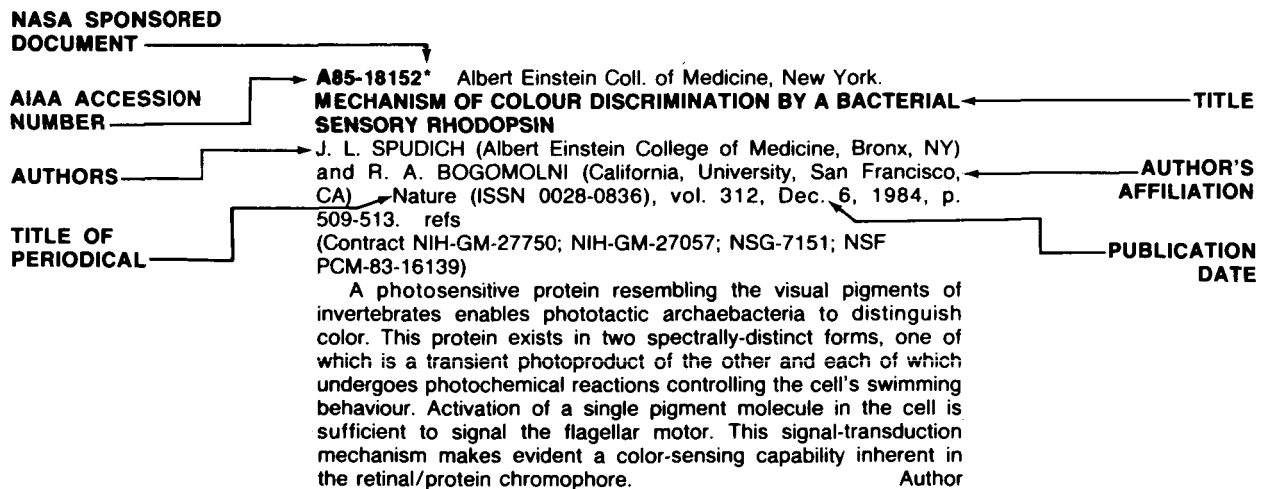
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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 275)

SEPTEMBER 1985

51

LIFE SCIENCES (GENERAL)

Includes genetics.

A85-33586

THE CARDIOVASCULAR EFFECTS OF GLUTAMINIC ACID [KARDIOVASKULIARNOE DEISTVIE GLIUTAMINOVOI KISLOTY]

G. V. KOVALEV, V. I. PETROV, I. N. TIURENKOV, and N. M. ERDNI-GORIAEVA (Volgogradskii Meditsinskii Institut, Volgograd, USSR) *Fiziologicheskii Zhurnal (Kiev)* (ISSN 0201-8489), vol. 31, Mar.-Apr. 1985, p. 143-148. In Russian. refs

The effect of glutamic acid on the cardiovascular and hemodynamic systems of cats have been investigated experimentally. The response of the sympathetic nervous system controlling vascular activity was also studied. It was found that intravenous injections of glutamic acid in doses of 20-500 mg/kg increased systemic arterial pressure by 25-30 percent due to the elevation of stroke and minute blood volume. Blood output from the left ventricle was also increased. Increases in sympathetic nervous system activity were measured on the basis of background and evoked potentials in the preganglionic and postganglionic sympathetic nerves which control the heart, the blood vessels of the kidneys, and the musculocutaneous region. Glutamic acid exhibited no effect on the excitation of the sympathetic ganglia.

I.H.

A85-33587

THE EFFECT OF 35-PERCENT BLOOD LOSS WITH AND WITHOUT A POLYGLUCIN BLOOD SUBSTITUTE IN ELECTROCARDIOGRAMS IN DOGS [VLIANIE NEZAMESHCENNOI I ZAMESHCENNOI POLIGLIUKINOM 35-PERCENT KROVOPOTERI NA ELEKTROKARDIOGRAMMU U SOBAK]

B. NAMORI (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR) *Fiziologicheskii Zhurnal (Kiev)* (ISSN 0201-8489), vol. 31, Mar.-Apr. 1985, p. 148-153. In Russian. refs

Results of experiments on dogs with 35 percent blood loss indicated a generalized reduction in electrocardiographic indices. Specific decreases were noted in the following: systolic blood flow; cardiac excitation time; general diastolic time; and electric systole. Administration of the polyglucin blood substitute dextran-70 immediately after the removal of blood was found to restore electrocardiographic indices to basal levels after one week. Reduction of the cardiac cycle duration in dogs not receiving the blood substitute was equivalent to the reduction observed in dogs receiving dextran-70.

I.H.

A85-33588

THE CONTRACTILE FUNCTION OF RAT CARDIAC PAPILLARY MUSCLE IN VARIOUSLY OXYGENATED ENVIRONMENTS [SOKRATITEL'NAIA FUNKTSIIA PAPIILLIARNYKH MYSHTS SERD TSA KRY S V USLOV IIAKH RAZLICHNOI OKSIGENATSII]

I. S. MUDRAIA (Kievskii Institut Kardiologii, Kiev, Ukrainian SSR) *Fiziologicheskii Zhurnal (Kiev)* (ISSN 0201-8489), vol. 31, Mar.-Apr. 1985, p. 158-164. In Russian. refs

The effect of varying levels of oxygen saturation in a nutrient medium on the contractile function of papillary muscles from the left ventricle has been investigated experimentally. Papillary muscle tissue was obtained from white rats. Contractile function was induced by electrostimulation, and was measured using an isometric contraction test apparatus. It was found that papillary muscle contractile function in an hypoxic medium of 40 + or -4 kPa oxygen developing muscle tension by 67 percent in comparison with control muscles. The maximum rate of tension development was reduced by 66 percent; and the maximum relaxation rate was reduced by 78 percent. The time course curve of papillary muscle contraction under reduced oxygen content had a steeper shape, and began to slope when oxygen pressure was increased in the nutrient medium.

I.H.

A85-33589

THE EFFECT OF INHALATION OF HELIUM-OXYGEN GAS MIXTURES OF VARIOUS OXYGEN CONTENTS ON CARBOHYDRASE HYDROGENATION ACTIVITY IN RAT BLOOD [VLIANIE DYKHANIIA GELIEVO-KISLORODNYMI GAZOVYMI SMESIAMI S RAZLICHNYM SODERZHANIEM KISLORODA NA AKTIVNOST' GIDRIRUIUSHCHEI KARBANGIDRAZY KROVI KRY S]

V. A. BEREZOVSKII, O. A. BOIKO, and T. N. GRIDINA (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR) *Fiziologicheskii Zhurnal (Kiev)* (ISSN 0201-8489), vol. 31, Mar.-Apr. 1985, p. 164-170. In Russian. refs

A85-33590

THE AGE-RELATED CHARACTERISTICS OF ALPHA-TOCOPHEROL DISTRIBUTION IN NORMAL ALBINO RATS AND IN RATS WITH PROLONGED LIVES [VOZRASNIE OSOBNOSTI RASPREDELENIIA A-TOKOFEROLA V ORGANIZME BELYKH KRY S V NORME I PRI PROLONGIROVANII ZHIZNI]

A. V. PARANICH (Khar'kovskii Institut Obshchestvennogo Pitaniia, Kharkov, Ukrainian SSR) *Fiziologicheskii Zhurnal (Kiev)* (ISSN 0201-8489), vol. 31, Mar.-Apr. 1985, p. 190-195. In Russian. refs

A85-33591

THE EFFECT OF MICROINJECTIONS OF GAMMA-AMINO BUTYRIC ACID IN THE MEDULLA OBLONGATA ON CARDIODYNAMIC AND HEMODYNAMIC INDICES [VLIANIE MIKROIN'EKTSII GAMK V STRUKTURU PRODOLGOVATOGO MOZGA NA POKAZATELI KARDIO- I GEMODINAMIKI]

L. N. SHAPOVAL, V. I. BOIKO, A. V. DMITRIEVA, and L. S. POBEGAILO (Akademiiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR) *Fiziologicheskii Zhurnal* (Kiev) (ISSN 0201-8489), vol. 31, Mar.-Apr. 1985, p. 219-223. In Russian. refs

The neuromediator effect of gamma-aminobutyric acid (GABA) on cardiovascular and hemodynamic systems has been investigated experimentally in cats. It is shown that microinjections of GABA (in doses of 500 mg/Kg) in the medulla oblongata region of the brain induced hypotensive reactions in 67 percent of the test animals. Shifts observed in electrocardiographic indices following the injection of GABA are illustrated in a series of graphs. I.H.

A85-33592

CHANGES IN THE CONTENT OF THE MONOAMINES AND THE 11-OXYCORTICOSTEROIDS IN RAT BLOOD IN THE PRESENCE OF STRESS [IZMENENIIA SODERZHANIIA MONOAMINOV I 11-OKSIKORTIKOSTEROIDOV V KROVI KRYS PRI STRESSOVYKH VOZDEISTVIIAKH]

O. P. UGAROVA (Akademiiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR) *Fiziologicheskii Zhurnal* (Kiev) (ISSN 0201-8489), vol. 31, Mar.-Apr. 1985, p. 224-227. In Russian. refs

Variations in the blood content of the 11-oxycorticosteroids and the monoamines (adrenaline, noradrenaline, serotonin, and the catecholamines), in response to emotional stress have been investigated experimentally in rats. It is found that the content of mediators and hormones in the blood was closely related to the strength and duration of emotional stress reactions. The role of humoral factors increasing adrenomedullary activity during emotional stress reactions is discussed on the basis of the experimental results. I.H.

A85-33620

ISO-FREQUENCY CURVES OF OCULOMOTOR NEURONS IN THE RHESUS MONKEY

K. HEPP (Zuerich Eidgenoessische Technische Hochschule, Zurich, Switzerland) and V. HENN (Zuerich, Universitaet, Zurich, Switzerland) *Vision Research* (ISSN 0042-6989), vol. 25, no. 4, 1985, p. 493-499. refs

A85-33741* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SPACE STATION MEDICAL SCIENCES CONCEPTS

J. A. MASON and P. C. JOHNSON, JR. (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 8 p. Previously announced in STAR as N84-21040.

(SAE PAPER 840928)

Current life sciences concepts relating to Space Station are presented including the following: research, extravehicular activity, biobehavioral considerations, medical care, maintenance of dental health, maintaining health through physical conditioning and countermeasures, protection from radiation, atmospheric contamination control, atmospheric composition, noise pollution, food supply and service, clothing and furnishings, and educational program possibilities. Information on the current status of Soviet Space Stations is contained. Author

A85-33743* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NASA'S PLANS FOR LIFE SCIENCES RESEARCH FACILITIES ON A SPACE STATION

R. ARNO, M. HEINRICH, and A. MASCY (NASA, Ames Research Center, Moffett Field, CA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 9 p. (SAE PAPER 840930)

A Life Sciences Research Facility on a Space Station will contribute to the health and well-being of humans in space, as well as address many fundamental questions in gravitational and developmental biology. Scientific interests include bone and muscle attrition, fluid and electrolyte shifts, cardiovascular deconditioning, metabolism, neurophysiology, reproduction, behavior, drugs and immunology, radiation biology, and closed life-support system development. The life sciences module will include a laboratory and a vivarium. Trade-offs currently being evaluated include (1) the need for and size of a 1-g control centrifuge; (2) specimen quantities and species for research; (3) degree of on-board analysis versus sample return and ground analysis; (4) type and extent of equipment automation; (5) facility return versus on-orbit refurbishment; (6) facility modularity, isolation, and system independence; and (7) selection of experiments, design, autonomy, sharing, compatibility, and integration. Author

A85-33758

SPACE STATION LIFE SCIENCES RESEARCH FACILITY TECHNOLOGY ASSESSMENT

T. C. SECORD and H. B. KELLY (McDonnell Douglas Astronautics Co., Huntington Beach, CA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 12 p. (SAE PAPER 840947)

The Space Station Life Science Research Facility (LSRF) Technology Assessment and Development Plan study for non-human research was performed for the NASA Ames Research Center. The primary objectives of the effort were to: (1) provide an identification and assessment of the relevant technology needed to support high-priority research, (2) identify LSRF technology impacts on Space Station systems, and (3) provide a technology development plan that will lead to the design and ultimate development of the LSRF critical technology. The most significant study results that will be reported include: (1) identification of experiment technology and system support requirements, (2) definitions of key equipment needed to support specific experiments and experiment groups, (3) establishment of equipment technology status, (4) definition of pacing equipment areas requiring supporting research and technology (SRT), (5) technology development plans, cost and schedules for identified flight hardware and related SRT, and (6) LSRF/Space Station interfaces and accommodation impacts. Author

A85-34276* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LIFE SCIENCES AND SPACE RESEARCH XXI(1); PROCEEDINGS OF THE TOPICAL MEETING, GRAZ, AUSTRIA, JUNE 25-JULY 7, 1984

H. P. KLEIN, ED. (NASA, Ames Research Center, Moffett Field, CA) and G. HORNECK, ED. (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Flugmedizin, Cologne, West Germany) Meeting sponsored by COSPAR. *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, 297 p. For individual items see A85-34277 to A85-34309.

Space research in biology is presented with emphasis on flight experiment results and radiation risks. Topics discussed include microorganisms and biomolecules in the space-environment experiment ES 029 on Spacelab-1, the preliminary characterization of persisting circadian rhythms during space flight; plant growth, development, and embryogenesis during the Salyut-7 flight, and the influence of space-flight factors on viability and mutability of plants. Consideration is also given to radiation-risk estimation and its application to human beings in space, the radiation situation in

space and its modification by the geomagnetic field and shielding, the quantitative interpretation of cellular heavy-ion action, and the effects of heavy-ion radiation on the brain vascular system and embryonic development. M.D.

A85-34280
MICROORGANISMS AND BIOMOLECULES IN SPACE ENVIRONMENT EXPERIMENT ES 029 ON SPACELAB-1

G. HORNECK, H. BUECKER, G. REITZ, H. REQUARDT (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Luft- und Raumfahrt, Institut fuer Flugmedizin, Cologne, West Germany), K. DOSE, K. D. MARTENS, A. BIEGER (Mainz, Universitaet, Mainz, West Germany), H. D. MENNIGMANN (Frankfurt, Universitaet, Frankfurt am Main, West Germany), and P. WEBER (Leiden, Rijksuniversiteit, Sterrewacht, Leiden, Netherlands) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 19-27. Research supported by the Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt and Bundesministerium fuer Forschung und Technologie. refs

Studies on the limiting factors for survival of *Bacillus subtilis* spores in free space, performed during the Spacelab-1 mission, are reported. An exposure tray on the pallet of Spacelab-1 allowed a ten-day treatment of 316 samples of dry spores with space vacuum and/or selected wavelengths of solar UV (greater than 170 nm, 220 nm, 240 nm, 260 nm, 280 nm). Postflight analyses of the samples, which include tests of viability and growth kinetics, determination of mutation frequencies, and photobiochemical evaluation of DNA and proteins are described. A better understanding of the mechanisms of increased UV sensitivity of bacterial spores in vacuo, of the problem of survival of resistant life forms in the harsh environment of space, and of the interplanetary transfer of life is provided by the results. M.D.

A85-34281
INVESTIGATIONS ON-BOARD THE BIOSATELLITE COSMOS-83

O. G. GAZENKO and E. A. ILIN (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 29-37. refs

Experimental investigations carried out on board the biosatellite Cosmos-1514, launched in December 1983, to clarify the effect of short-term microgravity on the physiology, growth, and development of various animal and plant species, are described. The study of two Rhesus monkeys shows that they are an adequate experimental model for investigating the pattern of adaptation of the vestibular apparatus and the cardiovascular system to weightlessness. The results of a rat embryology experiment indicate that the development of a mammalian fetus at the stage of active organogenesis proceeds normally in microgravity, which is also confirmed by fish studies. It is shown that exposure to microgravity produces no effect on the generative stage of plant development or on the metabolism of germinating seeds. M.D.

A85-34282* State Univ. of New York, Binghamton.
PRELIMINARY CHARACTERIZATION OF PERSISTING CIRCADIAN RHYTHMS DURING SPACE FLIGHT

F. M. SULTZMAN (New York, State University, Binghamton, NY) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 39-46. refs (Contract NAS9-15975)

In order to evaluate the function of the circadian timing system in space, the circadian rhythm of conidiation of the fungus *Neurospora crassa* was monitored in constant darkness on the STS 9 flight of the Space Shuttle Columbia. During the first 7 days of spaceflight many tubes showed a marked reduction in the apparent amplitude of the conidiation rhythm, and some cultures appeared arrhythmic. There was more variability in the growth rate and circadian rhythms of individual cultures in space than is

usually seen on earth. The results of this experiment indicate that while the circadian rhythm of *Neurospora* conidiation can persist outside of the earth's environment, either the timekeeping process or its expression is altered in space. Author

A85-34283
INTRAMUSCULAR CALCIUM MOVEMENTS - EXPERIMENTS FROM THE SOVIET BIOSATELLITE BIOSCOSMOS

C. GOBLET, X. HOLY, and Y. MOUNIER (Lille I, Universite, Villeneuve-d'Ascq, Nord, France) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 47-53. refs

Experiments have been performed in skeletal muscle fibers from the lateral head of gastrocnemius muscles of female rats. Changes in intramuscular calcium movements due to microgravity conditions have been tested by tension measurements in chemically skinned muscle fibers. The results show that microgravity induces a decrease in maximal muscle strength developed by contractile proteins and a decrease of intensity and rate of both Ca release and Ca uptake by the sarcoplasmic reticulum. Author

A85-34284
PLANT GROWTH, DEVELOPMENT AND EMBRYOGENESIS DURING SALYUT-7 FLIGHT

A. J. MERKYS, R. S. LAURINAVICIUS, and D. V. SVEGZDIENE (Akademiia Nauk Litovskoi SSR, Institut Botaniki, Vilnius, Lithuanian SSR) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 55-63. refs

The results of two experiments carried out in 1982 on board the orbital station Salyut 7 are presented. The first experiment, performed with the help of the station-borne centrifuge, investigates the character of the initial growth phases and the performance of tropical movements of roots and hypocotyls of lettuce under spaceflight conditions. The length of the hypocotyls on the centrifuge at 0.1 and 0.01 g and under weightlessness, is found to increase by 8-16 percent, whereas the length of the roots decreases by 17 percent at 0.01 g and under weightlessness. In the second experiment, an attempt is made to grow the plants of *Arabidopsis* on board the station achieving a full cycle of biological development. It is shown that the seeds sown during the flight germinated, performed growth processes, formed vegetative and generative organs, and succeeded in fecundation, embryogenesis, and ripening. M.D.

A85-34285
THE INFLUENCE OF SPACE FLIGHT FACTORS ON VIABILITY AND MUTABILITY OF PLANTS

L. KOSTINA, I. ANIKEEVA, and E. VAULINA (Akademiia Nauk SSSR, Institut Obshchei Genetiki, Moscow, USSR) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 65-70. refs

Experiments carried out on the Soyuz 16 spacecraft and the orbital stations Salyut 5, 6, and 7, in which air-dried *Crepis capillaris* seeds were used to study cytogenetic effects in seedlings, are reported. The experiments reveal an increase in the frequency of chromosome aberrations in seedlings grown from flight-exposed seeds during the flight and after the flight on earth as compared to a ground-based control. An analysis of fruits from *Arabidopsis thaliana* plants grown during the flight in a Light block-1 device shows an increase in the frequency of recessive mutants and a reduction in plant fertility. The germinating ability of seeds from *Arabidopsis* plants grown in space in a Fiton-3 device and the survival of the next generation of plants from these seeds are reduced. It is shown that in the first postflight generation, damages resulting from chromosome aberrations are eliminated, whereas those resulting from gene mutations and microaberrations are preserved for a longer time. M.D.

A85-34286

CHANGES IN DEVELOPMENTAL CAPACITY OF ARTEMIA CYST AND CHROMOSOMAL ABERRATIONS IN LETTUCE SEEDS FLOWN ABOARD SALYUT-7 - BIOBLOC III EXPERIMENT

V. NEVZGODINA, E. E. KOVALEV, E. N. MAKSIMOVA (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR), Y. GAUBIN, H. PLANEL, G. GASSET, B. PIANEZZI (Toulouse III, Universite, Toulouse, France), and J. CLEGG (Miami, University, Coral Gables, FL) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 71-76. refs

This paper gives the results of investigations performed on the first container (A) of the Biobloc III experiment, flown aboard the orbital station Salyut 7 for 40 days. The space flight resulted in a decreased developmental capacity of Artemia cysts, hit or not hit by the HZE particles. No effect was observed in cysts in bulk. A synergetic effect of microgravity and gamma pre irradiation is described. The germination of in-flight lettuce seeds was decreased. The space flight resulted also in a higher percentage of cells with chromosomal aberrations. Relations between biological response, TEL and location of HZE particles are discussed. Author

A85-34288

ADVANCED BIOSTACK - EXPERIMENT 1 ES 027 ON SPACELAB-1

H. BUECKER, K. BALTSCHUKAT, R. FACIUS (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Flugmedizin, Cologne, West Germany), R. BEAUJEAN, W. ENGE (Kiel, Universitaet, Kiel, West Germany), S. L. BONTING (Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands), M. DELPOUX (Toulouse III, Universite, Toulouse, France), H. FRANCOIS (Commissariat a l'Energie Atomique, Fontenay-aux-Roses, Hauts-de-Seine, France), E. H. GRAUL (Marburg, Universitaet, Marburg, West Germany), W. HEINRICH (Siegen, Universitaet-Gesamthochschule, Siegen, West Germany) et al. (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 83-90. Research supported by the Bundesministerium fuer Forschung und Technologie. refs

The radiobiological properties of the heavy ions of cosmic radiation were investigated on Spacelab 1 by use of biostacks, monolayers of biological test organisms sandwiched between thin foils of different types of nuclear track detectors. Biostacks were exposed to cosmic radiation at several locations with different shielding environments in the module and on the pallet. Evaluations of the physical and biological components of the experiment to date indicate that in general they survived the spaceflight in good condition. Dosimetric data are presented for the different shielding environments. Author

A85-34289

EFFECTS OF GRAVITY AND COSMIC RAYS ON CELL PROLIFERATION KINETICS IN PARAMECIUM TETRAURELLA

R. TIXADOR, G. RICHOLLEY, G. GASSET, and H. PLANEL (Toulouse III, Universite, Toulouse, France) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 91-95. refs

Space flights resulted in a stimulating effect on kinetics of proliferation in Paramecium tetraurelia. Additional experiments were performed in order to determine the origin of this phenomena. Paramecia were cultivated in balloon flights or in a slow clinostat, or were exposed to different levels of hypergravity. The results suggest that changes in cell proliferation rate are related to cosmic rays and to a direct effect of microgravity. Author

A85-34290

BIOLOGICAL CHANGES OBSERVED ON RICE AND BIOLOGICAL AND GENETIC CHANGES OBSERVED ON TOBACCO AFTER SPACE FLIGHT IN THE ORBITAL STATION SALYUT-7 - BIOBLOC III EXPERIMENT

J. BAYONOVE, M. BURG, A. MIR (Montpellier II, Universite Montpellier, France), and M. DELPOUX (Toulouse III, Universite, Toulouse, France) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 97-101. refs

Caryopses and isolated embryos from Rice (*Oryza sativa* L.) and Tobacco seeds (*Nicotiana tabacum* L. variety Xanthi) were studied in the Biobloc III container aboard the Soviet orbital space station Salyut 7. The recovery from radiation damage under conditions of space flight was observed for rice caryopsis and embryos gamma irradiated (Co 60, 50 grays) prior to launch. There was a large decrease in the percentage of germinating seeds from the Tobacco strain tested when the seeds were exposed to heavy ions. Among the germinating plantlets there were few morphological anomalies. Furthermore, there was a significant greater amount of genetic change in those samples held in grids as compared to those in bags. Author

A85-34291

RADIOSENSIBILITY OF HIGHER PLANT SEEDS AFTER SPACE FLIGHT

E. VAULINA, I. ANIKEEVA, and L. KOSTINA (Akademiiia Nauk SSSR, Institut Obshchei Genetiki, Moscow, USSR) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 103-107. refs

In experiments performed on the orbital stations Salyut 6 and 7, the influence of long-term storage of *Crepis capillaris* and *Arabidopsis thaliana* seeds under space flight conditions on seed radio-sensitivity is studied. It is shown that the radiosensitivity of *C. capillaris* seeds is not affected by short-term storage, while in the case of maximal exposure duration, the chromosome aberration frequency, in post-flight irradiated seeds exceeds chromosome aberration frequency in the ground-based irradiated control. An increase in the number of cells with multiple chromosome aberrations is also observed. After exposure to gamma-irradiation and with the prolongation of seed storage, the germinating ability of *A. thaliana* seeds and the survival rate of the plants decreases. Flight-exposed seeds are found to be more sensitive to irradiations with respect to these parameters. In two experiments of long-exposure duration, an increase in the recessive lethal mutation frequency is observed. M.D.

A85-34297

UNIQUE RADIOBIOLOGICAL ASPECTS OF HIGH-LET RADIATION

R. FACIUS, M. SCHAEFER, and H. BUECKER (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Flugmedizin, Cologne, West Germany) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 175-185. refs

The radiobiological effects of high-let radiation, which focus on features of densely ionizing radiation, are discussed. The findings obtained from space-flight and ground-based experiments include the observation of a long lateral range of radiobiological effectiveness around tracks of single heavy ions, the observation of microlesions induced in biological targets by the penetration of heavy ions, the nonadditivity of radiobiological effects from sparsely and densely ionizing radiation, the kinetics of damage expression of late effects under irradiation with sparsely or densely ionizing radiation, and the observation of a reversed dose-rate effect. The results are found to influence the radiation protection standards for manned space flight and the design of experiments which contribute to their specification. M.D.

A85-34298

THE MICROLESION CONCEPT IN HZE PARTICLE DOSIMETRY

P. TODD and J. T. WALKER (Pennsylvania State University, University Park, PA) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 187-197. refs

The cosmic radiation field above the earth's atmosphere and beyond the earth's magnetosphere includes primary particles which are highly charged nuclei with high kinetic energies (HZE's). The cosmic HZE particles which penetrate the nuclei of biological cells are much more effective than gamma rays in a low dose field. However, quantitative measurements are needed for a hazard analysis. It is possible that such a quantitative measurement should be related to the 'microlesion' considered by Grahn (1973). The occurrence of HZE particles in manned orbital missions is discussed along with the dominant role of iron nuclei, the microlesion concept, visual effects of individual cosmic-ray HZE particles, retinal damage, particle tracks in corneal epithelia, hair depigmentation, intestinal epithelial cell inactivation, and the independent action of penumbra electrons. Attention is given to two types of single-cell laboratory experiments, and the evidence regarding the microlesion hypothesis is critically evaluated. G.R.

A85-34299

ON THE QUANTITATIVE INTERPRETATION OF CELLULAR HEAVY ION ACTION

J. KIEFER and E. SCHNEIDER (Giessen, Universitaet, Giessen, West Germany) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 199-204. refs

A quantitative analysis of the effects of heavy ion radiation (from helium to uranium) on the behavior of mammalian cell systems is presented. The analysis is based on recent models of lesion formation due to ionizing radiation, and experimental results for heavy ion linear transfer energies of less than 500 keV/micron. It is shown that cell damage due to heavy ion radiation can be described in terms of a common curve which includes 'nonlinear' effects (where the distribution of energy is anisotropic). The applications of the theoretical results to the prediction of radiation hazards in space is discussed. I.H.

A85-34300* California Univ., Berkeley.

NEOPLASTIC CELL TRANSFORMATION BY ENERGETIC HEAVY IONS AND ITS MODIFICATION WITH CHEMICAL AGENTS

T. C. YANG and C. A. TOBIAS (California, University, Berkeley, CA) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 207-218. NASA-supported research. refs (Contract NIH-CA-15184; DE-AC03-76SF-00098)

One of the major deleterious late effects of ionizing radiation is related to the induction of neoplasms. In the present report recent experimental results on neoplastic cell transformation by heavy ions are presented, and possible means to circumvent the carcinogenic effect of space radiation are discussed. Biological effects observed in experiments involving the use of energetic heavy ions accelerated at the Bevalac suggest that many of the biological effects observed in earlier space flight experiments may be due to space radiation, particularly cosmic rays. It is found that the effect of radiation on cell transformation is dose-rate dependent. The frequency of neoplastic transformation for a given dose decreases with a decrease of dose rate of Co-60 gamma rays. It is found that various chemical agents give radiation protection, including DMSO. G.R.

A85-34301

HZE EFFECTS ON MAMMALIAN CELLS

G. KRAFT, L. HIEBER, M. SCHUBER (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt, West Germany), E. A. BLAKELY, C. A. TOBIAS (California, University, Berkeley, CA), W. KRAFT-WEYRATHER, H. G. MILTENBURGER, W. MUELLER, and H. WULF (Darmstadt, Technische Hochschule, Darmstadt, West Germany) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 219-226. Research supported by the Bundesministerium fuer Forschung und Technologie. refs (Contract NIH-CA-15184; DE-AC03-76SF-00098)

The rates of survival and chromosomal aberration among Chinese hamster cells exposed to heavy ion beam (from helium to uranium) were investigated experimentally. The velocities of the ion beams were in the range 0.03-0.87 c, and linear energy transfer (LET) was 10-15,000 keV per micron. The energy range of the beams was 0.05-960 MeV. It was found that: (1) the cross-section of cell deaths increased uniformly in relation to LET values of less than 200 keV per micron, regardless of the atomic number of the ion beam; and (2) deviations from the common cell-death curve occurred when LET was 200 keV or more per micron. Saturation of the lighter ions corresponded to the lower LET values. Data for the rate of chromosome aberrations among the cells were found to agree with the cell death results. I.H.

A85-34302

ANALYSIS OF CYTOGENETIC EFFECTS OF THE SECONDARY RADIATION RESULTING FROM 70 GEV PROTONS OF CHINESE HAMSTER CELLS

A. KH. AKHMADIEVA, G. PH. APTIKAEVA, I. A. LIVANOVA, A. V. ANTIPOV, I. G. AKOEV, and E. E. GANASSI (Akademii Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 227-230. refs

A85-34303

EFFECT OF SECONDARY RADIATION PRODUCED BY 70 GEV PROTONS ON DNA OF MAMMALIAN CELLS

G. A. LEONTEVA, B. S. FOMENKO, and A. V. ANTIPOV (Akademii Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 231-235. refs

It is shown that the relative biological efficiency (RBE) of Chinese hamster fibroblast and lymphoid cells was significantly reduced by secondary synchrotron radiation of protons, with an average power of 70 GeV. The RBE of the fibroblasts was 1.6-7.6, in comparison with 1.04-3.8 for the lymphoid cells. During postirradiation incubation at a temperature of 37 C, single-strand breaks in DNA due to the proton radiation were repaired at the same rate as those induced by gamma-radiation in doses of 4 Gy/min. Some possible reasons for the greater sensitivity of the fibroblast cells are discussed. I.H.

A85-34304* California Univ., Berkeley.

EFFECTS OF HEAVY ION RADIATION ON THE BRAIN VASCULAR SYSTEM AND EMBRYONIC DEVELOPMENT

T. C. YANG and C. A. TOBIAS (California, University, Berkeley, CA) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 239-245. NASA-supported research. refs (Contract NIH-CA-15184; DE-AC03-76SF-00098)

The present investigation is concerned with the effects of heavy-ion radiation on the vascular system and the embryonic development, taking into account the results of experiments with neonatal rats and mouse embryos. It is found that heavy ions can be highly effective in producing brain hemorrhages and in causing body deformities. Attention is given to aspects of methodology,

the induction of brain hemorrhages by X-rays and heavy ions, and the effect of iron particles on embryonic development. Reported results suggest that high linear energy transfer (LET) heavy ions can be very effective in producing developmental abnormalities. G.R.

A85-34305* Colorado State Univ., Fort Collins.
QUANTITATION OF HEAVY ION DAMAGE TO THE MAMMALIAN BRAIN - SOME PRELIMINARY FINDINGS

A. B. COX (Colorado State University, Fort Collins, CO) and L. M. KRAFT (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, CA) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 247-250. Research supported by the U.S. Department of Energy. refs
 (Contract NGR-06-002-128; NSG-9045; NIH-AG-00005)

For several years, studies have been conducted regarding late effects of particulate radiations in mammalian tissues, taking into account the brains of rodents and lagomorphs. Recently, it has become feasible to quantify pathological damage and morpho-physiologic alterations accurately in large numbers of histological specimens. New investigative procedures make use of computer-assisted automated image analysis systems. Details regarding the employed methodology are discussed along with the results of the information. The radiations of high linear energy transfer (LET) cause apparently earlier and more dramatic shrinkage of olfactory glomeruli in exposed rabbit brains than comparable doses of Co-60 gamma photons. G.R.

A85-34306* Colorado State Univ., Fort Collins.
LATE EFFECTS FROM PARTICULATE RADIATIONS IN PRIMATE AND RABBIT TISSUES

J. T. LETT, A. B. COX, D. S. BERGTOLD, A. C. LEE (Colorado State University, Fort Collins, CO), and J. E. PICKERING (USAF, School of Aerospace Medicine, Brooks AFB, TX) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 251-256. Research supported by the U.S. Department of Energy. refs
 (Contract NSG-9045; NAG9-10)

In connection with studies regarding the hazards posed by ionizing radiations to man in space, the U.S. Air Force conducted an experiment about 20 years ago. In this experiment a large number of young rhesus monkeys was exposed to proton fluxes similar to those to be anticipated during solar flares. After irradiation, the animals were kept at the USAF School of Aerospace Medicine in Texas. The monkeys have been employed in investigations concerning aspects of late radiation damage. These investigations are discussed, taking into account the propagation of fibroblasts from irradiated monkeys. The results of the investigations are evaluated, giving attention also to experiments with white rabbits. It is found that, except in the case of major solar flares, when acute radiation damage could lead quickly to death, the hazards to astronauts from space radiations arise from such debilitating late effects as cataracts, damage to the central nervous system and benign tumors, and life-threatening neoplasia. G.R.

A85-34307
MODIFICATION OF RADIATION RESPONSE BY K AND MG ASPARTATES IN CONTINUOUSLY IRRADIATED RATS AND MICE

O. CHLEBOVSKY and M. PRASLICKA (Univerzita Pavla Jozefa Safarika, Kosice, Czechoslovakia) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 257-262. refs

An experiment in which 500 mg of monopotassium D, L-aspartate and 500 mg of monomagnesium D, L-aspartate are administered in 100 ml of drinking water to mice and rats, prior to, during, and after the outset of prolonged continuous irradiation, is discussed. The rats are exposed to gamma radiation at daily dose rates of 0.76 Gy and 1.53 Gy until the death of the last

animal and at a dose rate of 0.19 Gy/h up to a total dose of 15.2 Gy over 80 h, and the mice are irradiated at a dose rate of 2.3 Gy/day up to a total dose of 16.1 over 7 days. It is shown that the mortality of the mice and rats decreases while the neuromuscular coordination and physical strength in the mice increases. The results indicate that K and Mg aspartates are suitable not only as radioprotective substances against cosmic radiation, but also against the effects of other factors of cosmic flights, such as stress, hypoxia, muscular fatigue, and a decrease in erythropoiesis and lymphopoiesis. M.D.

A85-34308
THE LIFE SCIENCES PROGRAMME OF THE EUROPEAN SPACE AGENCY, AND OPPORTUNITIES FOR RADIATION BIOLOGY EXPERIMENTS

H. OSER (ESA, Microgravity Office, Paris, France) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 265-275. refs

The history, present status, and future plans of the ESA life-sciences program are briefly reviewed and illustrated with drawings and diagrams. Topics examined include the life-sciences component of the ESA/NASA Spacelab project, the microgravity-program payload elements and their planned reflights, sounding-rocket experiments, the Biorack, the Shuttle pallet satellite, the development of the European retrievable carrier Eureka, and life-science experiments proposed for the Space Station. T.K.

A85-34309* National Aeronautics and Space Administration, Washington, D. C.

NASA'S LIFE SCIENCES AND SPACE RADIATION BIOLOGY
 P. RAMBAUT and A. NICOGOSSIAN (NASA, Washington, DC) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 277-283. refs

Plans for the various missions in which men and women are expected to participate during the next 10 years are outlined. Such missions include flights of up to three months duration in low earth orbit as well as possible short excursions to geosynchronous orbit. Research activities are described which cover the full spectrum of physiological and psychological responses to space flight. These activities are shown to contribute to the ongoing Shuttle program and the future Space Station. The paper includes a summary of the major technical thrusts needed to support extended habitation in space. Author

A85-34362* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

HYPOTHALAMIC, RECTAL, AND MUSCLE TEMPERATURES IN EXERCISING DOGS - EFFECT OF COOLING
 B. KRUK, H. KACIUBA-USCILKO, K. NAZAR, J. E. GREENLEAF, and S. KOZLOWSKI (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, CA; Polska Akademia Nauk, Centrum Badan Medycznych, Warsaw, Poland) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 58, May 1985, p. 1444-1448. Research supported by the Polska Akademia Nauk. refs

An experimental investigation of the mechanisms of performance prolongation during exercise is presented. Measurements were obtained of the rectal, muscle, and hypothalamic temperature of dogs during treadmill exercise at an ambient temperature of 22 + or - 1 C, with and without cooling by use of ice packs. In comparison with exercise without cooling, exercise with cooling was found to: (1) increase exercise duration from 90 + or - 14 to 145 + or - 15 min; (2) attenuate increases in hypothalamic, rectal and muscle temperature; (3) decrease respiratory and heart rates; and (4) lower blood lactic acid content. It is shown that although significant differences were found between the brain, core, and muscle temperatures during exercise with and without cooling, an inverse relation was observed between muscle temperature and the total duration of exercise. It is suggested that sustained muscle hyperthermia may have

contributed to the limitation of working ability in exercise with and without cooling. I.H.

A85-34364* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SPONTANEOUS RUNNING ACTIVITY IN MALE RATS - EFFECT OF AGE

C. E. MONDON, C. B. DOLKAS, C. SIMS, and G. M. REAVEN (NASA, Ames Research Center, Moffett Field; Stanford University, Stanford; U.S. Veterans Administration, Medical Center, Palo Alto, CA) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 58, May 1985, p. 1553-1557. Research supported by the U.S. Veterans Administration and NASA. refs

Variations in the intensity and the patterns of spontaneous running activity in wheel cages were studied in male rats aged 7 weeks to one year. Daily running records were obtained for periods of 12 mo, and 24-hour recordings were made for selected runners in order to study variations in running activity during the day. The data indicate that for rats running over two miles/day, the maximum running intensity can be divided into two groups: a group of high achievers running 8 miles/day; and a group of moderate achievers running 4.8 miles/day. For both groups spontaneous activity reached a maximum after 4-5 weeks. An hourly pattern of running activity during the day was identified in rats of increasing age who averaged 9.0, 4.5, 2.6, and 1.2 miles/day, respectively. Progressive losses were observed in both the speed and the duration of spontaneous running as the rats increased in age, with the intensity of exercise falling below 2 miles/day after 7-8 months of age. I.H.

A85-34365 VENTRAL MEDULLARY PH AND VENTILATORY RESPONSES TO HYPERPERFUSION AND HYPOXIA

J. A. NEUBAUER, T. V. SANTIAGO, M. A. POSNER, and N. H. EDELMAN (New Jersey, University of Medicine and Dentistry; Rutgers University, New Brunswick, NJ) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 58, May 1985, p. 1659-1668. Research supported by the American Lung Association of New Jersey. refs (Contract NIH-HL-16022; NIH-HL-23315; NIH-HL-29855; NIH-HL-07467)

The effect of sudden increases in brain perfusion on ventral medullary surface pH (Vm pH) and minute ventilation (V-dot I) was studied in anesthetized cats. Increased brain perfusion was induced by acute hypertension, and hypoxemia. In the group of animals with increased brain perfusion due to hypertension, increasing arterial blood pressure (from 122 + or - 3 to 180 + or - 5 mmHg) led to a uniform rapid increase in Vm pH. In animals with increased perfusion due to hypoxia, a significant increase in Vm pH (0.003 + or - 0.0005 pH unit) was observed, as well as a decrease in V-dot I. Further increases in the CO content of the breathing mixture caused progressive ventral medullary acidosis and greater reductions in V-dot I. On the basis of the above results, it is concluded that: (1) hyperfusion produces a steady increase in Vm pH, as well as a reduction of V-dot I equivalent in magnitude to that predicted from the CO₂ response curve; and (2) the ventilatory depression associated with medullary acidosis of moderate brain hypoxia must be due to another mechanism. I.H.

A85-34366* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

BONE AND MUSCLE ATROPHY WITH SUSPENSION OF THE RAT

A. LEBLANC, C. MARSH, H. EVANS, P. JOHNSON, V. SCHNEIDER, and S. JHINGRAN (NASA, Johnson Space Center, Medical Sciences Div.; Baylor College of Medicine, Houston, TX) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 58, May 1985, p. 1669-1675. refs

In order to identify a suitable model for the study of muscle atrophy due to suspension in space, a modified version of the Morey tail suspension model was used to measure the atrophic responses of rat bone and muscle to 14-30 days of unloading of

the hindlimbs. The progress of atrophy was measured by increases in methylene diphosphonate (MDP) uptake. It is found that bone uptake of methylene diphosphonate followed a phasic pattern similar to changes in the bone formation rate of immobilized dogs and cats. Increased MDP uptake after a period of 60 days indicated an accelerated bone metabolism. Maximum muscle atrophy in the suspended rats was distinctly different from immobilization atrophy. On the basis of the experimental results, it is concluded that the tail suspension model is an adequate simulation of bone atrophy due to suspension. I.H.

A85-34367 INFLUENCE OF EXERCISE TRAINING ON REACTIVITY AND CONTRACTILITY OF ARTERIAL STRIPS FROM HYPERTENSIVE RATS

J. G. EDWARDS, C. M. TIPTON, and R. D. MATTHES (Iowa, University, Iowa City, IA) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 58, May 1985, p. 1683-1688. refs (Contract NIH-HL-21245; NIH-HL-29099-01)

Helical strips from different rat arteries (femoral, aorta, and renal) were obtained following running and swimming exercise, in order to study the relationship between lowered resting blood pressure and vascular reactivity and contractility in hypertensive rats. Training effects were measured in terms of changes in muscle aerobic enzymes; maximum O₂ consumption; and body weight. Norepinephrine added to the testing chamber containing the helical strips did not induce any changes in reactivity which were attributable to exercise training. However, trained hypertensive rats exhibited a trend toward lower contractility in some of the strips. On the basis of the experimental results, it is concluded that the lowered resting blood pressures associated with exercise training cannot be explained by changes in vascular reactivity alone. I.H.

A85-34423* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

OSSEOUS ADAPTATION TO CONTINUOUS LOADING OF RIGID ENDOSSEOUS IMPLANTS

W. E. ROBERTS (NASA, Ames Research Center, Moffett Field; University of the Pacific, San Francisco, CA), R. K. SMITH, P. G. MOZSARY (University of the Pacific, San Francisco, CA), Y. ZILBERMAN (Jerusalem, Hebrew University, Jerusalem, Israel), and R. S. SMITH (Engineering Enterprises, San Jose, CA) *American Journal of Orthodontics* (ISSN 0002-9416), vol. 86, Aug. 1984, p. 95-111. refs (Contract NAGW-356; NCC2-224; NIH-S07-RR-95301)

The effect of loading on etched Ti implants in the femurs of young (3 mo) and adult (6 mo) rabbits is investigated experimentally. The results are presented in photographs, fluorescence and polarization micrographs, radiographs, and drawings and discussed. Implantation is followed by formation of coarse woven bone within 3 d and mature lamellar bone by 6 wks, with nonspecific subperiosteal bony hypertrophy in the young rabbits only. Spring loading at 100 g produces spontaneous spiral-type fractures when applied immediately, but the implants remain rigid when loads are applied after 6-12 wks of healing. The mechanisms of bone formation involved are examined, and the potential of endosseous implants as anchors in orthodontics or dentofacial-orthopedics is confirmed. T.K.

A85-34681 STIMULATION OF CONNECTIVE TISSUE CELL GROWTH BY SUBSTANCE P AND SUBSTANCE K

J. NILSSON, C.-J. DALSGAARD (Karolinska Institutet, Stockholm, Sweden), and A. M. VON EULER (Stockholm, Universitet, Stockholm, Sweden) *Nature* (ISSN 0028-0836), vol. 315, May 2, 1985, p. 61-63. Research supported by the Medicinska Forskningsradet, King Gustaf V 80th Birthday Fund, Karolinska Institutet, Magnus Bergvalls Stiftelse, Tore Nilsons Fond, Harald and Greta Jeansson's Stiftelse, Swedish National Association against Heart and Lung Disease and SRA. refs

It is reported that substance P and substance K stimulate DNA synthesis in cultured arterial smooth muscle cells and human skin fibroblasts, and that this stimulation is inhibited by the substance

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P-antagonist spantide. The results demonstrate that substance P and substance K, two structurally related neurotransmitters belonging to the tachykinin family which are found in both the central and peripheral nervous system, may act as mitogens for connective tissue cells. The data also suggest a possible role for tachykinins in wound healing. C.D.

A85-34891

THE POSSIBLE EFFECT OF NATURAL RADIOACTIVITY ON GLYKOKINASE SYNTHESIS INDUCTION IN THE LIVER OF DEVELOPING RATS [K VOPROSU O VOZMOZHNO M VLIANII ESTESTVENNOI RADIOAKTIVNOSTI NA INDUKTSIIU SINTEZA GLIUKOKINAZY V PECHENI RAZVIVAIUSHCHIKHSIA KRYV]
L. V. SLOZHENIKINA, L. A. FIALKOVSKAIA, V. N. PRIMAK-MIROLIUBOV, and A. M. KUZIN (Akademiia Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Radiobiologiya (ISSN 0033-8192), vol. 25, Mar.-Apr. 1985, p. 227-230. In Russian. refs

A85-34892

THE ROLE OF HYPOXIC MECHANISMS IN THE RADIOPROTECTIVE ACTION OF PHENYLEPHRINE HYDROCHLORIDE [O ROLI GIPOKSICHESKOGO MEKHA NIZMA V RADIOZASHCHITNOM DEISTVII MEZATONA]
A. A. ORLOVSKII and L. M. ROZHDESTVENSKII (Ministerstvo Zdravookhraneniia SSSR, Institut Biofiziki, Moscow, USSR) Radiobiologiya (ISSN 0033-8192), vol. 25, Mar.-Apr. 1985, p. 230-234. In Russian. refs

Coupled estimates of hypoxytension and the radioprotective effect of phenylephrine hydrochloride are presented, based on experiments with narcotized guinea pigs. The dosage of phenylephrine hydrochloride used in the experiments was 5 mg/kg, and the maximum X-ray dose was 6.2 gr. Statistical analysis of the experimental results showed that the physiological mechanisms for the regulation of hypoxia did not contribute to the radioprotective effect of phenylephrine hydrochloride. I.H.

A85-34893

MATHEMATICAL MODELING OF THE INACTIVATION OF CELLS DUE TO RADIATION [K MATEMATICHESKOMU MODELIROVANIU RADIATSIONNOI INAKTIVATSII KLETOK]
I. V. FILIUSHKIN and I. N. BRAGIN (Ministerstvo Zdravookhraneniia SSSR, Institut Biofiziki, Moscow, USSR) Radiobiologiya (ISSN 0033-8192), vol. 25, Mar.-Apr. 1985, p. 273-277. In Russian. refs

Experimental data from the literature were fitted to a number of mathematical models in order to find a suitable model of the processes of mammalian cell inactivation due to radiation. Statistical correlations were revealed between the model survival curves of Kellerer and Rossi (1972) and Leenhouts and Chadwick (1978), and the approximated experimental data. It is shown that the rough statistical agreement between model predictions and some sets of experimental data was not sufficient to establish the theoretical value of the mathematical model. Experimental data based on many millions of similar biological objects are recommended as a basis for statistical criteria in future modeling experiments. I.H.

A85-34894

EXPERIMENTAL NEUROSES [EKSPERIMENTAL'N YE NEVROZY]

M. G. AIRAPETIANTS (Akademiia Nauk SSSR, Institut Vyshei Nervnoi Deiatei'nosti i Neirofiziologii, Moscow, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 16, Apr.-June 1985, p. 8-32. In Russian. refs

The history of research in the field of experimental neurosis is reviewed, with emphasis on some current issues. Consideration is given to the general features of nervous system activity, vegetative disorders, and sleep disturbances of animals in experimentally induced neurotic states. Data are also presented concerning the changes in cerebral microstructure and brain electrical activity which occur in response to neurotic stimuli. Some possible pathogenic

mechanisms of neurosis are examined, with particular attention given to cerebral hypoxia. I.H.

A85-34895

THE METABOLIC EFFECTS OF NEUROHYPOPHYSEAL HORMONES [METABOLICHESKOE DEISTVIE NEIROGIFIZARNYKH GORMONOV]

I. O. ABELSON (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 16, Apr.-June 1985, p. 33-60. In Russian. refs

Experimental data are reviewed concerning the effects of neurohypophyseal hormones (vasopressin and oxytocin) on the regulation of metabolic processes in mammals. Consideration is given to: the effects of vasopressin and oxytocin on enzymatic processes in the water and fat metabolism of the liver and fatty tissues; and hormonal processes in the regulation of glucose and fatty acid content in the blood. The effects of vasopressin and oxytocin on salt-water metabolism and arterial pressure are also discussed. I.H.

A85-34896

THE BLOOD-BRAIN BARRIER DURING EMOTIONAL STRESS [GEMATO-ENTSEFALICHESKII BAR'ER PRI EMOTSIONAL'NOM STRESSE]

T. I. BELOVA (Akademiia Meditsinskikh Nauk SSSR, Institut Normal'noi Fiziologii, Moscow, USSR) and I. UNSON (Karolinska Institutet, Stockholm, Sweden) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 16, Apr.-June 1985, p. 61-76. In Russian. refs

Experimental data are presented on the relationship between emotional stress and the permeability of the blood brain barrier of the brain stem. It is shown that long term immobilization stress in rats can lead to a significant loss of permeability in the blood brain barrier of the oral and caudal regions of the reticular brain stem. The effectiveness of pharmacological compounds in enhancing the permeability of the blood brain barrier is discussed with reference to the available data. It is suggested that damage to the oral and caudal regions due to changes in the permeability of the blood brain barrier is one of the factors contributing to the impairment of self-regulating physical functions during immobilization stress. I.H.

A85-34897

THE CELLULAR AND MOLECULAR BASES OF PROSTAGLANDIN ACTIVITY IN THE NERVOUS SYSTEM [KLETOCHNO-MOLEKULIARNYE OSNOVY UCHASTIYA PROSTAGLANDINOV V DEIATEL'NOSTI NERVNOI SISTEMY]

A. I. GROMOV, V. P. NIKITIN, and V. V. SHERSTNEV (Akademiia Meditsinskikh Nauk SSSR, Institut Normal'noi Fiziologii, Moscow, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 16, Apr.-June 1985, p. 77-97. In Russian. refs

Experimental results are presented concerning the role of prostaglandins in nervous system activity. Consideration is given to: the functional, structural and biochemical characteristics of prostaglandins in biologically active compounds; the molecular and cellular mechanisms of prostaglandin activity; and the physiological role of prostaglandins in regulating neuronal activity as a whole. The basic pathways of prostaglandin synthesis are illustrated in a table. I.H.

A85-35099* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

METHANE EMISSIONS TO THE ATMOSPHERE THROUGH AQUATIC PLANTS

D. I. SEBACHER, R. C. HARRISS (NASA, Langley Research Center, Hampton, VA), and K. B. BARTLETT (College of William and Mary, Williamsburg, VA) Journal of Environmental Quality (ISSN 0047-2425), vol. 14, Jan.-Mar. 1985, p. 40-46. NASA-supported research. refs

The movement of methane (CH₄) from anaerobic sediments through the leaves, stems, and flowers of aquatic plants and into the atmosphere was found to provide a significant pathway for

the emission of CH₄ from the aquatic substrates of flooded wetlands. Methane concentrations well above the surrounding ambient air levels were found in the mesophyll of 16 varieties of aquatic plants and are attributed to transpiration, diffusion, and pressure-induced flow of gaseous CH₄ from the roots when they are embedded in CH₄-saturated anaerobic sediments. Methane emissions from the emergent parts of aquatic plants were measured using floating chamber techniques and by enclosing the plants in polyethylene bags of known volume. Concentration changes were monitored in the trapped air using syringes and gas chromatographic techniques. Vertical profiles of dissolved CH₄ in sediment pore water surrounding the aquatic plants' rhizomes were obtained using an interstitial sampling technique. Methane emissions from the aquatic plants studied varied from 14.8 mg CH₄/d to levels too low to be detectable. Rooted and unrooted freshwater aquatic plants were studied as well as saltwater and brackish water plants. Included in the experiment is detailed set of measurements on CH₄ emissions from the common cattail (*Typha latifolia*). This paper illustrates that aquatic plants play an important gas exchange role in the C cycle between wetlands and the atmosphere. Author

A85-35226

REGIONAL CIRCULATORY CHANGES FOLLOWING MASSIVE BLOOD LOSS DURING IMMOBILIZATION STRESS [REGIONARNYE IZMENENIYA KROVOOBRASHCHENIYA POSLE MASSIVNOI KROVOPOTERI NA FONE IMMOBILIZATSIONNOGO STRESSA]

O. A. KOVALEV, S. K. SHEREMETEVSKAYA, and M. V. PROTASOV (Leningradskii Institut Uovershenstvovaniya Vrachey, Leningrad, USSR) Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya (ISSN 0031-2991), Mar.-Apr. 1985, p. 15-18. In Russian. refs

A85-35227

THE MECHANISMS OF ADAPTATION TO BLOOD LOSS IN VERTEBRATES [MEKHANIZMY ADAPTATSII POZVONOCHNYKH K POTERE KROVI]

A. I. TIUKAVIN and G. S. MAZURKEVICH (Nauchno-Issledovatel'skii Institut Skoroi Pomoshchi, Leningrad, USSR) Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya (ISSN 0031-2991), Mar.-Apr. 1985, p. 18-22. In Russian. refs

Experimental results are presented concerning the relative effectiveness of blood loss adaptation mechanisms in the vertebrate animals (amphibians, birds, reptiles, and mammals). It is shown that the resistance of the animals to blood loss (25 percent of the total circulating volume) was greatest among the amphibians, followed by the reptiles, birds, and mammals, respectively. In the lower vertebrates and the birds, hypovolemia was compensated by the introduction of extravascular fluid into circulation to permit the maintenance of cardiac output. In the mammals, however, the total peripheral resistance of the blood and systemic arterial pressure increased in response to blood loss, leading to equivalent reductions in plasma circulating volume and cardiac output. The complete experimental results are given in a table. I.H.

A85-35228

VARIATION IN THE SERUM FIBRONECTIN LEVEL AND THE RETICULOENDOTHELIAL SYSTEM DUE TO BURNS AND RADIATION INJURY [IZMENENIYE UROVNYA SYVOROTOCHNOGO FIBRONEKTINA I SOSTOIANIE RETIKULOENDOTELIAL'NOI SISTEMY PRI OZHOGAKH I RADIATSIONNO-TERMICHESKIKH PORAZHENIYAKH]

R. S. BUDAGOV, A. V. KONOV, V. N. PETROV, V. K. PODGORODNICHENKO, and L. N. CHUREEVA (Akademiya Meditsinskikh Nauk SSSR, Nauchno-Issledovatel'skii Institut Meditsinskoi Radiologii, Obninsk, USSR) Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya (ISSN 0031-2991), Mar.-Apr. 1985, p. 27-29. In Russian. refs

A85-35229

THE EFFECT OF ADAPTATION TO HIGH-ALTITUDE HYPOXIA ON MICROCIRCULATION IN RATS DURING THE INITIAL STAGE OF BURN SHOCK [VLIANIE ADAPTATSII K VYSOTNOI GIPOKSII NA MIKROTSIRKULIATSIIU U KRYSA V RANNEM PERIODE OZHOGOVOGO SHOKA]

Z. R. ATADZHANOVA (Akademiya Meditsinskikh Nauk SSSR, Nauchno-Issledovatel'skii Institut Obshchei Patologii i Patologicheskoi Fiziologii, Moscow, USSR) and I. U. M. SHTYKHNO Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya (ISSN 0031-2991), Mar.-Apr. 1985, p. 30-32. In Russian. refs

A85-35230

THE MITOCHONDRIAL METABOLISM AND LYSOSOMAL STRUCTURE OF RABBIT LIVER CELLS IN THE PRESENCE OF BURN SHOCK [SOSTOIANIE MITOKHONDRII I LIZOSOMAL'NOGO APPARATA KLETOK PECHENI KROLIKOV PRI OZHOGOVOM SHOKE]

L. V. SLEPNEVA, M. I. REMIZOVA, and N. I. KOCHETYGOV (Leningradskii Nauchno-Issledovatel'skii Institut Gematologii i Perelivaniya Krovi, Leningrad, USSR) Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya (ISSN 0031-2991), Mar.-Apr. 1985, p. 32-36. In Russian. refs

A85-35231

THE EFFECT OF MEDIUM MOLECULAR BLOOD PEPTIDES ON THE PERMEABILITY OF THE BLOOD-BRAIN BARRIER IN HEALTHY DOGS AND IN DOGS WITH BURNS [VLIANIE SREDNEMOLEKULIARNYKH PEPTIDOV KROVI SOBAK ZDOROVYKH I S OZHOGAMI NA PRONITSAEMOST' GEMOENTSEFALICHESKOGO BAR'ERA]

B. M. VALDMAN, I. A. VOLCHEGORSKII, and R. I. LIFSHITS (Cheliabinskii Meditsinskii Institut, Chelyabinsk, USSR) Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya (ISSN 0031-2991), Mar.-Apr. 1985, p. 36-40. In Russian. refs

A85-35232

THE EFFECT OF PYRIDOXINE, RIBOFLAVIN, AND GLUTAMINIC ACID ON LYSOSOMAL HYDROLASE ACTIVITY IN THE LIVER AND KIDNEYS OF RATS IN THE PRESENCE OF SEVERE MECHANICAL TRAUMA [VLIANIE PIRIDOKSINA, RIBOFLAVINA I GLUTAMINOVOI KISLOTY NA AKTIVNOST' LIZOSOMAL'NYKH GIDROLAZ PECHENI I POCHEK KRYSA PRI TIAZHELOI MEKHANICHESKOI TRAVME]

L. N. KOBLYANSKII, L. I. AVRENEVA, A. V. VASILEV, L. V. KRAVCHENKO, and V. A. TUTELIAN (Akademiya Meditsinskikh Nauk SSSR, Institut Pitaniya, Moscow, USSR) Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya (ISSN 0031-2991), Mar.-Apr. 1985, p. 44-48. In Russian. refs

A85-35233

RESPIRATION PATTERNS DURING HEMORRHAGIC SHOCK [PATTERN DYKHANIYA PRI GEMORRAGICHESKOM SHOKE]

O. S. NASONKIN, I. B. VORONOV, A. A. BUDKO, N. I. RUKOIATKINA, and A. L. ZIMIN (Voenno-Meditsinskaya Akademiya; Akademiya Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya (ISSN 0031-2991), Mar.-Apr. 1985, p. 52-55. In Russian. refs

Variations in the respiratory cycle due to hemorrhagic shock have been investigated experimentally in 13 cats. The breathing indices examined were: inspiration time (TI), expiration time (TE), and single breath volume (VT). It is found that TI and TE were shorter when systemic arterial pressure decreased from an initial level of 60 mm/Hg due to blood loss. Further decreases in arterial pressure were associated with increases in TI and TE, as well as an increase in the minute respiratory volume. Agonal breathing was characterized by gasping inspirations which diminished the (percent) contribution of inspiration to the respiratory cycle. The respiratory rhythm tension index (RRTI), and the stability index (SI) increased at the beginning of hemorrhagic shock and decreased progressively. It is suggested that the decrease in RRTI

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following the onset of hemorrhagic shock was due to the intensification of respiration work during gasping inspiration. I.H.

A85-35465

GRAVITATIONAL SENSITIVITY AND GROWTH OF PLANTS UNDER CONDITIONS OF ZERO GRAVITY [GRAVITATSIONNAIA CHUVSTVITEL'NOST' I ROST RASTENII V USLOVIAKH NEVESOMOSTI]

A. I. MERKIS, R. S. LAURINAVICHUIS, and D. V. SHVIAGZHDENE (Vsesoiuznyi Seminar po Gidromekhanike i Teplomassoobmenu v Nevesomosti, 3rd, Chernogolovka, USSR, Jan.-Feb. 1984) Akademiia Nauk SSSR, Izvestiia, Seriiia Fizicheskaiia (ISSN 0367-6755), vol. 49, April 1985, p. 715-723. In Russian. refs

Experiments conducted on board the Salyut-7 orbital station are reported in which the growth and the geotropic motions of the roots and hypocotyls of lettuce (*Lactuca sativa*) were studied under stationary conditions (g equal to zero or greater) and in a centrifuge ($g = 0.01, 0.1, \text{ or } 1$). An analysis of experimental results shows that a complete plant development cycle is possible under conditions of a space flight; the seeds produced are shown to be fully adequate. V.L.

A85-35466

ELECTROPHORESIS UNDER CONDITIONS OF ZERO GRAVITY - STATE OF THE ART [ELEKTROFOREZ V USLOVIAKH NEVESOMOSTI - SOSTOIANIE PROBLEMY]

V. G. BABSKII (Vsesoiuznyi Seminar po Gidromekhanike i Teplomassoobmenu v Nevesomosti, 3rd, Chernogolovka, USSR, Jan.-Feb. 1984) Akademiia Nauk SSSR, Izvestiia, Seriiia Fizicheskaiia (ISSN 0367-6755), vol. 49, April 1985, p. 724-730. In Russian. refs

Current theoretical and experimental research in the field of the electrophoresis of cells and biologically active substances in the microgravity environment is reviewed. A classification of electrophoresis types based on the behavior of the electrophoresis zone is presented, the results of major experiments in space are summarized, and the specific difficulties and problems involved in this kind of experiment are discussed. Work concerned with the mathematical description of the electrophoresis process is briefly reviewed. V.L.

A85-35518

LINEAR ELASTIC PROPERTIES OF TRABECULAR BONE - A CELLULAR SOLID APPROACH

K. RAJAN (National Aeronautical Establishment, Ottawa, Canada) Journal of Materials Science Letters (ISSN 0261-8028), vol. 4, May 1985, p. 609-611. refs

A85-35575* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

IMMUNOCYTOCHEMICAL LOCALIZATION OF GLIAL FIBRILLARY ACIDIC PROTEIN (GFAP) IN THE AREA POSTREMA OF THE CAT - LIGHT AND ELECTRON MICROSCOPIC STUDY

F. E. DAMELIO, M. A. GIBBS, W. R. MEHLER (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, CA), and L. F. ENG (U.S. Veterans Administration Medical Center, Palo Alto, CA) Brain Research (ISSN 0006-8993), vol. 330, 1985, p. 146-149. refs
(Contract NCC2-282)

Glial fibrillary acidic protein (GFAP) was demonstrated in the cytoplasm and processes of ependymal cells and astroglial components of the area postrema of the cat. These observations differ from the findings in the ependyma of the ventricular cavities which are consistently negative for the protein. Since some studies have suggested sensory functions of the glial cells in this emetic chemoreceptor trigger zone, a careful consideration of morphological and biochemical attributes of these cells seems appropriate. Author

A85-35824

QUANTITATIVE MORPHOLOGY AND THE MATHEMATICAL MODELLING OF A MYOCARDIAL INFARCT [KOLICHESTVENNAIA MORFOLOGIIA I MATEMATICHESKOE MODELIROVANIE INFARKTA MIOKARDA]

G. G. AVTANDILOV, N. I. IABLUCHANSKII, K. D. SALBIEV, and L. M. NEPOMNIASHCHIKH Novosibirsk, Izdatel'stvo Nauka, 1984, 288 p. In Russian. refs

Consideration is given to the theoretical basis for a quantitative description of myocardial infarction in man. The results of a morphometric and stereological study of myocardial infarcts in animals are used to develop a numerical model of healing processes following an infarct event. Numerical data for a multivariable correlation and regression analysis of the clinical symptoms of myocardial infarctions are given in an appendix. I.H.

A85-35880

COMPENSATORY REORGANIZATION OF THE VISCERAL ANALYZER [KOMPENSATORNAIA REORGANIZATSIIA VISTSERAL'NOGO ANALIZATORA NA UROVNE NEOKORTEKSA]

M. S. SINIAIA, V. L. SILAKOV, G. I. MGALOBILISHVILI, and V. V. SENATOROV (Akademiia Meditsinskikh Nauk SSSR, Nauchno-Issledovatel'skii Institut Eksperimental'noi Meditsiny; Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 281, no. 6, 1985, p. 1500-1502. In Russian. refs

Neuronal activity in the cortical region of the vestibular analyzer was investigated experimentally in two groups of cats: a group with intact cortices; and a group whose cortices were separated by surgical isolation of the right brain hemisphere. Neuronal activity was recorded following electrical stimulation at a frequency of 100 Hz for 0.5 milliseconds. It is found that complete isolation of the right brain hemisphere led to significant disruption of somatosensory neuron S(1) activity in the cortical region of the vestibular analyzer two hours after surgery. Some possible mechanisms for the observed disruption of S(1) activity are discussed. I.H.

A85-36000* University of the Pacific, San Francisco, Calif. **CIRCADIAN RHYTHM OF MECHANICALLY MEDIATED DIFFERENTIATION OF OSTEOBLASTS**

W. E. ROBERTS, P. G. MOZSARY (University of the Pacific, San Francisco, CA), and E. KLINGLER (Paris V, Universite, Paris, France) Calcified Tissue International (ISSN 0008-0594), vol. 36, 1984, p. S62-S66. Research supported by the Pacific Dental Research Foundation. refs
(Contract NIH-DE-05135; NIH-S07-RR-05301; NAGW-356; NCA2-OR-588-002)

The differential of osteoblasts in response to orthodontic pressure in the periodontal ligament of the maxillary-first-molar periodontal ligaments of 12-h-light/dark-entrained 7-wk-old male Simonsen outbred rats is measured by (H-3)-Thymidine nuclear-volume morphometry (Roberts et al., 1983) at hourly intervals throughout the circadian cycle. The results are presented in graphs and discussed. Preosteoblast large nuclei (D-cells) are found to synthesize DNA mainly in light and to divide in the following dark period, while small-nucleus osteoprogenitors (A-cells) synthesize in darkness and divide in light. These findings are seen as consistent with a model in which the sequence of proliferation and differentiation requires at least 60 h (five 12-h periods) and the shift from A to D cells lasts about 19 h. T.K.

A85-36447

EUROPEAN FACILITIES FOR LIFE SCIENCES RESEARCH IN SPACE

M. J. F. FOWLER (Royal Free Hospital, London, England) and H. OSER (ESA, Microgravity Office, Paris, France) IN: Space: A developing role for Europe; Proceedings of the Eighteenth European Space Symposium, London, England, June 6-9, 1983. San Diego, CA, Univelt, Inc., 1984, p. 13-18. refs (AAS PAPER 83-501)

The status of ESA life-sciences payload components for use in Spacelab is reviewed. Consideration is given to the Space Sled (for testing human responses to linear acceleration in microgravity), the Biorack (for observing the growth and development of small specimens such as cells, seeds, bacteria, or insect eggs in microgravity), the Anthrorack (for advanced human-physiology studies), and the botany facility for the European Retrievable Carrier (for longer-term microgravity plant-growth experiments). Diagrams and a photograph are included. T.K.

A85-36602

THE EFFECT OF DELTA-SLEEP PEPTIDE ON ERYTHROCYTE MEMBRANES AT LOW TEMPERATURE [VLIANIE PEPTIDA DEL'TA-SNA NA SOSTOIANIE MEMBRAN ERITROTSITOV PRI DEISTVII NIZKOI TEMPERATURY]

T. I. BONDARENKO, A. A. KRICHEVSKAIA, E. I. KRUPENNIKOVA, and I. I. MIKHALEVA (Rostovskii Gosudarstvennyi Universitet, Rostov-on-Don, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, March 1985, p. 279-282. In Russian. refs

The effect of delta-sleep peptide on erythrocyte membranes at low temperatures. It is found that three days of exposure to temperatures in the range 0-2 C increased the concentration of erythrocyte hemoglobin in the blood serum of test animals by 64 percent in comparison with normal animals. Glucose-6-phosphatodehydrogenase (G6PhD) activity was increased by 231 percent. Following administration of delta-sleep peptide (DSIP) in doses of 6.12 micrograms per 100 g body weight, increases in G6PhD activity of 256 percent were observed in comparison with normal control animals. Administration of DSIP in doses of 12 and 18 micrograms/100 g body weight increased G6PhD activity by 156.6 and 90.6 percent, respectively. Erythrocyte hemoglobin content and G6PhD activity stabilized at a dose level of 12 micrograms/100 g body weight. The complete experimental results are given in a table. I.H.

A85-36603

THE STATUS OF AND PERSPECTIVES IN THE STUDY OF THE MECHANISMS OF RESPIRATORY CONTROL [SOSTOIANIE I PERSPEKTIVY IZUCHENIIA MEKHANIZMOV REGULIATSII DYKHANIIA]

I. S. BRESLAV and G. G. ISAEV (Akademii Nauk SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, March 1985, p. 283-292. In Russian. refs

The state of current physiological knowledge concerning the mechanisms of respiratory control is described with reference to a number of experimental results. Consideration is given to the origins of three major respiratory system phenomena, the mechanism for generating respiratory rhythm; the role of medullary and chemosensitive structures in regulating respiratory activity; and the adaptation of the respiratory system to the changing energy requirements of the muscles during exercise. The connection between the organization of respiratory neurons in the brain stem and the rhythmogenesis of respiration is discussed in detail. I.H.

A85-36604

THE EXTERNAL RESPIRATION RESPONSE TO HYPERCAPNEA IN ALERT DOGS [REAKTSII VNESHNEGO DYKHANIIA BODRSTVUIUSHCHIKH SOBAK NA GIPERKAPNIU]

E. A. KONZA (Akademii Nauk SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, March 1985, p. 310-315. In Russian. refs

A85-36605

RESPONSE OF THE RABBIT RESPIRATORY SYSTEM TO AN HYPOXIC NITROGEN-OXYGEN MIXTURE UNDER INCREASED PRESSURE [REAKTSIIA SISTEMY DYKHANIIA KROLIKOV NA GIPOKSICHESKII STIMUL V AZOTNO-KISLORODNOI SREDE POD POVYSHENNYM DAVLENIEM]

ZH. A. DONINA (Akademii Nauk SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, March 1985, p. 316-319. In Russian. refs

A85-36606

MEASURES OF THE PROPERTIES OF BLOOD-OXYGEN TRANSPORT AND ERYTHROPOIESIS IN RATS FOLLOWING PROLONGED EXPOSURE TO NITROGEN-OXYGEN GAS MIXTURE UNDER INCREASED PRESSURE [POKAZATELI KISLORODTRANSPORTNYKH SVOISTV KROVI I ERITROPOEZA U KRYV POSLE PREBYVANIA V AZOTNO-KISLORODNOI SREDE POD POVYSHENNYM DAVLENIEM]

A. M. VOLZHSKAIA, G. V. TROSHIKHIN, and T. E. SHUMILOVA (Akademii Nauk SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, March 1985, p. 320-323. In Russian. refs

A85-36607

VARIATION IN THERMAL EMISSION OF MICE FOLLOWING EXPERIMENTAL HYPOXIA [IZMENENIIA TEPLOOTDACHI U MYSHEI POSLE EKSPERIMENTAL'NOI GIPOKSII]

A. S. SEPI SHEVA (Akademii Nauk Kirgizskoi SSR, Institut Fiziologii i Eksperimental'noi Patologii Vysokogor'ia, Frunze, Kirgiz SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, March 1985, p. 324-327. In Russian. refs

Direct calorimetry was used to measure changes in the emission of heat from white mice following exposure to a hypoxic breathing mixture in a pressure chamber. Temperatures in the pressure chamber corresponded to seasonal and variations, the winter temperature was 18 C and the summer temperature was 22 C. Following periodic exposure to the hypoxic breathing hypoxia, the body temperatures of the animals decreased by 5.7 for the summer temperature, and 1.6 for the summer temperature. No variations in body temperature were observed in animals not receiving the hypoxic breathing mixture. I.H.

A85-36608

THE QUANTITATIVE ASSESSMENT AND PREDICTION OF THE BIOLOGICAL EFFECTS OF HYPEROXIA [O KOLICHESTVENNOI OTSENKE I PROGNOZIROVANII BIOLOGICHESKIKH EFFEKTOV GIPEROKSII]

A. V. FILATOV, A. N. LEONOV, K. M. REZNIKOV, and I. K. CHERNYKH (Voronezhskii Meditsinskii Institut, Voronezh, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, March 1985, p. 328-332. In Russian. refs

Hyperoxia was induced in 104 white mice at pressure levels corresponding to three the onset of three hyperoxic effects: bradypnea; convulsions and death. Comparison of the experimental results with the predictions showed that the severity of toxic effects of hyperoxia was directly related to the two components of the oxygenation regimen, the oxygen pressure level and exposure time. The concept of an 'integral dose' is proposed to describe the pressure-exposure correlations for a number of hyperoxic environments. A minimal integral oxygen dose of 6400 GPa/50 min is found to be the lethal level for mice. I.H.

A85-36609

HOMOCARNOSINE IN THE RAT BRAIN DURING ADAPTATION TO THE COLD [GOMOKARNOZIN V GOLVOVNOM MOZGU KRYV PRI KHOLODOVOI ADAPTATSII]

T. I. BONDARENKO, A. A. KRICHEVSKAIA, and G. N. KOSHCHII (Rostovskii Gosudarstvennyi Universitet, Rostov-on-Don, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, March 1985, p. 333-336. In Russian. refs

It is found that 24-hour exposure to low temperatures of 2 C decreased the content of homocarnosine the brains of rats by

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47.5 percent. Homocarnosine content was decreased by 51.2 percent after three days of exposure to the cold, and by 62.2 percent after seven days. In rats adapted to the cold over a period of 45 days, homocarnosine remained 56.5 percent below basal levels. Some possible mechanisms for the depressed levels of homocarnosine in response to cold are discussed. I.H.

A85-36610

AN INVESTIGATION OF THE EFFECTIVENESS OF MUSCULAR WORK IN WHITE RATS ADAPTED TO COLD [ISSLEDOVANIIE EFFEKTIVNOSTI RABOTY MYSHTS U BELYKH KRYYS PRI ADAPTATSII K KHOLODU]

E. IA. TKACHENKO and M. A. IAKIMENKO (Akademiia Meditsinskikh Nauk, Institut Klinicheskoi i Eksperimental'noi Meditsiny, Novosibirsk, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 71, March 1985, p. 337-340. In Russian. refs

A85-36611

THE ORGANIZATION OF THE DAILY WAKEFULNESS-SLEEP CYCLE AND ENERGY METABOLISM OF RATS AT LOW AMBIENT TEMPERATURE [VNUTRISUTOCHNAIA ORGANIZATSIIA TSIKLA 'BODRSTVOVANIE-SON' I ENERGETICHESKII METABOLIZM U KRYYS PRI DEISTVII NIZKIO TEMPERATURY SREDI]

V. S. SAZONOV and I. U. F. PASTUKHOV (Akademiia Nauk SSSR, Institut Biologicheskikh Problem Severa, Magadan, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 71, March 1985, p. 342-347. In Russian. refs

A85-36612

INFRASLOW ACTIVITY AND BRAIN TEMPERATURE DURING EMOTIONAL STRESS TESTS [SVERKHMEDLENNAIIA AKTIVNOST' I TEMPERATURA MOZGA PRI TESTAKH EMOTSIONAL'NOGO NAPRIAZHENIIA]

I. A. LAPINA, I. K. IAICHNIKOV, and E. I. U. POLTAVCHENKO (Akademiia Meditsinskikh Nauk, Institut Eksperimental'noi Meditsiny, Leningradskii Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 71, March 1985, p. 348-353. In Russian. refs

Infraslow electrical activity (zeta and epsilon waves) and brain temperature were recorded simultaneously in rabbits. It is found that stimulation of the gyrus cinguli increased the amplitude and decreased frequency of infraslow activity and reduced the frequency stimulation of the hypothalamus led to variations in infraslow ac activity and elevated brain temperature. The administration of antihypoxant drugs following stimulation was found to mediate the effects of stimulation. I.H.

A85-36613

THE SPECIFIC RESPONSES OF THERMORECEPTORS LOCATED IN DIFFERENT LAYERS OF THE SKIN [OSOBENNOSTI REAKTSII TERMORETSEPTOROV, RASPOLOZHENNYKH V RAZLICHNYKH SLOIAKH KOZHII]

N. K. DANILOVA (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 71, March 1985, p. 354-359. In Russian. refs

Discharges of different skin cold-thermoreceptors in response to abrupt temperature changes were used to develop a classification of five different types of thermoreceptor. The different groups in the classification were selected according to the following criteria: the latency of the thermoreceptor response; the reverse pattern of intensity of the response; and the length of the response delay. It is shown that the quantitative differences in the responses are closely related to the depth of the thermoreceptor in the skin. A list of the thermoreceptor classifications is given. I.H.

A85-36614

AMYLASE FIXATION BY THE VASCULAR ENDOTHELIUM [DINAMIKA SODERZHANIIA MIKROELEMENTOV V KROVI I VNUTRENNIKH ORGANAKH ZHIVOTNYKH PRI MYSHECHNYKH NAGRUZKAKH RAZLICHNOI INTENSIVNOSTI]

V. IA. RUSIN, V. V. NASOLODIN, V. A. VOROBEV, and T. N. KHRUSTALEVA (Iaroslavskii Gosudarstvennyi Pedagogicheskii Institut; Iaroslavskii Gosudarstvennyi Universitet, Yaroslavl, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 71, March 1985, p. 377-380. In Russian. refs

N85-25326# Joint Publications Research Service, Arlington, Va. **SECOND SOVIET-FRENCH SYMPOSIUM ON SPACE TECHNOLOGY**

V. P. OVCHAROV *In its USSR Rept.: Space (JPRS-USP-85-003)* p 46 4 Mar. 1985 Transl. into ENGLISH from Sov. Estoniya (USSR), 1 Dec. 1984 p 3

Avail: NTIS HC A08/MF A01

Results of the latest joint experiments and plans for further scientific cooperation were the focus of attention for participants in the second Soviet-French symposium on space cytology. The subjects of the discussion are of space biology and medicine, space cytology studies the effects of space flight factors, particularly zero gravity, on the activity of life's primary units--animal and plant cells. Functional impairments which are observed in cosmonauts are reviewed during flights are reversible; the disappear following the return to the development of methods and instruments which would make it possible to observe changes on the cellular level directly in orbit are discussed. Researchers in the field of space cytology have to solve a considerable number of complex problems; they have to develop automatic methods for growing cell cultures in orbit and thoroughly ascertain how zero gravity affects the structure, metabolism and functions of cells. Author

N85-25327# Joint Publications Research Service, Arlington, Va. **PLASMODIUM OF MYXOMYCETE AS RESEARCH OBJECT IN GRAVITATIONAL BIOLOGY Abstract Only**

M. G. TAIRBEKOV, S. I. BEYLINA, D. B. LAYRAND, A. A. BUDNITSKIY, and V. V. LEDNEV *In its USSR Rept.: Space (JPRS-USP-85-003)* p 48 4 Mar. 1985 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Biologicheskaya (USSR), no. 2, Mar.-Apr. 1984 p 48

Avail: NTIS HC A08/MF A01

The growth, morphology and migration of the plasmodium were studied aboard the Cosmos 1129 biosatellite to ascertain the influence of changes in the concentration of culture medium components and various in flight factors. Gravitational effects were found which can be attributed primarily to energy processes in the cell. It appears that a myxomycete plasmodium can be regarded as a fundamental research object in gravitational biology for studying the effect of weightlessness on a cell. G.L.C.

N85-26053 Central Electricity Generating Board, London (England).

TWO-PHASE FLOW IN CENTRIFUGAL PUMPS

I. KOSMOWSKI 7 Mar. 1985 13 p refs Transl. into ENGLISH from Maschinenbautech. (East Germany), v. 29, no. 8, 1980 p 361-365

(BLL-CE-TRANS-8065-(9022.09)) Avail: British Library Lending Div., Boston Spa, England

To determine the specific energy of centrifugal pumps in two phase flow, it is necessary to consider a logarithmic term. Analysis of the energy computation with and without slip between the gas and liquid phase showed that under real conditions higher energy levels are achieved than is determined from homogeneous observation of two phase flow. As a result, there is a safety margin in the zero-slip computation of pump flow used in practice. The falling away observed in centrifugal pump characteristics as the gas volume flow fraction increases can be attributed to peculiarities in the behavior of two phase flows, which demands corresponding pump design. The selection of vane angle can also influence pump performance. A comparison of impellers with vane outlet angles

of Beta sub 2=30 and 90 deg. shows the influence of decreased output in two-phase flow. In some cases it is necessary to assume a considerable falling away in the theoretical characteristic due to the greater decreased output with backwards-curved blading. The decreased output is dependent on the gas volume flow fraction and the flow rate. Author

N85-26054*# National Aeronautics and Space Administration, Washington, D. C.
NASA SPACE BIOLOGY PROGRAM: 9TH ANNUAL SYMPOSIUM Abstracts Only
 T. W. HALSTEAD Apr. 1985 128 p refs Symp. held in Harper's Ferry, W. Va., 6-9 Nov. 1984 (NASA-CP-2336; NAS 1.55:2336) Avail: NTIS HC A07/MF A01 CSCL 06C

Topics covered include plant and animal gravity receptors and transduction; the role of gravity in growth and development of plants and animals; biological support structures and the role of calcium; mechanisms and responses of gravity sensitive systems; and mechanisms of plant responses to gravity.

N85-26055*# Michigan Univ., Ann Arbor. Dept. of Anatomy.
MAMMALIAN GRAVITY RECEPTORS: STRUCTURE AND METABOLISM Abstract Only
 M. D. ROSS *In* NASA. Washington NASA Space Biol. Program: p 5-6 Apr. 1985 (Contract NSG-9047) Avail: NTIS HC A07/MF A01 CSCL 06C

Calcium metabolism in mammalian gravity receptors is examined. To accomplish this objective it is necessary to study both the mineral deposits of the receptors, the otoconia, and the sensory areas themselves, the saccular and utricular maculas. The main focus was to elucidate the natures of the organic and inorganic phases of the crystalline masses, first in rat otoconia but more recently in otoliths and otoconia of a comparative series of vertebrates. Some of the ultrastructural findings in rat maculas, however, have prompted a more thorough study of the organization of the hair cells and innervation patterns in graviceptors. Author

N85-26056*# Eastern Virginia Medical School, Norfolk. Dept. of Pathology.
EFFECTS OF WEIGHTLESSNESS OF AURELIA EPHYRA DIFFERENTIATION AND STATOLITH SYNTHESIS Abstract Only
 D. B. SPANGENBERG *In* NASA. Washington NASA Space Biol. Program: p 7-8 Apr. 1985 refs (Contract NAGW-530) Avail: NTIS HC A07/MF A01 CSCL 06C

Aurelia polyps are especially suited for space flight experiments because they are very small (2 to 4 mm), form ephyrae with gravity sensing structures in 6 to 7 days, and can be reared easily and inexpensively in the laboratory. During iodine-induced metamorphosis ephyrae develop in sequential order from the oral to the aboral end of the polyps. Eight sites of gravity receptors (rhopalia) form per ephyra. These structures have sacs of statoliths at their distal end, which are composed of calcium sulfate dihydrate. Only one statolith forms per cell (statoocyte) and the cells collect at the distal end of the rhopalia forming statocysts. Rhopalia with statocysts are necessary for the righting reflex of swimming medusae. Using the Aurelia Metamorphosis Test System (Spangenberg, 1984) for the past eight months, the effects of clinostat rotation in the horizontal and vertical planes on the development of ephyrae and the synthesis of their statoliths were investigated. Author

N85-26057*# Millsaps Coll., Jackson, Miss. Dept. of Biology.
GRAVITY PERCEPTION IN A CLADOCERAN-ZOOPLANKTER: ANATOMY OF ANTENNAL SOCKET SETAE OF DAPHNIA MAGNA Abstract Only
 D. G. MEYERS *In* NASA. Washington NASA Space Biol. Program: p 9 Apr. 1985 (Contract NAGW-643) Avail: NTIS HC A07/MF A01 CSCL 06C

Night orientation in *Daphnia magna* was recently associated with setae on the basal socket of the swimming antennae. Daphnids are suspected of maintaining nocturnal equilibrium by monitoring the gravity vector through upward setal deflections caused by sinking between antennal swimming strokes. Setae appear to be hydrodynamic rheoceptors that sense the gravity vector indirectly by mechanoreceptivity to the direction and velocity of water currents. Neuroanatomical stains have revealed cell bodies at the base of the setal shafts, dendritic connections through to the distal ends of the shafts, and axonal tracts around the antennal socket connecting with an additional cell body and continuing toward the brain. These anatomical observations combined with previous scanning electron microscopy studies suggest that the setae are similar to mechanoreceptors and proprioceptors used by higher crustaceans to sense water currents and gravity, and maintained balance. Author

N85-26058*# Temple Univ., Philadelphia, Pa.
GRAVITY PERCEPTION AND CARDIAC FUNCTION IN THE SPIDER Abstract Only
 A. FINCK *In* NASA. Washington NASA Space Biol. Program: p 10 Apr. 1985 (Contract NAGW-242) Avail: NTIS HC A07/MF A01 CSCL 06C

The following features of the arachnid gravity system were studied. (1) the absolute threshold to hyper-gz is quite low indicating fine proprioceptive properties of the lyriform organ, the Gz/vibration detector; (2) the neurogenic heart of the spider is a good dependent variable for assessing its behavior to Gz and other stimuli which produce mechanical effects on the exoskeleton; (3) Not only is the cardiac response useful but it is now understood to be an integral part of the system which compensates for the consequences of gravity in the spider (an hydraulic leg extension); and (4) a theoretical model was proposed in which a mechanical amplifier, the leg lever, converts a weak force (at the tarsus) to a strong force (at the patella), capable of compressing the exoskeleton and consequently the lyriform receptor. Author

N85-26059*# Cornell Univ., Ithaca, N.Y.
AMYLOPLAST SEDIMENTATION KINETICS IN CORN ROOTS Abstract Only
 A. C. LEOPOLD and F. SACK *In* NASA. Washington NASA Space Biol. Program: p 13-14 Apr. 1985 (Contract NAGW-3) Avail: NTIS HC A07/MF A01 CSCL 06C

Knowledge of the parameters of amyloplast sedimentation is crucial for an evaluation of proposed mechanisms of root graviperception. Early estimates of the rate of root amyloplast sedimentation were as low as 1.2 micron/min which may be too slow for many amyloplasts to reach the vicinity of the new lower wall within the presentation time. On this basis, Haberlandt's classical statolith hypothesis involving amyloplast stimulation of a sensitive surface near the new lower wall was questioned. The aim was to determine the kinetics of amyloplast sedimentation with reference to the presentation time in living and fixed corn rootcap cells as compared with coleoptiles of the same variety. Author

N85-26060* # Yale Univ., New Haven, Conn. Dept. of Biology.
POLYAMINES AS POSSIBLE MODULATORS OF GRAVITY INDUCED CALCIUM TRANSPORT IN PLANTS Abstract Only
 A. W. GALSTON and R. D. SLOCUM *In* NASA. Washington NASA Space Biol. Program: p 15 Apr. 1985 refs
 Avail: NTIS HC A07/MF A01 CSCL 06C

Data from various laboratories indicate a probable relationship between calcium movement and some aspects of graviperception and tropistic bending responses. The movement of calcium in response to gravistimulation appears to be rapid, polar and opposite in direction to polar auxin transport. What might be the cause of such rapid Ca(2+) movement? Data from studies on polyamine (PA) metabolism may furnish a clue. A transient increase in the activity of ornithine decarboxylase (ODC) and titers of various PAs occurs within 60 seconds after hormonal stimulation of animal cells, followed by Ca(2+) transport out of the cells. Through the use of specific inhibitors, it was shown that the enhanced PA synthesis from ODC was essential not only for Ca(2+) transport, but also for Ca(2+) transport-dependent endocytosis and the movement of hexoses and amino acids across the plasmalemma. In plants, rapid changes in arginine decarboxylase (ADC) activity occur in response to various plant stresses. Physical stresses associated with gravisensor displacement and reorientation of a plant in the gravitational field could similarly activate ADC and that resultant increases in PA levels might initiate transient perturbations in Ca(2+) homeostasis. B.G.

N85-26061* # Texas Univ., Austin. Dept. of Botany.
CALCIUM AND CALMODULIN LOCALIZATION IN GRAVITROPICALLY-RESPONDING PLANT ORGANS Abstract Only

S. J. ROUX *In* NASA. Washington NASA Space Biol. Program: p 16-17 Apr. 1985
 (Contract NSG-7480)
 Avail: NTIS HC A07/MF A01 CSCL 06C

Antimonate staining procedures were used to detect calcium redistribution changes in corn roots. Results show that an asymmetric redistribution of Ca is induced by a gravitropic stimulus in roots as it is in shoots. Since this response occurs within 10 min, at least 5 min before any visible bending, it could play a role in the regulation of root gravitropism. Two different general approaches were used to localize calmodulin in plant tissue: radioimmunoassay of its content in tissue and in purified subcellular organelles, and immunocytochemical detection of it in roots and coleoptiles. Radioimmunoassay results indicate that calmodulin is present in large quantities in plant cells and that it is specifically associated with mitochondria, etioplasts and nuclei. An assayed of an extract of soluble wall proteins revealed that over 1% of these proteins was calmodulin. Controls indicate that this calmodulin is not cytoplasmic in origin. A reaction product from anti-calmodulin was found mainly in the root cap cells, moderately in metaxylem elements, in some cells in the stele surrounding metaxylem elements and in cortical cells. A.R.H.

N85-26062* # Ohio State Univ., Columbus.
THE INTERACTION OF CALCIUM AND AUXIN IN THE GRAVITROPIC RESPONSE OF ROOTS Abstract Only
 M. L. EVANS *In* NASA. Washington NASA Space Biol. Program: p 18-19 Apr. 1985 refs
 (Contract NAGW-297)
 Avail: NTIS HC A07/MF A01 CSCL 06C

The role of calcium redistribution in the responding region of the root is examined, however, the potential connection between calcium and auxin redistribution in the elongation zone is not found. The following items are examined: (1) the effect of gravity on calcium movement across the elongation zone; (2) the effect of gravity on auxin movement across the elongation zone; and (3) the effect of calcium on auxin movement across the elongation zone. It is indicated that gravistimulation induces a physiological asymmetry in the auxin transport system of maize roots and that calcium increases the total transport of auxin across the root. Gravistimulation is apparently necessary for the enhancing effect of calcium on lateral auxin movement, and it is possible that the

preferential downward movement of calcium across the elongation zone of gravistimulated roots plays a role in establishing the auxin asymmetry proposed to cause positive gravitropic curvature. E.A.K.

N85-26063* # Kenyon Coll., Gambier, Ohio.
TRANSDUCTION OF THE ROOT GRAVITROPIC STIMULUS: CAN APICAL CALCIUM REGULATE AUXIN DISTRIBUTION? Abstract Only
 K. L. EDWARDS *In* NASA. Washington NASA Space Biol. Program: p 20-21 Apr. 1985
 (Contract NAGW-368)
 Avail: NTIS HC A07/MF A01 CSCL 06C

The hypothesis was tested that calcium, asymmetrically distributes in the root cap upon reorientation to gravity, affects auxin transport and thereby auxin distribution at the elongation zone. It is assumed that calcium exists in the root cap and is asymmetrically transported in root caps altered from a vertical to a horizontal position and that the meristem, the tissue immediately adjacent to the root cap and lying between the site of gravity perception and the site of gravity response, is essential for mediation of gravitropism. Tip calcium in root gravicurvature was implicated. The capstone evidence is that the root cap has the capacity to polarly translocate exogenous calcium downward when tissue is oriented horizontally, and that exogenous calcium, when supplied asymmetrically at the root tip, induces curvature and dictates the direction of curvature in both vertical and horizontal corn roots. E.A.K.

N85-26064* # Michigan State Univ., East Lansing. Dept. of Botany and Plant Pathology.
ATTEMPTS TO LOCALIZE AND IDENTIFY THE GRAVITY SENSING DEVICE OF PLANT SEEDLINGS Abstract Only
 R. S. BANDURSKI, A. SCHULZE, Y. MOMONOKI, M. DESROSIERS, and D. FEARN-DESROSIERS *In* NASA. Washington NASA Space Biol. Program: p 22-23 Apr. 1985 refs
 (Contract NAGW-97)
 Avail: NTIS HC A07/MF A01 CSCL 06C

The growth hormone asymmetry develops within three minutes following the initiation of the gravitational asymmetry and radio-labeled compounds being transported from the seed to the shoot also show asymmetric distribution. It is found that the target of the gravity stimulus resides primarily in the permeability of the vascular tissue that regulates the supply of hormone to the surrounding tissues. It is hypothesized that the gravitational stimulus induces an asymmetric change in the rate of secretion of the growth hormone, IAA, from the vascular tissue into the surrounding cortical cells. More hormone would be secreted from the vascular stele proximal to the lower side of a horizontally placed plant shoot than from the upper side. This results in more growth hormone in the lower cortical (plus epidermal) cells, and ultimately more growth, such that the plant grows asymmetrically and, ultimately attain its normal vertical orientation. A theory was developed of how plants respond to the gravitational stimulus. The theory is based upon the analytical results concerning the effects of gravity on the distribution of the plant growth hormone, IAA, in both its free and conjugated forms, and upon the effect of the growth stimulus on the distribution of externally applied radio-labeled compounds. Its advantage is that it is testable and that it is built upon solid knowledge of the effects of the gravitational stimulus upon the endogenous growth hormone, IAA, and upon the distribution of externally applied radio-labeled compounds. E.A.K.

N85-26065* # San Diego State Univ., Calif.
ROLE OF CA++ IN SHOOT GRAVITROPISM Abstract Only
 D. L. RAYLE *In* NASA. Washington NASA Space Biol. Program: p 24-25 Apr. 1985
 (Contract NAGW-230)
 Avail: NTIS HC A07/MF A01 CSCL 06C

A cornerstone in the argument that Ca(2+) levels may regulate growth is the finding the EGTA promotes straight growth. The

usual explanation for these results is that Ca(2+) chelation from cell walls results in wall loosening and thus accelerated straight growth. The ability of frozen-thawed Avena coleoptile tissue (subjected to 15g tension) to extend in response to EGTA and Quin II was examined. The EGTA when applied in weakly buffered (i.e., 0.1mM) neutral solutions initiates rapid extension. When the buffer strength is increased, similar concentrations of EGTA produce no growth response. This implies when EGTA liberated protons are released upon Ca(2+) chelation they can either initiate acid growth (low buffer conditions) or if consumed (high buffer conditions) have no effect. Thus Ca(2+) chelation in itself apparently does not result in straight growth. Author

N85-26066*# California Univ., Berkeley. Dept. of Botany.
GRAVISTIMULUS PRODUCTION IN ROOTS OF CORN Abstract Only

L. J. FELDMAN *In* NASA. Washington NASA Space Biol. Program: p 26-27 Apr. 1985 refs
(Contract NSG-239)
Avail: NTIS HC A07/MF A01 CSCL 06C

Because of the similarities in structure of known growth regulators, specifically abscisic acid and xanthoxin, with portions of the violaxanthin molecule, it was suggested that these growth substances normally arise from the breakdown or turnover of carotenoid. The light-induced disappearance of violaxanthin occurs in a time frame coincident with an increase in the levels in cap tissue of substances with growth inhibitor properties. One of the ways by which light may regulate root development, including aspects of gravitropism, is through the production of inhibitory growth substances arising from the turnover of carotenoids.

Author

N85-26067*# Washington Univ., St. Louis, Mo.
A POSSIBLE EXPLANATION OF WHY GRAVITROPIC GROWTH IS DETECTED EARLIER THAN STRAIGHT GROWTH Abstract Only

B. G. PICKARD *In* NASA. Washington NASA Space Biol. Program: p 28-29 Apr. 1985
(Contract NAGW-420)
Avail: NTIS HC A07/MF A01 CSCL 06C

The mechanism of gravitropic gravity reception by seedling shoots was examined. Gravitropism is mediated by lateral migration of the auxin IAA. The 10 min. lag for induction of growth by IAA helps to explain auxin action. Evidences for the rapidity of gravitropism are examined. B.G.

N85-26068*# State Univ. of New York, Stony Brook.
DAYLILY AS A SYSTEM TO STUDY EFFECTS OF SPACE FLIGHT ON PLANT DEVELOPMENT Abstract Only

A. D. KRIKORIAN *In* NASA. Washington NASA Space Biol. Program: p 33-34 Apr. 1985
(Contract NSG-7270)
Avail: NTIS HC A07/MF A01 CSCL 06C

The intent of the protoplast experimentation was to develop a system which would permit work with wall less counterparts of totipotent free cells as a model for a fertilized egg cell. It is clear that the daylily system is becoming a valuable tool with which to study any number of basic phases of higher plant development. The system can now be studied from a number of perspectives. A system amenable to rigorous experimentation was developed and can be used as a point of departure for studying problems of development in the space environment. This will be a prelude to the studying of the effect of hypogravity on higher plant development. E.A.K.

N85-26069*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE ROLE OF GRAVITY ON THE REPRODUCTION OF ARABIDOPSIS PLANTS Abstract Only

T. HOSHIZAKI *In* NASA. Washington NASA Space Biol. Program: p 35-36 Apr. 1985
(Contract NAS7-918)
Avail: NTIS HC A07/MF A01 CSCL 06C

The presence of gravity as a necessary environmental factor for higher plants to complete their life cycle was examined. Arabidopsis thaliana (L.) Heynh. Columbia strain plants were grown continuously for three generations in a simulated micro-g environment as induced by horizontal clinostats. Growth, development and reproduction were followed. The Arabidopsis plants were selected for three generations on clinostats because: (1) a short life cycle of around 35 days; (2) the cells of third generation plants would in theory be free of gravity imprint; and (3) a third generation plant would therefore more than likely grow and respond like a plant growing in a micro-g environment. It is found that gravity is not a required environmental factor for higher plants to complete their life cycle, at least as tested by a horizontal clinostat. Clinostatting does not prevent the completion of the plant life cycle. However, clinostatting does appear to slow down the reproductive process of Arabidopsis plants. Whether higher plants can continue to reproduce for many generations in a true micro-g environment of space can only be determined by long duration experiments in space. E.A.K.

N85-26070*# Pennsylvania Univ., Philadelphia.
IMPORTANCE OF GRAVITY FOR PLANT GROWTH AND BEHAVIOR Abstract Only

A. H. BROWN (University City Science Center) *In* NASA. Washington NASA Space Biol. Program: p 37-39 Apr. 1985 refs
(Contract NGR-39-010-149; NGR-39-030-010)
Avail: NTIS HC A07/MF A01 CSCL 06C

Flight experiments on the importance of gravity to plant growth and behavior are reported. The following studies were undertaken: (1) hyperastic responses to incremental changes of an axially imposed centripetal force; (2) Spacelab-1 experiments, methods for preparing soil in flight hardware containers were impound, to ensure desired moisture content and minimal contamination probability; (3) mesocotyl growth patterns were established by Avena lore exposure to red light during early seedling outogency; (4) the development of flight hardware; (5) choice of member of seedlings in each cube; (6) data processing and reduction; (7) clinostat validation; circummutation in space was more vigorous than on Earth based clinostat. E.A.K.

N85-26071*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

STRUCTURAL DEVELOPMENT AND GRAVITY Abstract Only

E. M. HOLTON *In* NASA. Washington NASA Space Biol. Program: p 45-46 Apr. 1985
Avail: NTIS HC A07/MF A01 CSCL 06C

Major research projects designed to elucidate the mechanisms by which gravity loading and/or fluid distribution alter bone formation and/or resorption in rat bone are reported. Projects completed include: (1) analysis of bone parameters in rats from 6 weeks to 68 weeks of age; (2) restricted access area in which rats on the model were not allowed to touch any side of the cage; and (3) the effect of dietary calcium levels on bone formation and resorption rates in controls and head-down rats. E.A.K.

51 LIFE SCIENCES (GENERAL)

N85-26072*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE ROLE OF VITAMIN D IN THE BONE CHANGES ASSOCIATED WITH SIMULATED WEIGHTLESSNESS Abstract Only

B. HALLORAN (California Univ., San Francisco), D. BIKLE (VA Medical Center, San Francisco), E. HOLTON, M. LEVENS, and R. GLOBUS *In* NASA. Washington NASA Space Biol. Program: p 47-48 Apr. 1985 (Contract NAGW-349)

Avail: NTIS HC A07/MF A01 CSCL 06C

The role of vitamin D in the change in bone metabolism was examined. The serum concentrations in rats sacrificed after 2, 5, 7, 10, 12 and 15 days of suspension was measured. Between days 1 and 5 of suspension and then gradually decreased towards normal between days 5 and 15. The time course of the changes in the circulating concentrations of 1,25(OH)₂D and 24,25(OH)₂D mirror almost precisely the changes in bone metabolism. The relationship between the changes in vitamin D metabolism and bone metabolism is investigated. Whether the bone changes are due to the change in serum concentration of 1,25(OH)₂D or the changes in bone formation causing a reduction in Ca flux out of the serum pool and thereby suppressing 1,25(OH)₂D production is examined. It is found that suspension had no effect on hormone concentration in the 1,25(OH)₂D infused animals. Nevertheless, both vehicle and 1,25(OH)₂D infused suspended rats exhibited the same reduction in bone mineral, and uptake of (45)Ca. It is suggested that the transitory reduction in circulating 1,25(OH)₂D during suspension is not likely to cause the abnormalities in bone metabolism but rather that the changes in bone metabolism are primary and cause the fall in serum 1,25(OH)₂D concentration. This supports the hypothesis that the metabolic abnormalities in bone associated with simulated weightlessness are due to the direct effect of unweighting on the bone. E.A.K.

N85-26073*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE SALUTARY EFFECT OF DIETARY CALCIUM ON BONE MASS IN A RAT MODEL OF SIMULATED WEIGHTLESSNESS Abstract Only

D. D. BIKLE (VA Medical Center, San Francisco), R. GLOBUS, B. HALLORAN (California Univ. Medical Center, San Francisco), and E. MOREY-HOLTON *In* NASA. Washington NASA Space Biol. Program: p 49 Apr. 1985 (Contract NAGW-236)

Avail: NTIS HC A07/MF A01 CSCL 06C

Whether supplementation of dietary calcium reduces the differences in bone mass of unweighed limbs and normally weighted limbs, and whether parathyroid hormone (PTH) and 1,25-dihydroxyvitamin D (1,25(OH)₂D) respond differently to dietary calcium in unweighed animals in comparison with pair-fed controls was studied. The hind limbs of rats were unweighed by a tail suspension method and diets containing 0.1% to 2.4% calcium. After 2 weeks serum calcium, phosphorus, PTH and 1,25(OH)₂D intestinal calcium transport were determined and bone mass, ash weight, and calcium in the tibia, L-1 vertebra, and humerus were measured. No significant differences in body weights were observed among the various groups. Suspended rats maintained constant levels of serum calcium and phosphate over the wide range of dietary calcium. Serum PTH and 1,25(OH)₂D and intestinal calcium transport fell as dietary calcium was increased. Bone calcium in the tibia and vertebra from suspended rats remained less than that from pair-fed control. It is suggested that although no striking difference between suspended and control animals was observed in response to dietary calcium, increasing dietary calcium may reduce the negative impact of unloading on the calcium content of the unweighed bones. The salutary effect of high dietary calcium appears to be due to inhibition of bone resorption rather than to stimulation of bone formation. E.A.K.

N85-26074*# University of the Pacific, San Francisco, Calif. Dept. of Orthodontics.

ACTUAL AND SIMULATED WEIGHTLESSNESS INHIBIT OSTEOGENESIS IN LONG BONE METAPHYSIS BY DIFFERENT MECHANISMS Abstract Only

W. E. ROBERTS *In* NASA. Washington NASA Space Biol. Program: p 50-51 Apr. 1985 refs (Contract NAGW-356)

Avail: NTIS HC A07/MF A01 CSCL 06C

Weightlessness and simulated weightlessness inhibit the rate of periosteal bone formation in long bones. Formation of preosteoblasts is suppressed in periodontal ligament (PDL) of maxillary molars, which suggests a generalized block in osteoblast histogenesis. Growth in length of long bones is decreased by simulated weightlessness, but there are no reliable data on the influence of actual weightlessness on metaphyseal growth. The nuclear size assay for assessing relative numbers of osteoblast precursor cells was utilized in the primary spongiosa of growing long bones subjected to actual and simulated weightlessness. It is found that: (1) Actual weightlessness decreases total number of osteogenic cells and inhibits differentiation of osteoblast precursor cells, (2) Simulated weightlessness suppresses only osteoblast differentiation; and (3) The nuclear morphometric assay is an effective means of assessing osteogenic activity in the growing metaphysis or long bones. E.A.K.

N85-26075*# Columbia Univ., New York. Dept. of Anatomy/Cell Biology.

QUANTITATIVE ALTERATIONS IN THE FUNCTION OF BONE FORMING CELLS DUE TO REDUCED WEIGHT BEARING Abstract Only

S. B. DOTY *In* NASA. Washington NASA Space Biol. Program: p 52-53 Apr. 1985 refs (Contract NAGW-238)

Avail: NTIS HC A07/MF A01 CSCL 06C

Rats subjected to spaceflight or suspended in a non-weight bearing position for 2 to 3 weeks, show a significant reduction in new bone formation. This reduction is associated with a decrease in alkaline phosphatase activity in the differentiated osteoblast population. Those cells in the saphyseal region of bone are more affected than the same cell type in metaphyseal bone. Measurements of alkaline phosphate activity in specific regions of bone, and the autoradiographic localization of H(3) proline in bone forming areas are described. Concomitant with decreased bone matrix synthesis, the osteoblast population also demonstrate changes in the Golgi/lysosomal complex as a result of whole animal suspension. Morphometric techniques are being applied for quantitation of the lysosomal population and the percentage of lysosomal or Golgi bodies containing acid phosphatase activity. M.G.

N85-26076*# California Univ., Berkeley.

NEW TECHNIQUES FOR STUDYING CALCIUM GRADIENTS Abstract Only

R. Y. TSIEN *In* NASA. Washington NASA Space Biol. Program: p 54-55 Apr. 1985 (Contract NAGW-515)

Avail: NTIS HC A07/MF A01 CSCL 06C

Improved techniques for detecting and manipulating spatial gradients of cytosolic free Ca(2+) concentrations (Ca(2)) sub i and intracellular stores are discussed. Three areas of progress are: (1) development of new fluorescent indicators for Ca(2+) that are the first to be suitable for measuring Ca(2+) sub i and its inhomogeneities in individual cells; (2) invention of photolabile chelators which shift irreversibly from high to low affinity for Ca(2+) upon illumination, permitting light-controlled jumps in (Ca(2+) sub i; and (3) fixation methods to trap dynamic intracellular Ca stores in a form readily visible by electron microscopy. M.G.

N85-26077*# Arizona Univ., Tucson. Dept. of Biochemistry.
ROLE OF GLUCOCORTICOIDS IN THE RESPONSE TO UNLOADING OF MUSCLE PROTEIN AND AMINO ACID METABOLISM Abstract Only

M. E. TISCHLER and S. R. JASPERS *In* NASA. Washington NASA Space Biol. Program: p 56-57 Apr. 1985
 (Contract NAGW-227)

Avail: NTIS HC A07/MF A01 CSCL 06C

Intact control (weight bearing) and suspended rats gained weight at a similar rate during a 6 day period. Adrenaectomized (adx) weight bearing rats gained less weight during this period while adrenaectomized suspended rats showed no significant weight gain. Cortisol treatment of both of these groups of animals caused a loss of body weight. Results from these studies show several important findings: (1) Metabolic changes in the extensor digitorum longus muscle of suspended rats are due primarily to increased circulating glucocorticoids; (2) Metabolic changes in the soleus due to higher steroid levels are probably potentiated by greater numbers of receptors; and (3) Not all metabolic responses in the unloaded soleus muscle are due to direct action of elevated glucocorticoids or increased sensitivity to these hormones. E.R.

N85-26078*# Texas Univ. Health Science Center, Dallas.
CONSTANT FIBER NUMBER DURING SKELETAL MUSCLE ATROPHY AND MODIFIED ARACHIDONATE METABOLISM DURING HYPERTROPHY Abstract Only

G. TEMPLETON *In* NASA. Washington NASA Space Biol. Program: p 58 Apr. 1985

(Contract NAGW-140)

Avail: NTIS HC A07/MF A01 CSCL 06C

A previously documented shift from Type I to IIA predominance of the soleus muscle during rat suspension was further investigated to determine if this shift was by selective reduction of a single fiber type, simultaneous reduction and formation of fibers with different fiber types, or a transformation of fiber type by individual fibers. By partial acid digestion and dissection, average total soleus fiber number was found to be 3022 + or - 80 (SE) and 3008 + or - 64 before and after four-week suspension (n=12). Another area of current research was based on previous studies which indicate that prostaglandins are biosynthesized by skeletal muscle and evoke protein synthesis and degradation. Author

N85-26079*# Louisville Univ., Ky. Dept. of Physiology and Biophysics.

BLOOD PRESSURE RESPONSES AND MINERAL OCORTICOID LEVELS IN THE SUSPENDED RAT MODEL FOR WEIGHTLESSNESS Abstract Only

X. J. MUSACCHIA and J. M. STEFFEN *In* NASA. Washington NASA Space Biol. Program: p 59-60 Apr. 1985

(Contract NSG-2325)

Avail: NTIS HC A07/MF A01 CSCL 06C

Cardiovascular responses and fluid/electrolyte shifts seen during space flight are attributed to cephalad redistribution of vascular fluid. The antiorthostatic (AO) rat (suspended head down tilted, 15-20 deg) is used to model these responses. Current studies show that elevated blood pressures in A0 rats are sustained for periods up to seven days. Comparisons are made with presuspension rats. Increased blood pressure in head down tilted subjects suggests a specific response to A0 positioning, potentially relatable to cephalad fluid shift. To assess a role for hormonal regulation of sodium excretion, serum aldosterone levels were measured. Author

N85-26080*# Arizona Univ., Tucson.
EFFECTS OF MUSCLE ATROPHY ON MOTOR CONTROL: CAGE SIZE EFFECTS Abstract Only

D. G. STUART *In* NASA. Washington NASA Space Biol. Program: p 61-62 Apr. 1985 refs

(Contract NAGW-338)

Avail: NTIS HC A07/MF A01 CSCL 06C

Two populations of male Sprague-Dawley rats were raised either in conventional minimum-specification cages or in a larger cage. When the animals were mature (125 to 150 d), the physiological

status of the soleus (SOL) and extensor digitorum longus (EDL) muscles of the small- and large-cage animals were compared. Analysis of whole-muscle properties including the performance of the test muscle during a standardized fatigue test in which the nerve to the test muscle was subjected to supramaximal intermittent stimulation shows: (1) the amplitude, area, mean amplitude, and peak-to-peak rate of the compound muscle action potential decreased per the course of the fatigue test; (2) cage size did not affect the profile of changes for any of the action-potential measurements; (3) changes exhibited in the compound muscle action potential by SOL and EDL were substantially different; and (4) except for SOL of the large-cage rats, there was a high correlation between all four measures of the compound muscle action potential and the peak tetanic force during the fatigue test; i.e., either the electrical activity largely determines the force profile during the fatigue test or else contractile-related activity substantially affects the compound muscle action potential.

A.R.H.

N85-26081*# Vanderbilt Univ., Nashville, Tenn. School of Medicine.

INDUCED CHANGES IN THE CHOLINERGIC SYSTEM OF SCIATIC NERVE AND SLOW AND FAST TWITCH MUSCLE OF RATS Abstract Only

W. D. DETTBARN, R. C. GUPTA, and K. E. MISULIS *In* NASA. Washington NASA Space Biol. Program: p 63-64 Apr. 1985

(Contract NAG2-301)

Avail: NTIS HC A07/MF A01 CSCL 06C

Hindlimb suspension was used as a model of disuse in experiments studying the effects of reduced muscle activity on AChE and its molecular forms, choline acetyltransferase and nicotinic receptor binding in innervated slow and fast muscle. The weight of SOL was reduced to 64% within one week and continued to decrease progressively up to the third week when the weight was reduced to 40% as compared to controls. EDL showed a significant decrease in its weight only at the end of three weeks hypokinesia when it was reduced to 71% of control. Biochemical and histochemical findings are summarized. From these data and from morphological findings it is evident that some properties of skeletal muscles are strongly dependent on patterns and level of loadbearing and on motor unit activity. With suspension-induced disuse, the usually slow SOL appeared to change its characteristics such as fiber type distribution and AChE activity to one that more resembled a faster muscle. It is important to note that hypokinesia induced changes either physiological, biochemical or morphological, are totally reversible as the induced changes returned to control levels within a week after cessation of disuse. A.R.H.

N85-26082*# California Univ., Davis. Dept. of Animal Physiology.

THERMOREGULATORY AND VESTIBULAR SYSTEMS IN THE RAT Abstract Only

J. M. HOROWITZ *In* NASA. Washington NASA Space Biol. Program: p 67-68 Apr. 1985

(Contract NSG-2234)

Avail: NTIS HC A07/MF A01 CSCL 06C

Responses in six rats to auditory and vestibular stimuli were compared at two temperatures. It was observed that the peaks in the BAER recorded at a brain temperature of approximately 34 degrees centigrade occur later in time than the peaks from the 37 degree waveforms. In addition, the later peaks of the BAER recorded at the low temperature were more delayed than the earlier peaks, indicating that the interpeak latency increases as brain temperature is decreased. Responses to angular acceleration also show that later peaks in the evoked waveforms are associated with increases in interpeak latencies with decreasing temperature.

A.R.H.

51 LIFE SCIENCES (GENERAL)

N85-26083*# California Univ., San Francisco. Dept. of Physiology.

NEURAL MECHANISM BY WHICH GRAVITATIONAL STIMULUS AND STRESS AFFECT THE SECRETION OF RENIN AND OTHER HORMONES Abstract Only

W. F. GANONG, E. GOTOH, and R. H. ALPER *In* NASA. Washington NASA Space Biol. Program: p 69-70 Apr. 1985 (Contract NAGW-490)

Avail: NTIS HC A07/MF A01 CSCL 06C

The serotonin-releasing drug p-chloroamphetamine (PCA), as well as L-propranolol and chlorisondamine were used in a study which established that the pathway from the hypothalamus to the kidneys is sympathetic. Which hypothalamic nuclei mediate the response to PCA is being investigated experiments are being conducted to determine a readily reproducible psychological stimulus to renin secretion that can be used in rats. The effects of equithesin, urethane, and inactin on plasma renin activity were examined in preparation for tilting experiments. The relation of vasopressin-secreting neurons in the brain stem to PCA response was explored in Brattleboro rats that are congenitally unable to produce vasopressin in their hypothalami. A.R.H.

N85-26084*# California Univ., Berkeley. Lab. of Environmental Physiology.

GRAVITY, BODY MASS AND COMPOSITION, AND METABOLIC RATE Abstract Only

N. PACE and A. H. SMITH (California Univ., Davis) *In* NASA. Washington NASA Space Biol. Program: p 71-72 Apr. 1985 (Contract NSG-7336)

Avail: NTIS HC A07/MF A01 CSCL 06C

Metabolic rate and body composition as a function of sex and age were defined in 5 species of common laboratory mammals, the mouse, hamster, rat, guinea pig and rabbit. Oxygen consumption and carbon dioxide production rates were measured individually in 6 male and 6 female animals for each of 8 age cohorts ranging from 1 month to 2 years, and for each of the species. From the results it is evident that among these small mammals there is no indication of scaling of muscularity to body size, despite the 100-fold difference in body mass represented by the skeletal musculature seems to reach a pronounced peak value at age 2 to 3 months and then declines, the fraction of the fat-free body represented by other body components in older animals must increase complementarily. Under normal gravity conditions muscularity in small laboratory mammals displays large, systematic variation as a function both of species and age. This variation must be considered when such animals are subjects of experiments to study the effects of altered gravitational loading on the skeletal musculature of the mammal. A.R.H.

N85-26085*# California Univ., Davis. Dept. of Animal Physiology.

HOMEOSTASIS IN PRIMATES IN THE HYPERDYNAMIC ENVIRONMENT Abstract Only

C. A. FULLER *In* NASA. Washington NASA Space Biol. Program: p 73-74 Apr. 1985 (Contract NAGW-309)

Avail: NTIS HC A07/MF A01 CSCL 06C

The influence of chronic centrifugation upon the homeostatic regulation of the circadian timekeeping system was examined. The interactions of body temperature regulation and the behavioral state of arousal were studied by evaluating the influence of cephalic fluid shifts induced by lower body positive air pressure (LBPP), upon these systems. The small diurnal squirrel monkey (*Saimiri sciureus*) was used as the non-human primate model. Results show that the circadian timekeeping system of these primates is functional in the hyperdynamic environment, however, some of its components appear to be regulated at different homeostatic levels. The LBPP resulted in an approximate 0.7 C decrease in DBT (p 0.01). However, although on video some animals appeared drowsy during LBPP, sleep recording revealed no significant changes in state of arousal. Thus, the physiological mechanisms underlying this lowering of body temperature can be independent of the arousal state. A.R.H.

N85-26086*# Utah State Univ., Logan.

GRAVITROPISM IN LEAFY DICOT STEMS Abstract Only

F. B. SALISBURY *In* NASA. Washington NASA Space Biol. Program: p 79-80 Apr. 1985 (Contract NSG-7567)

Avail: NTIS HC A07/MF A01 CSCL 06C

A polarizing research microscope with rotating stage and associated camera equipment were ordered, and techniques of fixation and preparation of specimens were perfected for studying possible changes in orientation of cellulose microfibrils in cell walls of gravistimulated dicot stems. Acid ethephon solutions or acid without ethephon caused elongation of stem tissues where they were applied; stems bent away from the side of application. Acid solutions applied to the bottom of horizontal stems greatly delayed bending. Research in tissue sensitivity changes during gravitropic bending of soybean hypocotyls while immersed in auxin and in castor bean stems is also reported. A.R.H.

N85-26087*# Purdue Univ., Lafayette, Ind. Dept. of Horticulture.

MECHANICAL STRESS REGULATION OF PLANT GROWTH AND DEVELOPMENT Abstract Only

C. A. MITCHELL *In* NASA. Washington NASA Space Biol. Program: p 81 Apr. 1985 (Contract NSG-7278)

Avail: NTIS HC A07/MF A01 CSCL 06C

Growth dynamics analysis was used to determine to what extent the seismic stress induced reduction in photosynthetic productivity in shaken soybeans was due to less photosynthetic surface, and to what extent to lower efficiency of assimilation. Seismic stress reduces shoot transpiration rate 17% and 15% during the first and second 45 minute periods following a given treatment. Shaken plants also had a 36% greater leaf water potential 30 minutes after treatment. Continuous measurement of whole plant photosynthetic rate shows that a decline in CO₂ fixation began within seconds after the onset of shaking treatment and continued to decline to 16% less than that of controls 20 minutes after shaking, after which gradual recovery of photosynthesis begins. Photosynthetic assimilation recovered completely before the next treatment 5 hours later. The transitory decrease in photosynthetic rate was due entirely to a two fold increase in stomatal resistance to CO₂ by the abaxial leaf surface. Mesophyll resistance was not significantly affected by periodic seismic treatment. Temporary stomatal aperture reduction and decreased CO₂ fixation are responsible for the lower dry weight of seismic stressed plants growing in a controlled environment. A.R.H.

N85-26088*# Wake Forest Univ., Winston-Salem, N.C. Dept. of Biology.

MUTANT PEAS AS PROBES IN THE UNDERSTANDING OF GROWTH AND GRAVITROPISM Abstract Only

M. J. JAFFE and H. TAKASHI *In* NASA. Washington NASA Space Biol. Program: p 82-83 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

One mutant of *Pisum sativum* CREEP grows normally up to the first internode stage, and then begins to grow plagiotropically. The upper internodes bend slowly downward according to a programmed sequence which follows circumnutation of the previous internode and opening of the previous leaves, but precedes expansion of the previous leaves. The bending is partially inhibited by excision of the opposing stipules. The second mutant, AGEOTROPUM is gravitropically incompetent when grown etiolated, in the dark. When etiolated plants are illuminated with white light, the stems become gravitropically competent, but the roots do not. If the plants are grown in the light in particulate medium, some secondary roots, growing randomly, emerge into the air, and turn and grow downward toward moist soil. When etiolated AGEOTROPUM plants are illuminated, the shoots then become able to respond to gravity in a normal, negatively orthogravitropic manner. The response is to red light and is reversed by far red light. The mutation may involve one or more of the following: (1) release of sequestered calcium for

redistribution; (2) radial transport of released calcium; or (3) net calcium flux in the upward direction. A.R.H.

N85-26089*# Pennsylvania State Univ., University Park. Dept. of Biology.

PLANT GROWTH BIOPHYSICS: THE BASIS FOR GROWTH ASYMMETRY INDUCED BY GRAVITY Abstract Only

D. COSGROVE *In* NASA. Washington NASA Space Biol. Program: p 84 Apr. 1985

(Contract NAGW-480)

Avail: NTIS HC A07/MF A01 CSCL 06C

The identification and quantification of the physical properties altered by gravity when plant stems grow upward was studied. Growth of the stem in vertical and horizontal positions was recorded by time lapse photography. A computer program that uses a cubic spline fitting algorithm was used to calculate the growth rate and curvature of the stem as a function of time. Plant stems were tested to ascertain whether cell osmotic pressure was altered by gravity. A technique for measuring the yielding properties of the cell wall was developed. E.R.

N85-26090*# Ohio State Univ., Columbus. Dept. of Biology.
AN INDIRECT ROLE FOR ETHYLENE IN SHOOT-INVERSION RELEASE OF APICAL DOMINANCE IN PHARBITIS NIL Abstract Only

M. G. CLINE *In* NASA. Washington NASA Space Biol. Program: p 85-86 Apr. 1985

(Contract NSG-625)

Avail: NTIS HC A07/MF A01 CSCL 06C

Evidence is presented which indicated that ethylene does not play a direct role in promoting or inhibiting bud outgrowth as a gravity response. It is concluded that the treatment of inactive or induced lateral buds with ethylene inhibitors or ethrel has no significant effect on bud outgrowth and that no changes occur in ethylene emanation in the Highest Lateral Bud (HLB) or HLB node following shoot inversion. Possible mechanisms by which ethylene released by shoot inversion may indirectly promote outgrowth of the HLB is presented. E.R.

N85-26091*# Michigan Univ., Ann Arbor. Dept. of Cellular and Molecular Biology.

GRAVITY PERCEPTION AND RESPONSE IN SHOOT OF CEREAL GRASSES Abstract Only

P. B. KAUFMAN, I. SONG, and C. BLUNSON *In* NASA. Washington NASA Space Biol. Program: p 87-88 Apr. 1985

(Contract NAGW-34)

Avail: NTIS HC A07/MF A01 CSCL 06C

Two components of the gravitropic curvature response in cereal grass pulvini are studied. These two components are gravity perception and mechanism of response following the transduction phase. The effects of gravity, time lag, protein synthesis and enzyme production are included. E.R.

N85-26092*# Indiana Univ., Bloomington. Dept. of Biology.
SIMULATED MICROGRAVITY AS A PROBE FOR UNDERSTANDING THE MECHANISMS OF EARLY PATTERN SPECIFICATION Abstract Only

A. W. NEFF and G. M. MALACINSKI *In* NASA. Washington NASA Space Biol. Program: p 91 Apr. 1985

(Contract NAGW-60)

Avail: NTIS HC A07/MF A01 CSCL 06C

Early pattern specification (e.g., axial structure morphogenesis, dorsal ventral polarity, etc.) is monitored in amphibian eggs which were subjected to microgravity simulation by constant rotation on a horizontal clinostat. In contrast to previous clinostat experiments, rotation is initiated either prior to fertilization or immediately thereafter. Large proportions of clinostated eggs developed normal axial structures. A model which employs a multiple set of signals for specifying early pattern is discussed. Effects of microgravity simulation on the earliest post fertilization pattern specification event dorsal/ventral polarization is analyzed in detail. Other models are developed and they are discussed. As a general mechanism for explaining the manner in which regional developmental patterns

emerge from the initial, radially symmetrical egg, the density compartment model is described. The identification of the various zones or compartments of egg cytoplasm using inverted eggs is explained. Author

N85-26093*# Arizona Univ., Tucson. Dept. of Physiology.
DEVELOPMENT AND MATURATION OF THE NEUROMUSCULAR JUNCTION IN CELL CULTURE UNDER CONDITIONS OF SIMULATED ZERO-GRAVITY Abstract Only

R. GRUENER *In* NASA. Washington NASA Space Biol. Program: p 92-93 Apr. 1985

(Contract NAGW-539)

Avail: NTIS HC A07/MF A01 CSCL 06C

Alterations in gravitational conditions which alter the normal development and interactions of nerve and muscle cells grown in culture is examined. Clinostat conditions, simulating 0g, which produce changes in cell morphology and growth patterns is studied. Data show that rotation of cocultures of nerve and muscle cells results in morphologic changes which are predicted to significantly alter the functional interactions between the elements of a prototypic synapse. It is further predicted that similar alterations may occur in central synapses which may therefore affect the development of the central nervous system when subjected to altered gravitational conditions. E.R.

N85-26094*# Columbia Univ., New York. Dept. of Human Genetics and Development.

EFFECTS OF SIMULATED WEIGHTLESSNESS ON MAMMALIAN DEVELOPMENT. PART 2: MEIOTIC MATURATION OF MOUSE OOCYTES DURING CLINOSTAT ROTATION Abstract Only

D. J. WOLGEMUTH and G. S. GRILLS *In* NASA. Washington NASA Space Biol. Program: p 94-95 Apr. 1985 refs

(Contract NAGW-346)

Avail: NTIS HC A07/MF A01 CSCL 06C

In order to understand the role of gravity in basic cellular processes that are important during development, the effects of a simulated microgravity environment on mammalian gametes and early embryos cultured in vitro are examined. A microgravity environment is simulated by use of a clinostat, which essentially reorients cells relative to the gravity vector. Initial studies have focused on assessing the effects of clinostat rotation on the meiotic progression of mouse oocytes. Modifications centered on providing the unique in vitro culture of the clinostat requirements of mammalian oocytes and embryos: 37 C temperature, constant humidity, and a 5% CO₂ in air environment. The oocytes are observed under the dissecting microscope for polar body formation and gross morphological appearance. They are then processed for cytogenetic analysis. E.R.

N85-26095*# Texas Univ., Houston. Inst. of Dental Science.
EFFECTS ON IN VIVO AND IN VITRO EXPOSURE TO EXCESS GRAVITY ON GROWTH AND DIFFERENTIATION OF MAMMALIAN EMBRYOS Abstract Only

J. DUKE *In* NASA. Washington NASA Space Biol. Program: p 96-97 Apr. 1985 refs

(Contract NAGW-438)

Avail: NTIS HC A07/MF A01 CSCL 06C

Studies on the development of embryonic mouse tissues exposed to excess gravity in vitro and in vivo are discussed. Suppression is seen in limb buds cultured under 3G. Mouse palates were exposed to excess G in vitro, 13- and 14-day palates were exposed to 2.6G for 24 hours. For in vivo studies, a small animal centrifuge was constructed. When the centrifuge is operated at 40 and 45 rpm, the linear accelerations generated range from 1.8 to 3.5G. The effects of gravity on body weights and on reproduction is also presented. E.R.

51 LIFE SCIENCES (GENERAL)

N85-26096*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Developmental Genetics and Anatomy.

CELL DEATH, NEURONAL PLASTICITY AND FUNCTIONAL LOADING IN THE DEVELOPMENT OF THE CENTRAL NERVOUS SYSTEM Abstract Only

J. R. KEEFE *In* NASA. Washington NASA Space Biol. Program: p 98-99 Apr. 1985 refs

Avail: NTIS HC A07/MF A01 CSCL 06C

Research on the precise timing and regulation of neuron production and maturation in the vestibular and visual systems of Wistar rats and several inbred strains of mice (C57B16 and Pallid mutant) concentrated upon establishing a timing baseline for mitotic development of the neurons of the vestibular nuclei and the peripheral vestibular sensory structures (maculae, cristae). This involved studies of the timing and site of neuronal cell birth and preliminary studies of neuronal cell death in both central and peripheral elements of the mammalian vestibular system. Studies on neuronal generation and maturation in the retina were recently added to provide a mechanism for more properly defining the in utero developmental age of the individual fetal subject and to closely monitor potential transplacental effects of environmentally stressed maternal systems. Information is given on current efforts concentrating upon the (1) perinatal period of development (E18 thru P14) and (2) the role of cell death in response to variation in the functional loading of the vestibular and proprioceptive systems in developing mammalian organisms. R.J.F.

N85-26097*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

GRAVITATIONAL EFFECTS ON REPRODUCTION, GROWTH AND DEVELOPMENT OF MAMMALS Abstract Only

J. OYAMA *In* NASA. Washington NASA Space Biol. Program: p 100 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

The broad objective of this research program is to determine the role which gravity plays in the growth and development of mammalian animals. Current studies are focused on the effects of graded hypergravitational field intensities on mice, rats and other small sized laboratory animals using the chronic centrifugation technique. They include studies on reproduction and prenatal and postnatal growth and development. Among the important questions addressed are: (1) what stage or stages in animal development are affected by hypergravity and what are the effects? (2) is there a minimum or critical body size for hypergravity to produce a significant effect on growth and development? (3) are there field intensity thresholds for the preceding questions? From analysis of the body masses at birth of rats conceived and allowed to undergo gestation under 2.1G and under normal gravity (1G), it was found that there was no significant difference between the two groups. Furthermore, their growth rates postnatally were the same until they reached a body mass of approximately 50 grams when the 2.1G group showed a significantly slower rate. Results from these studies support the conclusion that prenatal as well as the early postnatal stages of growth and development of the rat are refractory to hyper-G. Author

N85-26098*# Washington Univ., St. Louis, Mo. Dept. of Pathology.

EVIDENCE THAT RESORPTION OF BONE BY RAT PERITONAL MACROPHAGES OCCURS IN AN ACIDIC ENVIRONMENT Abstract Only

H. C. BLAIR *In* NASA. Washington NASA Space Biol. Program: p 103 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

Skeletal loss in space, like any form of osteoporosis, reflects a relative imbalance of the activities of cells resorbing (degrading) or forming bone. Consequently, prevention of weightlessness induced bone loss may theoretically be accomplished by (1) stimulating bone formation or (2) inhibiting bone resorption. This approach, however, requires fundamental understanding of the mechanisms by which cells form or degrade bone, information not yet at hand. An issue central to bone resorption is the pH at which resorption takes place. The pH dependent spectral shift of

a fluorescent dye (fluorescein isothiocyanate) conjugated to bone matrix was used to determine the pH at the resorptive cell bone matrix interface. Devascularized rat bone was used as the substrate, and rat peritoneal macrophages were used as the bone resorbing cells. The results suggest that bone resorption is the result of generation of an acidic microenvironment at the cell matrix junction. R.J.F.

N85-26099*# Stanford Univ., Calif. Dept. of Biological Sciences.

CIRCADIAN RHYTHM CONTROL: NEUROPHYSIOLOGICAL INVESTIGATIONS Abstract Only

S. F. GLOTZBACH *In* NASA. Washington NASA Space Biol. Program: p 104 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

The suprachiasmatic nucleus (SCN) was implicated as a primary component in central nervous system mechanisms governing circadian rhythms. Disruption of the normal synchronization of temperature, activity, and other rhythms is detrimental to health. Sleep wake disorders, decreases in vigilance and performance, and certain affective disorders may result from or be exacerbated by such desynchronization. To study the basic neurophysiological mechanisms involved in entrainment of circadian systems by the environment, Parylene-coated, etched microwire electrode bundles were used to record extracellular action potentials from the small somata of the SCN and neighboring hypothalamic nuclei in unanesthetized, behaving animals. Male Wistar rats were anesthetized and chronically prepared with EEG and EMG electrodes in addition to a moveable microdrive assembly. The majority of cells had firing rates 10 Hz and distinct populations of cells which had either the highest firing rate or lowest firing rate during sleep were seen. R.J.F.

N85-26100*# Louisville Univ., Ky. Dept. of Microbiology and Immunology.

THE EFFECTS OF SIMULATED WEIGHTLESSNESS ON SUSCEPTIBILITY TO VIRAL AND BACTERIAL INFECTIONS USING A MURINE MODEL Abstract Only

C. L. GOULD *In* NASA. Washington NASA Space Biol. Program: p 105 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

Certain immunological responses may be compromised as a result of changes in environmental conditions, such as the physiological adaptation to and from the weightlessness which occurs during space flight and recovery. A murine antiorthostatic model was developed to simulate weightlessness. Using this model, the proposed study will determine if differences in susceptibility to viral and bacterial infections exist among mice suspended in an antiorthostatic orientation to simulate weightlessness, mice suspended in an orthostatic orientation to provide a stressful situation without the condition of weightlessness simulation, and non-suspended control mice. Inbred mouse strains which are resistant to the diabetogenic effects of the D variant of encephalomyocarditis virus (EMC-D) and the lethal effects of Salmonella typhimurium will be evaluated. Glucose tolerance tests will be performed on all EMC-D-infected and non-infected control groups. The incidence of EMC-D-induced diabetes and the percentage survival of S. typhimurium-infected animals will be determined in each group. An additional study will determine the effects of simulated weightlessness on murine responses to exogenous interferon. M.G.

N85-26101*# Washington Univ., St. Louis, Mo. Dept. of Biology.

PARTICIPATION OF ETHYLENE IN TWO MODES OF GRAVITASTIMULATION OF SHOOTS Abstract Only

M. HARRISON *In* NASA. Washington NASA Space Biol. Program: p 106 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

In order to elucidate the role of ethylene in gravitropism, detailed time courses for ethylene production in horizontal and upright plants were measured. Tomato and pea were chosen as examples of plants which exhibit different patterns of gravitropic curvature.

Tomato seedlings were placed in gas-tight lucite boxes from which air was sampled and analyzed for ethylene. During the first 2 min interval after one set of plants was turned horizontal ethylene production was double the baseline. Similarly, plants rotated 3 rpm about a vertical axis transiently doubled ethylene production when the axis was shifted 90 deg. In order to clarify the role of this 2-min burst, the effect of exogenous ethylene was studied. In peas, epicotyls were excised, equilibrated until wound ethylene had subsided to a low stable level, and ethylene production was measured in vertical and horizontal segments. As for tomatoes, excised pea epicotyls increased their rate of ethylene production during the first 2 min of gravistimulation. Also, very low concentrations of exogenous ethylene slightly enhance curvature. On the other hand, higher levels of ethylene and 1-aminocyclopropane-1-carboxylic acid (ACC) inhibit overall curvature. M.G.

N85-26102*# Wayne State Univ., Detroit, Mich. Dept. of Otolaryngology and Biochemistry.

QUANTITATION OF NA⁺, K⁺-ATPASE ENZYME ACTIVITY IN TISSUES OF THE MAMMALIAN VESTIBULAR SYSTEM Abstract Only

T. P. KERR *In* NASA. Washington NASA Space Biol. Program: p 107-108 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

In order to quantify vestibular Na(+), K(+)-ATPase, a microassay technique was developed which is sufficiently sensitive to measure the enzymatic activity in tissue from a single animal. The assay was used to characterize ATPase in the vestibular apparatus of the Mongolian gerbil. The quantitative procedure employs NPP (5 mM) as synthetic enzyme substrate. The assay relies upon spectrophotometric measurement (410 nm) of nitrophenol (NP) released by enzymatic hydrolysis of the substrate. Product formation in the absence of ouabain reflects both specific (Na(+), K(+)-ATPase) and non-specific (Mg(++)-ATPase) enzymatic activity. By measuring the accumulation of reaction product (NP) at three-minute intervals during the course of incubation, it is found that the overall enzymatic reaction proceeds linearly for at least 45 minutes. It is therefore possible to determine two separate reaction rates from a single set of tissues. Initial results indicate that total activity amounts to 53.3 + or - 11.2 (S.E.M.) nmol/hr/mg dry tissue, of which approximately 20% is ouabain-sensitive. M.G.

N85-26103*# Stanford Univ., Calif. Dept. of Biological Sciences.

ISOLATION OF HYBRIDOMAS FOR GOLGI-ASSOCIATED PROTEINS AND A PLANT CALMODULIN Abstract Only

K. M. KUZMANOFF and P. M. RAY *In* NASA. Washington NASA Space Biol. Program: p 109 Apr. 1985 refs

Avail: NTIS HC A07/MF A01 CSCL 06C

The demonstration of a role for calcium in the mechanism of the gravitropic response indicates a role for calmodulin. Localization studies indicate that plant cell walls have a high content of calmodulin which suggests a regulatory role for CaM in both gravitropic curvature and auxin-induced growth. Auxin regulation of cell wall loosening and elongation is the basis for most models of this phenomenon. Auxin treatment of pea stem tissue rapidly increases the activity of Golgi-localized B-1,4-glucan synthase (GS), an enzyme involved in biosynthesis of wall xyloglucan which apparently constitutes the substrate for the wall loosening process. In order to determine whether auxin stimulates GS activity either by modulation of existing enzyme or induces de novo formation of Golgi glucan synthase, a study was undertaken to isolate and quantitate glucan synthase. This enzyme appears to be an integral protein of the Golgi membrane and has resisted isolation with retention of activity. The production of monoclonal antibody for glucan synthase was undertaken due to the inability to isolate GS by standard detergent/liposome techniques. M.G.

N85-26104*# Pittsburgh Univ., Pa. Dept. of Physiology.

SENSORY AND MOTOR PROPERTIES OF THE CEREBELLAR UVULA AND NODULUS Abstract Only

F. R. ROBINSON *In* NASA. Washington NASA Space Biol. Program: p 110 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

The uvula and nodulus (vermal lobules 9 and 10) of the vestibulocerebellum are implicated by behavioral evidence in the control of eye and head movements and in the production of motion sickness. The uvula and nodulus could play a role in these functions through known output pathways. Purkinje cells in both structures project via the fastigial and vestibular nuclei to the ventral horn of the cervical spinal cord, to oculomotor neurons, and to the emetic region of the reticular formation (ablation of which abolishes susceptibility to motion sickness). Uvula and nodulus Purkinje cells will be analyzed in cats trained to make controlled head movements. The activity of these neurons is expected to modulate well during head and/or eye movements because the uvula and nodulus receive heavy projections from sources of visual, vestibular and neck proprioceptive information. How neuron activity contributes to movement and how different sensory inputs converge to influence this contribution may be determined by characterizing movement related properties of these neurons. A population of neurons that modulates powerfully to the conflict between different head movement signals that can cause motion sickness may be identified. M.G.

N85-26105*# Texas Univ., Austin.

DIFFERENTIAL WALL GROWTH IN GRAVISTIMULATED CORN ROOTS: ITS TIMING AND REGULATION Abstract Only

B. S. SERLIN *In* NASA. Washington NASA Space Biol. Program: p 111 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

The experiments designed to document cell-wall level changes which occur as a result of their gravistimulation are described. The goal of this research is to elucidate the mechanism and time frame of differential growth following a controlled gravistimulation. To achieve this, rates of wall deposition will be determined by following the incorporation of radioactive monosaccharides into the wall. Complementing this experiment will be a freeze-etch study directed at revealing the spatial arrangement of both newly-deposited microfibrils and microfibrils that were present in the growing root prior to stimulation. The second phase of the proposed research will examine the roles ethylene and Ca(2+) have in the modulation of differential wall changes during gravitropism. Ethylene and Ca(2+) have both been implicated as regulators of the gravitropic response in roots and they have also been implicated as regulators of the gravitropic response in roots and they have also been reported to exert some control on the orientation of microfibrils. Both of these agents will be manipulated in such a way as to reveal whether they have a direct influence on cell wall deposition and microfibrillar alignment during the geotropic response. M.G.

N85-26106*# California Univ., Irvine. Dept. of Anatomy and Surgery.

ANATOMY OF THE VESTIBULO-AUTOMATIC OUTFLOW TO THE GUT Abstract Only

Y. TORIGOE *In* NASA. Washington NASA Space Biol. Program: p 112-113 Apr. 1985

Avail: NTIS HC A07/MF A01 CSCL 06C

Motion sickness can be induced by vestibular effects on the sympathetic portion of the autonomic nervous system. However, the pathways linking the vestibular and autonomic pathways are unknown. As a first step in this analysis, the locations of preganglionic sympathetic neurons (PSN) and dorsal root afferent ganglionic neurons (DRG) which supply sympathetic innervation to major portions of the gastrointestinal tract in rabbits were identified. The objective of a second series of experiments is to determine which of the brainstem nuclei project to the autonomic regions of the spinal cord that control gastrointestinal motility. To achieve this goal, a trans-synaptic retrograde tracer (3H-tetanus toxoid) is applied to the greater splanchnic nerve. This method allows the labeling of neurons within the brainstem that project

only to the preganglionic sympathetic neurons. One structure that has been strongly implicated in mediating vestibulo-autonomic control is the cerebellum (i.e., nodulus and uvula). The outflow of these lobules to the autonomic regions of the brainstem is mediated by the fastigial nucleus. To determine the precise projections of the fastigial nucleus to the brainstem nuclei involved in emesis, anterograde tracer (3H-leucine) was injected into the fastigial nucleus in a third series of experiments. M.G.

N85-26107*# Management and Technical Services Co., Houston, Tex. Biomedical Research Div.

A DETAILED ANALYSIS OF THE ERYTHROPOIETIC CONTROL SYSTEM IN THE HUMAN, SQUIRREL, MONKEY, RAT AND MOUSE

A. W. NORDHEIM May 1985 94 p refs
(Contract NAS9-17151)
(NASA-CR-171879; NAS 1.26:171879; TIR-2114-MED-5010)
Avail: NTIS HC A05/MF A01 CSCL 06C

The erythropoiesis modeling performed in support of the Body Fluid and Blood Volume Regulation tasks is described. The mathematical formulation of the species independent model, the solutions to the steady state and dynamic versions of the model, and the individual species specific models for the human, squirrel monkey, rat and mouse are outlined. A detailed sensitivity analysis of the species independent model response to parameter changes and how those responses change from species to species is presented. The species to species response to a series of simulated stresses directly related to blood volume regulation during space flight is analyzed. E.A.K.

N85-26108*# Vanderbilt Univ., Nashville, Tenn. Dept. of Pharmacology.

IS FAST FIBER INNERVATION RESPONSIBLE FOR INCREASED ACETYLCHOLINESTERASE ACTIVITY IN REINNERVATING SOLEUS MUSCLES?

K. E. MISULIS and W. D. DETTBARN 1985 19 p refs
(Contract NAG2-301; NAGW-469)
(NASA-CR-175716; NAS 1.26:175716) Avail: NTIS HC A02/MF A01 CSCL 06C

An investigation was conducted as to whether the predominantly slow SOL, which is low in AChE activity, is initially reinnervated by axons that originally innervated fast muscle fibers with high AChE activity, such as those of the EDL. Local denervation of the SOL in the guinea pig was performed because this muscle is composed solely of slow (type I) fibers; thereby virtually eliminating the possibility of homologous muscle fast fiber innervation. The overshoot in this preparation was qualitatively similar to that seen with distal denervation in the guinea pig and local and distal denervation in the rat. Thus, initial fast fiber innervation is not responsible for the patterns of change in AChE activity seen with reinnervation in the SOL. It is concluded that the neural control of AChE is different in these two muscles and may reflect specific differences in the characteristics of AChE regulation in fast and slow muscle. Author

N85-26109*# Vanderbilt Univ., Nashville, Tenn. Dept. of Pharmacology.

USE AND DISUSE AND THE CONTROL OF ACETYLCHOLINESTERASE ACTIVITY IN FAST AND SLOW TWITCH MUSCLE OF RAT

W. D. DETTBARN, D. GROSWALD, R. C. GUPTA, and K. E. MISULIS 1985 22 p refs
(Contract NAG2-301)
(NASA-CR-175717; NAS 1.26:175717) Avail: NTIS HC A02/MF A01 CSCL 06C

The role of acetylcholinesterase (AChE) in neuromuscular transmission is relatively well established, little is known, however, of the mechanisms that regulate its synthesis and control its specific distribution in fast and slow muscle. Innervation plays an important role in the regulation of AChE and elimination of the influence of the nerve by surgical denervation results in a loss of AChE. The influences of the nerve and how they are mediated was investigated. It is suggested that muscle usage and other factors

such as materials carried by axonal transport may participate in the regulation of this enzyme. The mechanisms that regulate AChE and its molecular forms in two functionally different forms are studied. E.A.K.

N85-26110*# Vanderbilt Univ., Nashville, Tenn. Dept. of Pediatrics.

DIFFERENTIAL EFFECT OF DENERVATION ON FREE RADICAL SCAVENGING ENZYMES IN SLOW AND FAST MUSCLE OF RAT

K. ASAYAMA, W. D. DETTBARN, and I. M. BURR 1985 22 p refs
(Contract NAG2-301)
(NASA-CR-175719; NAS 1.26:175719) Avail: NTIS HC A02/MF A01 CSCL 06C

To determine the effect of denervation on the free radical scavenging systems in relation to the mitochondrial oxidative metabolism in the slow twitch soleus and fast twitch extensor digitorum longus (EDL) muscles, the sciatic nerve of the rat was crushed in the mid-thigh region and the muscle tissue levels of 5 enzymes were studied 2 and 5 weeks following crush. Radioimmunoassays were utilized for the selective measurement of cuprozinc (cytosolic) and manganoo (mitochondrial) superoxide dismutases. These data represent the first systematic report of free radical scavenging systems in slow and fast muscles in response to denervation. Selective modification of cuprozinc and manganosuperoxide dismutases and differential regulation of GSH-peroxidase was demonstrated in slow and fast muscle. B.G.

N85-26111*# Vanderbilt Univ., Nashville, Tenn. Dept. of Pharmacology.

CHANGES IN THE CHOLINERGIC SYSTEM OF RAT SCIATIC NERVE AND SKELETAL MUSCLE FOLLOWING SUSPENSION INDUCED DISUSE

R. C. GUPTA, K. E. MISULIS, and W. D. DETTBARN 1984 21 p refs
Presented at the 68th Ann. Meeting of Federation of American Societies for Experimental Biology, St. Louis, 1-6 Apr. 1984

(Contract NAGW-469)
(NASA-CR-175718; NAS 1.26:175718) Avail: NTIS HC A02/MMF A01 CSCL 06C

Muscle disused induced changes in the cholinergic system of sciatic nerve, slow twitch soleus (SOL) and fast twitch extensor digitorum longus (EDL) muscle were studied in rats. Rats with hindlimbs suspended for 2 to 3 weeks showed marked elevation in the activity of choline acetyltransferase (ChAT) in sciatic nerve (38%), in SOL (108%) and in EDL (67%). Acetylcholinesterase (AChE) activity in SOL increased by 163% without changing the molecular forms pattern of 4S, 10S, 12S, and 16S. No significant changes in activity and molecular forms pattern of AChE were seen in EDL or in AChE activity of sciatic nerve. Nicotinic receptor binding of 3H-acetylcholine was increased in both muscles. When measured after 3 weeks of hindlimb suspension the normal distribution of type 1 fibers in SOL was reduced and a corresponding increase in type IIa and IIb fibers is seen. In EDL no significant change in fiber proportion is observed. Muscle activity, such as loadbearing, appears to have a greater controlling influence on the characteristics of the slow twitch SOL muscle than upon the fast twitch EDL muscle. E.A.K.

N85-26112# Washington Univ., Seattle. Bioelectromagnetics Research Lab.

EFFECTS OF LONG-TERM LOW-LEVEL RADIOFREQUENCY RADIATION EXPOSURE ON RATS. VOLUME 7: METABOLISM, GROWTH AND DEVELOPMENT Final Reprint

R. B. JOHNSON, L. L. KUNZ, D. THOMPSON, J. CROWLEY, C. K. CHOU, and A. W. GUY Sep. 1984 100 p refs
(Contract F33615-80-C-0612)
(AD-A150829; USAFSAM-TR-84-31-VOL-7) Avail: NTIS HC A05/MF A01 CSCL 06R

For 25 months 100 male specific pathogen-free (SPF) rats were exposed to pulsed 2450-MHz circularly polarized microwaves

at an average power density of 0.480 mW/sq. cm; 100 rats served as sham-exposed controls. Analysis of daily body weight and food and water consumption failed to distinguish the treatment groups. Periodic assessment of oxygen consumption, carbon dioxide production, and respiratory quotient also failed to reliably differentiate the groups. Whole-body carcass analysis, including organ mass, fatty acid profile, and mineral content were conducted on 20 rats killed after 13 months exposure and 20 killed at termination. With one exception, these measures did not indicate significant differences between the treatment groups. No consistent significant effects were observed. Author

N85-26113# National Science Foundation, Washington, D.C.
BIOTECHNOLOGY IN JAPAN

H. W. LEWIS 15 Jun. 1984 91 p refs
(PB85-169464) Avail: NTIS HC A05/MF A01 CSCL 06E
Japan's special thrust in biotechnology started in 1981 with a report issued by the Ministry of International Trade and Industry (MITI), outlining a 10-year program. The present report is an assessment of the first 2 years of that program. The report is presented in two major parts: (1) the organization of the biotechnology enterprise and an assessment of its infrastructure, and (2) a survey of accomplishments. GRA

N85-27129# Utah Univ., Salt Lake City. Dept. of Electrical Engineering.

THE PHYSICAL INTERACTIONS OF RADIOFREQUENCY RADIATION FIELDS AND BIOLOGICAL SYSTEMS
C. H. DURNEY *In* AGARD The Impact of Proposed Radio Frequency Radiation Standards on Mil. Operations 19 p Mar. 1985 refs

Avail: NTIS HC A08/MF A01
A biological system irradiated by radiofrequency radiation (RFR) responds to the internal RFR fields produced by that irradiation. The measurement and calculation of the internal fields is called dosimetry. The internal fields are often described in terms of the specific absorption rate (SAR) in watts/kilogram. SARs are usually determined experimentally by measuring temperature rise in the absorber (either by discrete probes or thermographic cameras) or by directly measuring the internal electric field. A combination of techniques, each valid for a particular model and in a particular frequency range, are used to calculate average whole body SARs for models of human beings and other animals over a wide frequency range for plane wave irradiation. Calculating SARs for near field irradiation is much more difficult than for plane wave irradiation; thus fewer near field SAR data are available. To calculate the spatial distribution of SARs is still more difficult (especially at higher frequencies); this problem in dosimetry is yet to be solved satisfactorily, although significant progress has recently been made in this area. Author

N85-27131# Rochester Univ., N. Y. Dept. of Medicine.
THE BIOLOGICAL EFFECTS OF RADIOFREQUENCY RADIATION

N. J. ROBERTS, JR. and S. M. MICHAELSON *In* AGARD The Impact of Proposed Radio Frequency Radiation Standards on Mil. Operations 26 p Mar. 1985 refs
(Contract F33615-84-C-0608; DE-AC02-76EV-03490; NIH-N01-AL-15547; NIH-N01-ES-03239)
Avail: NTIS HC A08/MF A01

Exposure of the general public and in particular certain occupational groups to radiofrequency radiation (RFR) is ubiquitous and of growing concern. No clear and widely accepted understanding of the biological effects and health implications of such RFR exposure has emerged. The data available, including reports of RFR effects on single cells or cell components, on genetic composition or development, on developed organs, tissues, or cell systems, and on integrative and regulatory biological systems are reviewed. Reports of RFR effects on the immunological system with consideration of the influence of neuroendocrine responses, are critically reviewed in greater detail to illustrate important points regarding data acquisition and assessment, and understanding and application of the RFR bioeffects literature in general. Factors

affecting RFR bioeffects research are reviewed, and recommendations for future studies are provided. Author

N85-27507 Central Electricity Generating Board, London (England).

DOES A 50-CYCLE ALTERNATING FIELD HAVE CENTRAL NERVOUS EFFECTS?

G. FISCHER, H. UDERMANN, and KNAPP 28 Mar. 1985 6 p refs
Transl. into ENGLISH from Zentr. Bakteriolog. Hyg. Infektionskrankh. Abt. Orig. (West Germany), v. 166, 1978 p 381-385
(BLL-CE-TRANS-8083-(9022.09)) Avail: British Library Lending Div., Boston Spa, England

Rats were subjected to a 50-cycle alternating field of strength 5300 V/m for up to 21 days. At various intervals of the exposure, the norepinephrine content in the brain was measured. The changes ascertained in the turn-over of the norepinephrine metabolism agree with data in the literature on the triggering of central-nervous effects by field energies. The oxygen consumption of laboratory animals rose even after only brief exposure. At the same time, body temperature and heart rate fell below the control values. The spontaneous occurrence of these effects indicates that field energies have a point of attack in the central nervous system. To provide further data on the existence of this mechanism, the catechol amine content in the brain of exposed animals was measured. B.W.

N85-27508*# Applied Medical Technology, Inc., Brecksville, Ohio.

PERCUTANEOUS CONNECTORS Annual Report

G. J. PICHA and S. R. TAYLOR Sep. 1981 49 p refs
(Contract NAS3-22654)
(NASA-CR-175627; NAS 1.26:175627; AR-1) Avail: NTIS HC A03/MF A01 CSCL 06B

A surface possessing a regular array of micro-pillars was evaluated with regard to its ability to control epithelial downgrowth at the percutaneous interface. A range of pillar sizes were applied to the vertical segment of T shaped Biomer (R) implants. These percutaneous tabs were implanted into the dorsum of cats for a period of 6 weeks using a standardized surgical technique. Comments were made post-operatively and at the time of retrieval. A quantitative scoring system was applied to these observations as well as histological results. As observed, the pillar morphology used displayed the ability to control epithelial downgrowth. Collagen ingrowth into the interpillar spaces and possibly direct interactions of the epithelial cells with the morphology may account for the inhibition. The reproducibility of epithelial inhibition is, however, limited by other factors which are currently not well understood. These factors and potential methods of assessment are discussed. Author

N85-27509*# Oklahoma State Univ., Stillwater. Dept. of Botany and Microbiology.

MICROBIAL ECOLOGY OF EXTREME ENVIRONMENTS: ANTARCTIC YEASTS AND GROWTH IN SUBSTRATE-LIMITED HABITATS Final Report, 1 Dec. 1979 - 31 Aug. 1984

H. S. VISHNIAC 1984 9 p
(Contract NAGW-26)
(NASA-CR-175810; NAS 1.26:175810) Avail: NTIS HC A02/MF A01 CSCL 06C

An extreme environment is by definition one with a depauperate biota. While the Ross Desert is by no means homogeneous, the most exposed and arid habitats, soils in the unglaciated high valleys, do indeed contain a very sparse biota of low diversity. So sparse that the natives could easily be outnumbered by airborne exogenous microbes. Native biota must be capable of overwintering as well as growing in the high valley summer. Tourists may undergo a few divisions before contributing their enzymes and, ultimately, elements to the soil - or may die before landing. The simplest way to demonstrate the indigeneity of a particular microbe is therefore to establish unique distribution; occurrence only in the habitat in question precludes foreign origin. G.L.C.

N85-27510# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A COMMUNICATIONS LINK FOR AN IMPLANTABLE ELECTRODE ARRAY M.S. Thesis
 G. S. ZEMAN Dec. 1984 212 p
 (AD-A152238; AFIT/GE/ENG/84D-70) Avail: NTIS HC A10/MF A01 CSCL 06B

The research conducted in this thesis develops an implantable communications (biotelemetry) link for the Air Force Institute of Technology's implantable, multiplexed, multielectrode array used to record electric potentials on the visual cortex of a mammal. A prototype is developed to test the feasibility of transcutaneous data transfer and power transfer for a system relaying 100KHz of data bandwidth. The working system uses a varactor FM modulator, phase locked loop demodulator, and op amp signal amplification. Power transfer is made by a single frequency RF inductive couple to an implanted rechargeable Ni-Cd battery pack. The implanted system draws 18 milliwatts of power and the power supply is capable of supplying 30 milliamps of current at 5 volts for a 2 hour period before recharging is required. Details of the design procedures as well as recommendations for an implantable system realization are included. GRA

N85-27511# Smith-Kettlewell Inst. of Visual Sciences, San Francisco, Calif.
THE ORIGIN OF BRAIN POTENTIALS ASSOCIATED WITH SELECTIVE VISUAL ATTENTION Annual Scientific Report, 1 Sep. 1983 - 31 Aug. 1984
 K. NAKAYAMA and M. MACKEBEN 30 Nov. 1984 6 p Original contains color illustrations
 (Contract AF-AFOSR-0320-83)
 (AD-A152291; AFOSR-85-0246TR) Avail: NTIS HC A02/MF A01 CSCL 05J

This study is designed to find the origins of electrical signals generated by the brain in association with selective visual attention. A series of behavioral and electro-physiological tests on humans as well as on trained, alert monkeys is proposed and progress in pursuit of the stated goal is reported. GRA

N85-27512# Health Effects Research Lab., Research Triangle Park, N. C. Experimental Biology Div.
EXPERIMENTS IN MICROWAVE EXPOSURE IN THE RAT: BODY TEMPERATURE, SERUM CHEMISTRY AND THE USE OF CHEMICAL RESTRAINT Final Report, 1979 - 1980
 E. BERMAN and H. CARTER Jan. 1985 46 p refs
 (PB85-156834; EPA-600/1-85-005) Avail: NTIS HC A03/MF A01 CSCL 06R

A series of experiments was conducted in rats to observe their responses to 2450-MHz(CW) microwaves. Exposures of 30 mW/cm² caused a regular and significant increase in colonic temperature. A plateau of 38.9C was reached in 90 min and maintained for the rest of the 4-h exposure. Rats exposed to 20 mW/cm² for 4 h exhibited patterns of colonic temperature similar to sham-exposed rats. Measurements of 26 serum chemistry values produced similar results in rats exposed to 30 mW/cm² for 120 min and rats exposed to 0 or 20 mW/cm² for 120 min. Only serum corticosterone was significantly increased in the dose-related response of naive rats to this acute exposure. Various injectable anesthetics were evaluated as restraints in microwave exposure experiments. Immobilization was accompanied by decreased colonic temperature. After exposure to 30 mW/cm² for 90 min, mean colonic temperatures in chemically restrained rats ranged from 39-40.4C, and increased up to 5.5C from anesthetically to depressed pre-exposure levels. Limitations on the use of chemical restraint for this kind of experiment and on the use of multivariate serum chemistry screening tests were determined. GRA

N85-27513# National Academy of Sciences - National Research Council, Washington, D. C. Board on Agriculture.
GENETIC ENGINEERING OF PLANTS: AGRICULTURAL RESEARCH OPPORTUNITIES AND POLICY CONCERNS
 1984 96 p refs
 (DE85-006771; DOE/ER-13094/T1) Avail: NTIS HC A05/MF A01

The potential contribution of genetic engineering to agriculture is discussed. Research opportunities presented by the new genetic technologies, as well as their implications for funding and training in the plant sciences are discussed. DOE

52

AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A85-33580
ASPECTS OF THE WORK OF AN AVIATION DOCTOR [O NEKOTORYKH NAPRAVLENIYAKH RABOTY AVIATIONNOGO VRACHA]
 V. S. LOZINSKII Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), March 1985, p. 47, 48. In Russian.

Such aspects of the aviation doctor's work as the preflight examination of flight personnel and the assessment of the psychophysiological presuppositions of pilot error are examined. Particular emphasis is placed on the evaluation of the psychophysiological preparedness of flight personnel and on preparation methods. B.J.

A85-33581
CHANGE IN HEMOGLOBIN HETEROGENEITY IN SAILORS DURING LONG VOYAGES [IZMENENIE GETEROGENNOSTI GEMOGLOBINA U MORIAKOV PRI DLITEL'NOM PLAVANII]
 V. A. BARINOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), March 1985, p. 48, 49. In Russian.

The change in HbF and erythrocyte level and catalytic activity was investigated in 18 healthy male sailors 18-32 years of age three days prior to a long voyage, at the middle and end of the voyage, and 10 days after the end. A change was observed in the hemoglobin heterogeneity in the direction of a decrease in the HbF fraction having an elevated oxygen affinity and in the direction of the 'rejuvenation' of erythrocytes. B.J.

A85-33622
THE UPPER LIMIT OF HUMAN SMOOTH PURSUIT VELOCITY
 C. H. MEYER, A. G. LASKER, and D. A. ROBINSON (Johns Hopkins University, Baltimore, MD) Vision Research (ISSN 0042-6989), vol. 25, no. 4, 1985, p. 561-563. Research supported by the Johns Hopkins University.
 (Contract NIH-EY-00598; NIH-EY-01765)

The maximum smooth pursuit eye velocity was determined in five human subjects. Eye movements were recorded with the d.c.-coupled EOG. On each trial the target moved in a ramp, at a constant velocity between 10 and 200 deg/sec. In four subjects eye velocity was approximately 90 percent of target velocity up to a target velocity of 100 deg/sec. Eye velocity then saturated with a large variability from trial to trial (standard deviation 16 deg/sec). The fifth subject had eye velocities only 60 percent of these values. Author

A85-33623

PREDICTION OF FLICKER SENSITIVITIES FROM TEMPORAL THREE-PULSE DATA

J. R. BERGEN (RCA David Sarnoff Research Center, Princeton, NJ; Chicago, University, Chicago, IL) and H. R. WILSON (Chicago, University, Chicago, IL) Vision Research (ISSN 0042-6989), vol. 25, no. 4, 1985, p. 577-582. refs
(Contract NIH-R01-EY-02158)

Attention is given to the possibility of accurately predicting sinusoidal flicker sensitivities from thresholds for a series of three temporal pulses at low spatial frequencies, using a model which comprises a linear temporal filter followed by an essential nonlinearity and temporal probability summation. The results obtained show that, at these low frequencies, both of the temporal nonlinearities are required for the prediction of flicker sensitivities from pulse sensitivities, while at higher spatial frequencies, temporal probability summation is the only nonlinear factor required for accurate prediction. O.C.

A85-33624

MOTION PERCEPTION DURING DICHOPIC VIEWING OF MOVING RANDOM-DOT STEREOGRAMS

C. J. ERKELENS and H. COLLEWIJN (Rotterdam, Universiteit, Rotterdam, Netherlands) Vision Research (ISSN 0042-6989), vol. 25, no. 4, 1985, p. 583-588. refs

In the present experimental investigation of the relation between binocular and monocular motion perception, a random dot stereogram containing a central figure seen in front of the background in stereoscopic vision was viewed dichoptically by human subjects without a fixed visual frame of reference. The images seen by the right and the left eye were moved laterally, according to a triangular waveform, in counterphase but with variable amplitude ratios. It is noted that only purely lateral movement, maintaining stereoscopic vision of the figure-background relation despite a lack of motion in depth in the stereogram as a whole, was perceived. Only the addition of a stationary reference yielded the perception of motion in depth. O.C.

A85-33625

THE BINOCULAR CONTRIBUTION TO MONOCULAR OPTOKINETIC NYSTAGMUS AND AFTER NYSTAGMUS ASYMMETRIES IN HUMANS

T. HINE (MIT, Cambridge, MA) Vision Research (ISSN 0042-6989), vol. 25, no. 4, 1985, p. 589-598. Research supported by the Spencer Foundation. refs
(Contract NIH-EY-02621; NIH-EY-01191; N00014-84-C-0182)

A85-33733

DETECTION OF INTRAVASCULAR BUBBLES IN DECOMPRESSION SICKNESS AND ASSOCIATED PHYSIOLOGICAL ISSUES

J. D. ADAMS (USAF, School of Aerospace Medicine, Brooks AFB, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 5 p. refs
(SAE PAPER 840982)

Gas emboli have long been recognized as being involved in the mechanism of decompression sickness. A brief review of past observations and methods to detect gas bubbles in biological systems under decompression stresses is presented. The main body of the presentation focuses on current human data associated with gas bubbles preceding bends, and the bubble dynamics before, during and after episodes of subjective pain. Emphasis will be placed on ultrasonic methodology associated with monitoring humans in spacecraft/altitude research environments. Author

A85-33751

PREDICTION OF AIRCREW PERFORMANCE UNDER DIFFERENT ENVIRONMENTAL CONDITIONS

E. H. WISSLER (Texas, University, Austin, TX) and S. A. NUNNELEY (USAF, School of Aerospace Medicine, Brooks AFB, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 9 p. refs
(SAE PAPER 840939)

If thermal problems are to be avoided in both military and commercial aviation, a rational procedure is required for evaluating the effect of various environmental parameters on the condition of aircrew members. In this paper, the authors describe a computer model which has been shown to predict accurately human thermal responses over a wide range of conditions. The model allows one to evaluate the effect on aircrew members of important parameters, such as the work profile, regional and temporal variation in windspeed, temperature, and solar load, and the type of garment worn. It is also possible to simulate the use of liquid cooled garments to reduce thermal stress, and the effect of immersion in cold water. Representative applications involving three different situations are presented in the paper. Author

A85-33759

THE POSTURE EXPERIMENT

F. LESTIENNE (CNRS, Laboratoire de Physiologie Neurosensorielle, Paris, France), J. L. LAFON (Societe Bertin et Cie., Plaisir, Yvelines, France), and E. CAPRARO (Centre National d'Etudes Spatiales, Paris, France) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 10 p. refs
(SAE PAPER 840948)

During the flight of the French astronaut Chretien aboard the Soviet Space Station Salyut 7 an experiment called Posture, aiming to study the principles governing the adaptation of the posture control mechanisms in 0g environment was conducted. The results obtained before, during and after the flight with the specific equipment developed by the Bertin Company, show there are two types of adaptation of the central program of posture regulation to weightlessness: a fast adaptation, appearing at the beginning of the flight and a slow adaptation which is seen at the end of the flight. Author

A85-33859

CARBOHYDRATE METABOLISM IN U.S. NAVY SUBMARINE PERSONNEL

E. HEYDER, L. W. MOONEY, and D. V. TAPPAN (U.S. Navy, Naval Submarine Medical Research Laboratory, Groton, CT) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Feb. 1985, p. 115-119. refs

One- and two-hour postprandial glucose and insulin values were measured in 58 submariners with 5 or more FBM patrols and in 58 non-submariners. An interrelationship between serum glucose and insulin for classifying defects in carbohydrate metabolism indicated that 55 percent of the submariners and 45 percent of the non-submariners exhibited some type of defect. Exercise appears to play an important role in the maintenance of normal carbohydrate metabolism in these subjects. Non-submariners reported engaging in significantly more exercise than did submariners. Negative correlation between exercise vs 1 and 2-h glucose and 2-h insulin was significant for all subjects. An inverse relationship was observed between amount of exercise and the severity of carbohydrate metabolic defects in submariners and non-submariners as well as in normal weight and obese individuals. No statistical differences were found between the submariner and non-submariner groups with respect to age, percent body fat, fatness (normal or obese), glycosylated hemoglobin, or family history of diabetes. Author

A85-33860**ISOMETRIC ABDOMINAL MUSCLE TRAINING AND G TOLERANCE**

U. I. BALLDIN, K. MYHRE, P. A. TESCH, U. WILHELMSSEN, and H. T. ANDERSEN (Karolinska Institutet; Forsvarets Forskningsanstalt, Stockholm, Sweden; Royal Norwegian Air Force, Institute of Aviation Medicine, Oslo, Norway) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 56, Feb. 1985, p. 120-124. refs

Methods to increase G tolerance of pilots flying high-performance aircraft are of vital importance. Straining maneuvers to increase G tolerance involve abdominal muscles, and high intra-abdominal pressures (IAP) are recorded during G exposure. This study was carried out to examine the effects of an 11-week abdominal muscle training program on maximal IAP, G tolerance and muscle strength/endurance in 10 fighter pilots. G tolerance was measured in a human centrifuge using simulated aerial combat maneuvers (ACM). The pilots had a higher maximal IAP before training than a control group. G tolerance, maximal IAP, and maximal peak torque of knee extensors were not changed by the training. In contrast, leg muscle endurance increased (p less than 0.01) and ratings of local perceived exertion decreased (p less than 0.01). Static endurance of the knee extensors was positively correlated (p less than 0.05) with G tolerance. It is concluded that the present abdominal training program, employed in experienced fighter pilots, is not sufficient to increase IAP or G tolerance. Author

A85-33861* Universities Space Research Association, Houston, Tex.

EFFICACY OF PHOSPHATIDYLCHOLINE IN THE MODULATION OF MOTION SICKNESS SUSCEPTIBILITY

R. L. KOHL (Universities Space Research Association, Houston, TX), P. RYAN (Technology, Inc., Houston, TX), and J. L. HOMICK (NASA, Johnson Space Center, Houston, TX) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 56, Feb. 1985, p. 125-128. refs

This study evaluated the efficacy of pharmacological doses of phosphatidylcholine (lecithin) in the modulation of motion sickness induced by exposure to coriolis stimulation in a rotating chair. Subjects received daily dietary supplements of 25 grams of lecithin (90 percent phosphatidylcholine) and were tested for their susceptibility to motion sickness after 4 h, 2 d, and 21 d. A small but statistically significant increase in susceptibility (+15 percent) was noted 4 h after supplemental phosphatidylcholine, with four of nine subjects demonstrating a marked increase in susceptibility. This finding was attributed to choline's stimulatory action on cholinergic systems, an action which opposes that of the classical antimotion sickness drug scopolamine. Chronic lecithin loading revealed a trend towards reduced susceptibility, possibly indicating the occurrence of adaptive mechanisms such as receptor down-regulation. Withdrawal from lecithin loading, perhaps coupled with anticholinergic treatment, might prove to be a potent prophylactic regimen and ought to be tested. Author

A85-33862**THE INFLUENCE OF THE AUTONOMIC SYSTEM UPON ATRIO-VENTRICULAR ACCESSORY PATHWAYS CONDUCTIVE PERFORMANCE**

L. KOPKA, S. BOJENKO, and R. DABROWA (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 56, Feb. 1985, p. 158-164. refs

In this report, the influence of the autonomic nervous system on the accessory pathway (Kent and Mahaim fibers) is discussed, based on electrophysiological and centrifuge examination results in two military pilots. It was demonstrated that catecholamines reduce the effective refractory period (ERP) and improve conductivity in both the atrio-ventricular node (A-V node) and the accessory pathway. It was concluded that the pattern of intermittent preexcitation may be connected with phenomenon of the 3rd and 4th phase block of the functional potential in the accessory pathway, and that in some cases the +Gz gravito-inertial tolerance

test performed on the human centrifuge may help in distinguishing subjects with the intermittent preexcitation syndrome. Finally, it was concluded that all pilots with preexcitation syndrome should be dismissed from flying. Author

A85-33863**RAPID CHANGES IN RATE-CORRECTED AND UNCORRECTED SYSTOLIC TIME INTERVALS DURING COLD PRESSOR TEST**

M. MANTYSAARI, K. ANTILA, and T. PELTONEN (Turku, University, Turku, Finland) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 56, Feb. 1985, p. 165-170. refs

The changes in heart rate and systolic time intervals were studied in a group of 10 young healthy male volunteers during immersion of their hand in ice water for 1 min. The heart rate and systolic time intervals were measured from electro-, phono-, and impedance cardiograms in the standard way. When the cold immersion was done in the supine position the left ventricular ejection time (LVET) and the electromechanic systole (Q-S2Tc) shortened, and when corrected for the heart rate the Q-S2Tc lengthened in the beginning of the immersion. In the head-up position the Q-S(2)T shortened in the beginning of the immersion while the rate corrected systolic time intervals remained unchanged. Most of the changes in the systolic time intervals disappeared before the last quarter of the cold immersion. It was observed that during the cold immersion the linear regression coefficients between the heart rate and the Q-S2T in the supine position as well as between the heart rate and the LVET, Q-S2T and the PEP in the head-up position were greater than the regression coefficients used in the rate correction. Author

A85-33951**RESPONSE OF CORONARY CIRCULATION IN HEALTHY HUMANS TO THE ISOPROTERENOL STIMULATION OF THE HEART AND PHYSICAL EXERCISE [REAKTSIIA KORONARNOGO KROVOBRASHCHENIIA ZDOROVOGO CHELOVEKA NA STIMULIATSIIU SERDTSA IZOPROTERENOLOM I FIZICHESKUIU NAGRUZKU]**

V. V. CHESTUKHIN, V. E. KATKOV, E. M. NIKOLAENKO, N. V. PRAVETSKII, O. KH. ZYBIN, A. E. BELOVA, V. V. RUMIANTSEV, and O. A. SAVOSTIANOVA (Ministerstvo Zdravookhraneniia SSSR, Nauchno-Issledovatel'skii Institut Transplantologii i Iskusstvennykh Organov, Moscow, USSR) *Fiziologiya Cheloveka* (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 179-184. In Russian. refs

A85-33952**HEMODYNAMICS UNDER +GZ ACCELERATION MATHEMATICAL MODELING [GEMODINAMIKA PRI GRAVITATSIONNYKH PEREGRUZHAKH /MATEMATICHESKOE MODELIROVANIE/]**

B. L. PALETS, A. A. POPOV, M. A. TIKHONOV, and D. IU. ARKHANGELSKII (Akademiia Nauk Ukrainskoi SSR, Institut Kibernetiki, Kiev, Ukrainian SSR) *Fiziologiya Cheloveka* (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 185-191. In Russian. refs

A mathematical model is developed for the regulation of human blood circulation under +Gz acceleration in the head-pelvis direction. A digital-computer study of the model shows that it is adequate to experimental data with respect to indices of systemic hemodynamics in the entire +Gz acceleration range up to the tolerance limit. Regulatory processes determining changes in the central blood volume are shown to play an important role in the pattern of circulation responses to +Gz acceleration; the role of active venomotor responses is relatively small. B.J.

A85-33953

IDENTIFICATION OF ADDITIONAL INFORMATIVE FEATURES IN A PERIPHERAL-PULSE SIGNAL FOR THE ASSESSMENT OF THE FUNCTIONAL STATE OF A HUMAN OPERATOR [VYDELENIE DOPOLNITEL'NYKH INFORMATIVNYKH PRIZNAKOV V SIGNALNE PERIFERICHESKOGO PUL'SA DLIA OTSENKI FUNKSIONAL'NOGO SOSTOIANIIA CHELOVEKA-OPERATORA]

A. A. DESOVA, V. F. KOROTKII, I. I. BELOVA, and A. A. ZHURAVEL (Institut Problem Upravleniia, Moscow, USSR) *Fiziologiiia Cheloveka* (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 192-200. In Russian. refs

A number of additional signs correlating with the functional state of human operators have been identified on the basis of a statistical analysis of the time and amplitude parameters of diastolic and diastolic waves of single oscillations of the peripheral pulse. Appropriate complexing of a number of traditional and additional peripheral-pulse features enhances the quality of the discrimination of operational-load levels of test subjects. B.J.

A85-33954

CLASSIFICATION OF EKG CHANGES UNDER MUSCLE LOAD IN HEALTHY HUMANS [KLASSIFIKATSIIA IZMENENII ELEKTROKARDIOGRAMMY PRI MYSHECHNOI NAGRUZKE U ZDOROVOGO CHELOVEKA]

A. I. ZAVIALOV (Belorusskii Gosudarstvennyi Universitet, Minsk, Belorussian SSR) *Fiziologiiia Cheloveka* (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 201-207. In Russian. refs

A classification of EKG changes under physical work was developed on the basis of data for a large set of healthy persons, including athletes and nonathletes. This type of classification was found to increase the information value of single-channel EKG leads in the study of various loads. EKG changes in relation to physical work stress can be used as the basis of a quantitative evaluation of various qualitative EKG changes; this makes possible the statistical analysis of states arising under physical work, which in turn enhances the quality of comparative analysis. Finally, the proposed approach leads to the possibility of a more careful study of the effect of various types of loads on the body, with the aim of improving motor activity and the prevention of disease. B.J.

A85-33955

OCULOMOTOR ACTIVITY AS AN INDEX OF THE FUNCTIONAL STATE OF THE BRAIN [GLAZODVIGATEL'NAIA AKTIVNOST' KAK POKAZATEL' FUNKSIONAL'NOGO SOSTOIANIIA MOZGA]

E. D. KHOMSKAIA and I. V. EFIMOVA (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) *Fiziologiiia Cheloveka* (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 235-240. In Russian. refs

Tests performed on university students indicate that fatigue arising at the end of a day of lectures and emotional excitement connected with examinations lead to an increase in eye-movement frequency and to a decline in the uniformity of eye movements. These effects are most pronounced in subjects with a relatively low overall level of motor activity. These data point to the different physiological significance of the above-mentioned indices: the frequency index appears to reflect the overall energy characteristics of brain work, while the uniformity index appears to reflect the stability of mechanisms for the regulation of saccadic eye movements. B.J.

A85-33956

EFFECT OF INTENSE MENTAL LOAD ON NATURAL NIGHT SLEEP [VLIANIE INTENSIVNOI UMSTVENNOI NAGRUZKI NA NOCHNOI SON]

V. V. KULIKOVSKII (I Moskovskii Meditsinskii Institut, Moscow, USSR) *Fiziologiiia Cheloveka* (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 247-251. In Russian. refs

Five-hour intense mental load right after the usual working day is found to produce significant changes in the organization of the natural sleep of healthy test subjects. The following changes are observed in natural-sleep EEG after mental load: the percent

fraction of delta sleep increases and the delta index decreases; the percent fraction of the second stage and the spindle index (in the second cycle) decrease; the number of movements with activations in the second cycle decreases; the latency period of the rapid sleep phase is shortened; and the length of the second cycle increases. A decrease in heart rate and skin-galvanic response is observed during the entire period of night sleep. These results are a reflection of the adaptation of the test subjects to the experimental situation and are connected to a significant degree with the fatigue factor. B.J.

A85-33957

ADAPTIVE ROLE OF DELTA SLEEP [ADAPTIVNAIA ROL' DEL'TA-SNA]

A. M. VEIN, I. G. DALLAKIAN, T. S. ELIGULASHVILI, V. V. KULIKOVSKII, IA. I. LEVIN, A. A. SIDOROV (I Moskovskii Meditsinskii Institut, Moscow, USSR), and N. A. VLASOV *Fiziologiiia Cheloveka* (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 252-257. In Russian. refs

The adaptive function of restorative delta-sleep was studied in healthy males after total sleep deprivation, small doses of alcohol, and physical and mental loads. The adaptive role of delta sleep is observed in relation to all the above-mentioned factors, which is an indication of the polyfunctional character of sleep in general and of delta sleep in particular. B.J.

A85-33958

EFFECT OF MODERATE HYPOXIA ON THE WORK CAPACITY OF HUMAN OPERATORS DEPENDING ON INDIVIDUAL CHARACTERISTICS [VLIANIE UMERENNOI GIPOKSII NA RABOTOSPOBOST' CHELOVEKA-OPERATORA V ZAVISIMOSTI OT INDIVIDUAL'NYKH OSOBNOSTEI]

IU. V. BUSHOV, A. F. ERSHOV, F. V. OSMININ, A. P. PISANKO, and V. A. NIBUSH (Nauchno-Issledovatel'skii Institut Biologii i Biofiziki, Tomsk, USSR) *Fiziologiiia Cheloveka* (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 258-261. In Russian. refs

Tests of mental and physical work capacity were used to classify 50 male test subjects into those stable and unstable with respect to hypoxia at a simulated altitude of 3500 m and an exposure time of 60 min. One-hour moderate hypoxia was found to produce tachycardia, a decrease in the oxygen saturation of the blood, and a decrease in mental and physical work capacity. A negative correlation was found between emotional lability, individual anxiety, and work capacity prior to exposure to hypoxia. B.J.

A85-33959

STRUCTURE OF THE RESPIRATORY CYCLE IN THE CASE OF EXCESS INTRAPULMONARY PRESSURE AND DIFFERENT OXYGEN CONCENTRATIONS IN THE RESPIRATORY MIXTURE [STRUKTURA DYKHATEL'NOGO TSIKLA PRI IZBYTOCHNOM VNUTRILEGOCHNOM DAVLENII I RAZLICHNOM SODERZHANII KISLORODA V DYKHATEL'NOI SMESI]

I. S. BRESLAV, E. L. KALACHEVA, A. V. KOCHUBEEV, and E. A. SOKOL (Akademiiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) *Fiziologiiia Cheloveka* (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 262-265. In Russian. refs

The pattern of breathing under excess intrapulmonary pressure (20-30 mm Hg) was studied in healthy males 22-30 years of age in the case of respiratory mixtures consisting of air, 98 percent oxygen, and 8.5 percent oxygen in nitrogen. Significant variations in the breathing pattern depending on the individual characteristics of the subject were observed. The most regular response was an increase in breathing rate due to shortened expiration, leading to hyperventilation with the development of hypocapnia. There is no distinction among respiratory responses to short-term exposures to excess intrapulmonary pressure in normal-oxygen conditions, hyperoxia, and hypoxia. B.J.

A85-33960

INVESTIGATION OF EXTERNAL-BREATHING FUNCTIONS AND ACID-BASE STATE DURING FATIGUE [ISSLEDOVANIE FUNKTSII VNESHNEGO DYKHANIIA I KISLOTNO-SHCHELOCHNOGO SOSTOIANIIA PRI UTOMLENII]
N. P. KRASNIKOV, S. I. NAIDICH, and I. A. BUKOV (Krymskii Meditsinskii Institut, Simferopol, Ukrainian SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 266-271. In Russian. refs

Tests conducted on highly qualified bicyclists show that exercise on a bicycle ergometer up to total fatigue is accompanied by an increase in lactic-acid concentration, and a decrease in pH, partial CO₂ pressure, and the content of bicarbonates in the capillary blood. A decrease in CO₂ production and the respiratory coefficient during passive rest is considered as a compensatory response of external breathing, directed toward the restoration of pCO₂, pH, and the buffer capacity of the blood. Hypocapnia which arises under maximum physical load may be a diagnostic sign of the development of fatigue and an actuating factor in the mechanism for the restoration of the bicarbonate buffer, the external-breathing functions, and physical work capacity. B.J.

A85-33961

CHARACTERISTICS OF THE VENTILATION FUNCTION OF THE LUNGS UNDER HYPERCAPNIA IN LATE MIDDLE AGE AND IN OLD AGE [OSOBENNOSTI VENTILIATSIONNOI FUNKTSII LEGKIKH PRI GIPERKAPNII V POZHILOM I STARCHESKOM VOZRASTE]

L. A. IVANOV (Akademiia Meditsinskikh Nauk SSSR, Nauchno-Issledovatel'skii Institut Gerontologii, Kiev, Ukrainian SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 272-279. In Russian. refs

A85-33962

EFFECT OF A SINGLE APPLICATION OF ELF LOW-INTENSITY ELECTROMAGNETIC FIELDS ON INDICES OF THE ENDOCRINE SYSTEM [VLIANIE ODNOKRATNOGO VOZDEISTVIIA SLABYKH ELEKTROMAGNITNYKH POLEI SVERKHNIZKOI CHASTOTY NA POKAZATELI ENDOKRINNOI SISTEMY]

E. A. ZAGORSKAIA Fiziologiya Cheloveka (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 293-299. In Russian. refs

Experimental results are presented concerning the functional activity of the human endocrine system under electromagnetic fields with an intensity close to that of the natural geomagnetic background and a frequency close to that of the human EKG alpha-rhythm. The tests involved the five-hour exposure of 30 healthy male subjects. Changes in the activity of the hypophyseal-adrenal system were observed, accompanied by activation of the sex organs in most of the subjects and the activation of the hypophyseal-thyroid system in some. The observed changes probably have the character of adaptive compensatory responses of the regulatory systems of the body to short-term effects of the low-intensity fields. B.J.

A85-33963

INVESTIGATION OF THE EFFECT OF HYPOKINESIA AND ACCELERATIONS ON HUMAN CHROMOSOMES [ISSLEDOVANIE VLIANIIA GIPOKINEZII I USKORENII NA KHROMOSOMY CHELOVEKA]

N. N. BOBKOVA Fiziologiya Cheloveka (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 300-302. In Russian. refs

The effect of 30-day antiorthostatic hypokinesia with an inclination angle to the horizontal of -8 deg and the subsequent application of transverse accelerations of 8 g for 40 sec on the chromosomes was studied in seven male subjects 42-52 years of age with atherosclerosis and vegetative-vascular dystonia. The hypokinesia and acceleration did not damage the chromosomes in the peripheral-blood lymphocytes. B.J.

A85-33964

MECHANISM OF THE ADAPTOGENIC EFFECT OF ELEUTHEROCOCCUS ON THE HUMAN BODY UNDER HEAT STRESS [O MEKHANIZME ADAPTOGENNOGO DEISTVIA ELEUTEROKOKKA KOLIUCHEGO NA ORGANIZM CHELOVEKA PRI TEPLOVOM STRESSE]

G. N. NOVOZHILOV and K. K. SILCHENKO (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 303-306. In Russian. refs

The application of eleutherococcus extract in the course of 10 days prior to applied heat stress was found to have a favorable effect on body thermoregulation; body temperature was 0.73 C lower in test subjects than in the control group. However, a high biological 'cost' for the heat adaptation was observed, expressed in two effects: (1) a significantly higher energy cost of enhanced thermal stability under eleutherococcus administration than in the control group; and (2) a more pronounced mobilization of proteins, manifested in the growth of the fraction of protein consumed in the energy metabolism and in a higher level of excretion of nitrogen compounds in the sweat and urine. B.J.

A85-33965

SUBPOPULATIONS AND PHYSIOLOGICAL ACTIVITY OF IMMUNOCOMPETENT HUMAN CELLS [SUBPOPULIATSII I FIZIOLGICHESKAIA AKTIVNOST' IMMUNOKOMPETENTNYKH KLETOK CHELOVEKA]

K. A. LEBEDEV and I. D. PONIAKINA (Ministerstvo Zdravookhraneniia SSSR, Institut Immunologii, Moscow, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 317-326. In Russian. refs

The literature on subpopulations of immunocompetent human cells is reviewed. An effort is made to demonstrate the heterogeneity of subpopulations of immunocompetent and phagocytic cells on the basis of the presence of receptors, smlg, and antigens on their surfaces. These markers often overlap, and their appearance, disappearance, and quantity depend strongly on the degree of differentiation and physiological activity of the cells. B.J.

A85-33966

VESTIBULAR RESISTANCE AND CHANGES IN BLOOD CIRCULATION IN ORTHOSTATIC POSITION UNDER HYPERTHERMIA [VESTIBULIARNAIA REZISTENTNOST' I IZMENENIE KROVOOBRAZHCENIIA V ORTOSTATICHESKOM POLOZHENII PRI GIPERTERMII ORGANIZMA]

V. I. SOBOLEVSKII (Leningradskii Gosudarstvennyi Institut Fizicheskoi Kul'tury, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 327-330. In Russian. refs

A85-33967

SEASONAL ASYMMETRY OF THE MEAN SKIN TEMPERATURE OF THE RIGHT AND LEFT HANDS [SEZONNAIA ASIMMETRIIA SREDNEI TEMPERATURY KOZHI KISTEI PRAVOI I LEVOI RUK]

V. A. NIKULINA (Leningradskii Nauchno-Issledovatel'skii Neirokhirurgicheskii Institut, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 334-336. In Russian. refs

A85-33968

MECHANISM OF HEAT TRANSFER TO THE EXTREMITIES IN MAN [K VOPROSU O MEKHANIZME TEPLOPERENOSA V KONECHNOSTI CHELOVEKA]

T. G. RAIGORODSKAIA, V. N. KOSHELEV, and O. L. PERTSOV (Gosudarstvennyi Opticheskii Institut, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 11, Mar.-Apr. 1985, p. 336-338. In Russian. refs

The possible effects of conductive and convective forms of heat transfer on the formation of the skin temperature field in the lower extremities during exercise of the muscles are assessed by a comparison of experimental data with numerical results obtained

on the basis of the mathematical model of Koshelev and Pertsov (1978). Results indicate that the role of heat conduction in the transfer of heat from deep muscles to extremity surfaces is insignificant, while most of the heat dissipation in the tissues and heat transfer to the surfaces occurs convectively. B.J.

A85-34051
NECK INJURIES IN ACUTE VIBRATORY ACCIDENTS IN COMBAT AIRCRAFT [LES ATTEINTES CERVICALES DANS LES ACCIDENTS VIBRATOIRES AIGUS DES AVIONS DE COMBAT]
 M. SYLVESTRE (Base Aerienne, Dijon, France), J.-M. MULLER (Base Aerienne Militaire, Vengue France, Ville Gabon, Gabon), and P. DELAHAYE (Ministere de la Defense Armees de l'Air, Service de Sante de la Force Aerienne Tactique, Metz, France) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 7-10. In French.

Cervical lesions arising in violent pitch-up incidents involving combat aircraft with automatic flight-control systems are discussed. The aerodynamics of pitch-up are reviewed; an accident involving a Mirage III at airspeed 450 kts and altitude 800-1000 ft, resulting in mild injuries to the pilot and copilot is described in detail; and the findings of Delahaye (1980), Delahaye et al. (1981) and Delahaye and Auffret (1982) regarding the range of injuries (including subluxations, fractures, and disk hernias), the treatment of injuries, and the physiopathogenic mechanisms responsible are summarized. T.K.

A85-34052
AFTEREFFECTS OF SCHEUERMANN'S DISEASE AND MEDICAL CERTIFICATION OF AIRCREW MEMBERS [SEQUELLES DE LA MALADIE DE SCHEUERMANN ET APTITUDE AU PERSONNEL NAVIGANT]
 J. FLAGEAT, J. L. VICENS, P. J. METGES, and R. P. DELAHAYE *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 11-16. In French.

The aftereffects of Scheuermann's disease of the spine are reviewed, with discussion of their frequency of occurrence, symptomatology, localization, degree of severity, and radiological aspects; and the implications for the medical certification of aircrew members are examined from a biomechanical point of view. Drawings of the radiological appearance of the aftereffects and tables listing the conditions which should disqualify a candidate from piloting various classes of aircraft (combat aircraft, helicopters, and transport aircraft) are provided. T.K.

A85-34053
LONG-DURATION FLIGHTS OF COMBAT AIRCRAFT - BIOMEDICAL ASPECTS [LES VOLS DE LONGUE DUREE SUR AVIONS DE COMBAT - ASPECTS MEDICO-PHYSIOLOGIQUES]
 O. MONTAUT (Base Aerienne, Reims, France), G. J. DESMARIS (Base Aerienne, Strasbourg, France), and C. H. MOURAREAU (Base Aerienne, Saint-Disier, Haute-Marne, France) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 17-19. In French.

Medical complaints of pilots of fighter-interceptor or bomber aircraft on long-duration (inflight-refueled) flights (5.5-10 h) are discussed. Consideration is given to posture problems associated with cockpit, instrumentation, or seat; discomfort related to the anti-G suit, waterproof clothing, the Mae West, the headgear, and underwear; and difficulties in eating, drinking, and elimination. T.K.

A85-34054
INTRODUCTION TO AERONAUTICAL SPECIALIZED SURGERY AND SENSORY PHYSIOPATHOLOGY [INTRODUCTION A LA CHIRURGIE SPECIALE ET A LA PHYSIO-PATHOLOGIE SENSORIELLE AERONAUTIQUES]

P. MANENT (Centre Principal d'Expertise Medicale du Personnel Navigant de l'Aeronautique, Paris, France) and H. LIENHART (Centre Principal d'Expertise Medicale du Personnel Navigant de l'Aeronautique, Paris; Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) (*Journées de Medecine Aeronautique*, 3rd, Versailles, France, June 17, 1984) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 24-28. In French.

The ophthalmological and otorhinolaryngological problems of aircrew members and their treatment and prevention are discussed in a general introduction focusing on French institutions. Consideration is given to the characteristics of modern aircraft and control systems; typical (military) crew tasks; the physiopathological stresses of flight; lesions and functional disorders of the eyes, ears, nose, and throat; and the role of the French aerospace-medicine institutions in the selection of air personnel, the treatment of sensory anomalies, the instruction of medical graduates in the specialized skills required, and human engineering to improve the effectiveness and safety of crew members. Author

A85-34055
DISORDERS FOUND IN OPHTHALMOLOGICAL EXAMINATIONS OF AIRCREW MEMBERS [LES 'DIFFICULTES DE L'EXPERTISE DU PERSONNEL NAVIGANT EN OPHTALMOLOGIE]

J.-C. BALLION, P. MANENT (Centre Principal d'Expertise Medicale du Personnel Navigant de l'Aeronautique, Paris, France), and J.-F. MAURIN (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) (*Journées de Medecine Aeronautique*, 3rd, Versailles, France, June 17, 1984) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 29-32. In French. refs

The results of ophthalmological examinations performed on 258 French military aircrew members during 1983 are summarized. The four major problems encountered (objective myopia, deuteranomalopia, hypertropialike oculomotor disorders, and degenerative peripheral chorioretinal lesions) are characterized in detail. T.K.

A85-34056
OTORHINOLARYNGOLOGICAL DISORDERS FOUND IN MEDICAL EXAMINATIONS OF AIRCREW MEMBERS [LES DIFFICULTES RENCONTREES LORS DE L'EXPERTISE MEDICALE DU PERSONNEL NAVIGANT EN ORL]

F. DOUCET, J. M. FAUGERE, F. GOUTEYRON (Hopitaux des Armees, Paris, France), and H. LIENHART (Service de Sante des Armees, Paris, France) (*Journées de Medecine Aeronautique*, 3rd, Versailles, France, June 17, 1984) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 33-36. In French.

The ear, nose, and throat disorders typically encountered in routine physical examinations of current or prospective aircrew members, their treatment, and their implications for the flight certification of the crew member are reviewed. Consideration is given to problems of the inner ear (acoustic neuroma and disturbances of the endolymphatic pressure), the middle ear (tubular permeability problems and otospongiosis), and the throat (thyroid nodules). The diagnosis and treatment of thyroid nodules is discussed in detail. T.K.

A85-34057

OPHTHALMOLOGICAL TREATMENT AND PROFESSIONAL REHABILITATION OF AIRCREW MEMBERS [THERAPEUTIQUE ET REHABILITATION PROFESSIONNELLE DU PERSONNEL NAVIGANT EN OPHTALMOLOGIE]

H. BOURGEOIS, J.-P. RENARD (Hopital d'Instruction des Armees Val de Grace, Paris, France), and P. MANENT (Centre Principal d'Expertise Medicale du Personnel Navigant de l'Aeronautique, Paris, France) (Journées de Medecine Aeronautique, 3rd, Versailles, France, June 17, 1984) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 36-40. In French.

The diagnosis and treatment of eye disorders in six aircrew members examined at French military hospitals are described in detail and discussed. The need to take active surgical or physical-therapy measures to correct the problems, to obtain the fully informed consent of the patient, to take treatment aftereffects which may be incompatible with flight duties into account, and to achieve complete cooperation between the medical expert and the rehabilitation therapist is stressed. T.K.

A85-34058

OTORHINOLARYNGOLOGICAL TREATMENT AND PROFESSIONAL REHABILITATION OF AIRCREW MEMBERS [THERAPEUTIQUE ET REHABILITATION PROFESSIONNELLE DU PERSONNEL NAVIGANT EN OTO-RHINO-LARYNGOLOGIE]

J. F. GOUTEYRON, H. LIENHART, J. P. COHAT, and P. TRANNOY (Hopitaux des Armees, Paris, France) (Journées de Medecine Aeronautique, 3rd, Versailles, France, June 17, 1984) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 40-42. In French.

The diagnosis and treatment of sinus, ear, or throat disorders in four combat-aircraft pilots seen at French military hospitals are described in detail. The problems sometimes encountered when the treatment required may potentially disqualify the patient from flight duty are discussed. T.K.

A85-34059

A NEW PROFESSIONAL QUALIFICATION TEST FOR FLIGHT PERSONNEL CONTRAST SENSITIVITY [UN NOUVEAU TEST DE CAPACITE PROFESSIONNELLE DU PERSONNEL NAVIGANT - LA SENSIBILITE AU CONTRASTE]

C. CORBE (Service de Sante pour l'Armee de l'Air, Ecole d'Application, Paris, France) and J.-P. MENU (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France) (Journées de Medecine Aeronautique, 3rd, Versailles, France, June 17, 1984) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 43-47. In French.

The use of three-color contrast-sensitivity tests to evaluate the vision of working or candidate flight personnel is proposed. The conventional tests of visual acuity are characterized; the results of studies indicating a discrepancy between measured acuity and professional performance in pilots are summarized; the principles of contrast-sensitivity testing are discussed; and preliminary results of tests administered to active pilots are reported. Contrast tests are found to provide good indications of visual performance in the kinds of tasks performed by flight personnel and to facilitate the diagnosis of job-related pathologies such as radiation-induced lens damage. T.K.

A85-34060

EPIDEMIOLOGY OF AIRCREW HEARING LOSS [EPIDEMIOLOGIE DE LA SURDITE DE L'AVIATEUR]

H. LIENHART (Centre Principal d'Expertise Medicale du Personnel Navigant de l'Aeronautique, Paris; Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) and F. DOUCET (Hopitaux des Armees, Paris, France) (Journées de Medecine Aeronautique, 3rd, Versailles, France, June 17, 1984) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 47-51. In French.

The results of comparative audiometric measurements on 362 combat pilots, 352 military transport pilots, and 866 air traffic controllers of ages 25-55 are presented in graphs and tables and analyzed. Significant hearing loss (relative to the controllers)

is observed in the pilots after about age 40, the average difference between pilots and controllers in the 40-yr-old classification being 19 dB at 4 kHz. Since pilots are required to wear protective headgear in flight (reducing the cabin-noise exposure from 95 to about 50 dB) and are exposed to the same background radio noise as the controllers, these losses are attributed to their exposure to high noise levels in taxiways, hangars, and aircraft parking areas. The compensation of pilots for hearing loss by the French Military pension system is discussed, and the inclusion of the inclusion of the loss at 4 kHz in calculating the overall loss and its compensation is recommended. T.K.

A85-34061

OBJECTIVE AUDIOMETRY - APPLICATION TO THE EXAMINATION OF AIRCREW MEMBERS [L'AUDIOMETRIE OBJECTIVE - INTERET DANS L'EXPERTISE DU PERSONNEL NAVIGANT]

H. LIENHART (Centre Principal d'Expertise Medicale du Personnel Navigant de l'Aeronautique, Paris; Hopital d'Instruction des Armees Dominique Larrey, Versailles, France), F. DOUCET, F. GOUTEYRON, and J. M. FAUGERE (Hopitaux des Armees, Paris, France) (Journées de Medecine Aeronautique, 3rd, Versailles, France, June 17, 1984) *Medecine Aeronautique et Spatiale*, vol. 24, 1st Quarter, 1985, p. 54-59. In French.

The principles and techniques of objective audiometric testing are characterized in a general review and illustrated with diagrams and sample test results. Methods discussed include impedance measurements (tympanometry and muscular acoustic reflex) and measurements of auditory potentials in response to a stimulus. The advantages of the objective technique in a clinical environment and specifically for the routine evaluation of flight personnel are indicated. T.K.

A85-34277

THE EUROPEAN VESTIBULAR EXPERIMENTS IN SPACELAB-1

J. KASS, R. VON BAUMGARTEN (Mainz, Universitaet, Mainz, West Germany), A. BENSON (RAF, Institute of Aviation Medicine, Farnborough, Hants., England), A. BERTHOZ (CNRS, Laboratoire de Neurosensorielle, Paris, France), TH. BRANDT, TH. PROBST, H. SCHERER (Klinikum Grosshadern, Munich, West Germany), W. BRUZEK, J. DICHGANS (Neurologische Klinik, Tuebingen, West Germany), U. BRAND et al. (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research (ISSN 0273-1177)*, vol. 4, no. 10, 1984, p. 3-9. Research supported by the Bundesministerium fuer Forschung und Technologie and Centre National d'Etudes Spatiales. refs

A series of preflight, inflight, and postflight experiments, performed in the Spacelab-1 mission in November-December, 1983 are reported. Various aspects of the functions of the vestibular system, the inflight tests comprising threshold measurements for linear movements in three orthogonal axes, optokinetic stimulation, vestibulo-ocular reflexes under linear and angular accelerations, caloric stimulation with and without linear accelerations and eye counter-rotation measurements are considered by the experiments. The caloric experiment indicates a very significant result: strong caloric nystagmus is observed for the two subjects tested, which is not in agreement with what is expected from Barany's (1907) convection hypothesis for caloric nystagmus. The other experiments show a tendency of the organism after adaptation to weightlessness to ignore the signals from the otolith system and to increase dependence on the visual stimuli. M.D.

A85-34278
SYSTOLIC TIME INTERVALS AFTER A SEVEN-DAY ORBITAL FLIGHT

P. GROZA, R. VRANCIANU, M. LAZAR (Institutul de Fiziologie Normala si Patologica, Bucharest, Rumania), R. M. BAEVSKII, and V. L. FUNTOVA (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 11-14. refs

The cardiac cycle components (heart rate, systolic time intervals, ejection fraction, stroke volume, and QT interval) of two cosmonauts participating in the Soviet-Rumanian seven-day orbital flight on the Soyuz 40 - Salyut 6 complex in May, 1981, are investigated before, during, and after an ergometric bicycle-exercise test performed before flight and after landing. A precordial electrocardiogram (ECG) and an ear photodensitogram (DEN) are recorded simultaneously and the method used permits recording even during exercise. The ECG and DEN signals are stored on magnetic tape in order to obtain on-line direct analogue traces and to permit computer analysis. A slight myocardial deconditioning in one of the cosmonauts, demonstrated by an increase in the pre-ejection period (PEP), is indicated by the data obtained after landing, whereas in the other cosmonaut, PEP is unchanged, corresponding to a sympathoadrenergic hypertonia. It is concluded that no important cardiovascular changes are produced by the seven-day orbital flight. M.D.

A85-34279
STUDY OF NUCLEIC ACID METABOLISM IN TWO ASTRONAUTS

L. D. SZABO, P. KERESZTES, J. P. PALLOS, E. CSATO, and T. PREDMERSZKY (Orszagos Frederic Joliot-Curie Sugarbiologiai es Sugarregeszegugyi Kutato Intezet, Budapest, Hungary) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 15-18. refs

The urinary excretion of certain modified nucleosides (methylguanosine, dimethylguanosine, and methylinosine) of two astronauts, before and after the Soyuz-36-Salyut-6-Soyuz-35 mission in 1980, was measured. Individual daily urine samples were collected for four days before the start of the mission and six days after landing, and analyzed using affinity chromatography and high-performance liquid chromatography. It is shown that during the first and second day after landing, the level of excretion of the nucleosides increased to 200-400 percent in one of the astronauts, but returned to normal after the third day. In the case of the other astronaut, the level of excreted nucleosides did not change significantly after landing. Extreme factors of spaceflight such as weightlessness, stress, and radiations, were considered in order to interpret the changes in the excretion of the nucleosides. M.D.

A85-34292
RADIATION RISK ESTIMATION AND ITS APPLICATION TO HUMAN BEINGS IN SPACE

W. K. SINCLAIR (National Council on Radiation Protection and Measurements, Bethesda, MD) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 115-120. refs

The COSPAR meeting in 1982 has considered the bases for the existing standards or guidelines for radiation exposure in space. A reexamination of the entire question of dose limitations in space and the philosophy behind them was suggested. The reasons for this suggestion are partly related to changes regarding the appreciation of cancer risks since the development of the earlier guidelines prior to 1970. Philosophies relating to occupational exposures on the ground tend to base acceptable levels now on similarities with other occupational risks. Developments in the two years since 1982 are also discussed, taking into account changes in the appreciation and quantitation of cancer risks, changes in appreciation of relative biological effectiveness of heavy particles,

changes in the roles of people in space, and practical measures designed to study these problems further. G.R.

A85-34295* San Francisco Univ., Calif.
SUMMARY OF CURRENT RADIATION DOSIMETRY RESULTS ON MANNED SPACECRAFT

E. V. BENTON (San Francisco University, San Francisco, CA) (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 153-160. refs
 (Contract NAS9-15152)

It is pointed out that the experimental data existing on radiation levels inside orbiting spacecraft are currently limited. However, it is recognized that perhaps the single most important constraint to long-term manned space activity may be related to the complex space radiation environment. For this reason, it is important to know the radiological parameters which determine the biological effects of space radiation on humans. Attention is given to radiation dose measurements, LET (linear energy transfer) spectra for HZE particles, and dosimetry data from U.S. manned spaceflights. In particular, data are now available on dose rates in spacecraft at low altitudes (less than 300 km), while insufficient measurements exist for high altitude and high inclination orbits, geostationary orbits, and many orbits in between. Very little data exist on neutron dose and spectra. G.R.

A85-34363
SWEAT RATE VS. FOREARM BLOOD FLOW DURING LOWER BODY NEGATIVE PRESSURE

S. D. SOLACK, G. L. BRENGELMANN, and P. R. FREUND (Washington University, Seattle, WA) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 58, May 1985, p. 1546-1552. refs
 (Contract NIH-HL-30185; NIH-HL-16910; NIH-HL-07090)

The effect of lower body negative pressure (LBNP) on the sweat rate (SR) and forearm vascular conductance (FVC) of six normal men was investigated experimentally in the temperature range 36.9-37.8 C. LBNP was induced after heating in water perfused suits, and the level of LBNP was in the range -20 to -60 cmH₂O. It is found that SR did not decrease with the onset of LBNP. In four subjects, the slope of the esophageal temperature-sweat rate curve did not return to basal levels after heating was discontinued. In contrast to SR, FVC decreased by 22 percent at the onset of LBNP. Some possible mechanisms for the inhibition of forearm vascular conductance in response to lower body negative pressure are discussed. I.H.

A85-36496
HUMAN PROBLEMS OF SPACE TRAVEL

R. HARDING (RAF, Institute, of Aviation Medicine, Farnborough, Hants., England) *Spaceflight* (ISSN 0038-6340), vol. 27, June 1985, p. 254-256.

The data base on the psycho-physiological effects of a micro-g environment is summarized, together with ongoing experimentation to identify the mechanisms producing effects and to provide preventive or curative measures. Space motion sickness cannot be predicted for individuals, but always vanishes within 3-6 days. Its presence, however, can severely degrade functional efficiency. A consistent Ca loss in space cannot, if prolonged for more than 8-10 mos, be reversed once astronauts have returned to the terrestrial gravity field. Long-duration space voyages will therefore require artificial gravity. Space Station astronauts are expected to receive up to 150 rads cumulative radiation dosage after ten 90-day tours, projected to be enough to shorten expected life spans by 150 days. Psychological reactions to space flight, such as hyperarousal, insomnia and depersonalization, have been observed repeatedly. Group dynamics will become more significant on long missions, and may be exacerbated by sexually mixed crews. The provision of privacy is regarded as essential for long duration missions, together with continued personal communication links with earth-bound relatives and friends, exercise, and regular medical/dental care. M.S.K.

N85-25657# Joint Publications Research Service, Arlington, Va.
SPACE BRAIN RESEARCH IN CHINA REPORTED
 M. LEI *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013)
 p 83-90 1 May 1985 refs Transl. into ENGLISH from
 Kongjian Xuebao (Beijing), v. 4, no. 4, Oct. 1984 p
 326-329

Avail: NTIS HC A07/MF A01

Following the progress of the manned spaceflights, a lot of work had been done in other countries to study space travel related disorders in the vestibular system. At the same time, a series of simulated, ground-based experiments to study, from a broader angle of view, the techniques, methods and theories involved in space brain science research was conducted. The important conclusions arrived at from experimental results are briefly summarized. G.L.C.

N85-26114* National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES

Apr. 1985 116 p
 (NASA-SP-7011(270); NAS 1.21:7011(270)) Avail: NTIS HC
 A06 CSCL 06E

This bibliography lists 417 reports, articles and other documents introduced into the NASA scientific and technical information system in March 1985. M.G.

N85-26115*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

TEST AND EVALUATION OF THE 2.4-MICRON PHOTOREFRACTOR OCULAR SCREENING SYSTEM

J. R. RICHARDSON Feb. 1985 42 p refs
 (NASA-TM-86492; NAS 1.15:86492) Avail: NTIS HC A03/MF
 A01 CSCL 06E

An improved 2.4-m photorefractor ocular screening system was tested and evaluated. The photorefractor system works on the principal of obtaining a colored photograph of both human eyes; and, by analysis of the retinal reflex images, certain ocular defects can be detected such a refractive error, strabismus, and lens obstructions. The 2.4-m photorefractory system uses a 35-mm camera with a telephoto lens and an electronic flash attachment. Retinal reflex images obtained from the new 2.4-m system are significantly improved over earlier systems in image quality. Other features were also improved, notably portability and reduction in mass. A total of 706 school age children were photorefracted, 211 learning disabled and 495 middle school students. The total students having abnormal retinal reflexes were 156 or 22 percent, and 133 or 85 percent of the abnormal had refractive error indicated. Ophthalmological examination was performed on 60 of these students and refractive error was verified in 57 or 95 percent of those examined. The new 2.4-m system has a NASA patent pending and is authorized by the FDA. It provides a reliable means of rapidly screening the eyes of children and young adults for vision problems. It is especially useful for infants and other non-communicative children who cannot be screened by the more conventional methods such as the familiar E chart. Author

N85-26116*# National Aeronautics and Space Administration, Washington, D. C.

SEVERAL SPECIFIC AND NONSPECIFIC RESPONSES OF THE HUMAN AND ANIMAL BODY TO SHIP NOISE

S. S. MARKARYAN, S. S. VOLKOV, and A. B. SYSOYEV May 1983 9 p refs Transl. into ENGLISH from Vestn. Otorinolaringol. (USSR), Mar. - Apr. 1983 p 8-11 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Scientific Research Inst. of Hygiene and Water Transportation, Ministry of Health (USSR)
 (Contract NASW-3541)
 (NASA-TM-77483; NAS 1.15:77483) Avail: NTIS HC A02/MF
 A01 CSCL 06S

The effect of noise on cargo boats on a long voyage differs considerably from the effect of noise in factories and in service industries. The peculiarities of the effect of round-the-clock noises

at sea at 55 to 85 decibels, typical for cargo boats, were studied in white rats in the laboratory and aboard ship (each of the experiments lasted three months) and in young naval cadets and experienced seamen on voyages lasting one, two, and three months. The findings helped to derive health standards for maximum admissible noise level at sea. Author

N85-26117*# Management and Technical Services Co., Houston, Tex.

COMPUTER SIMULATION STUDIES IN FLUID AND CALCIUM REGULATION AND ORTHOSTATIC INTOLERANCE Final Report

7 May 1985 110 p refs
 (Contract NAS9-17151)
 (NASA-CR-171869; NAS 1.26:171869; TIR-2114-MED-5015;
 DLR-T-1825; DRD-MA945T) Avail: NTIS HC A06/MF A01
 CSCL 06P

The systems analysis approach to physiological research uses mathematical models and computer simulation. Major areas of concern during prolonged space flight discussed include fluid and blood volume regulation; cardiovascular response during shuttle reentry; countermeasures for orthostatic intolerance; and calcium regulation and bone atrophy. Potential contributions of physiologic math models to future flight experiments are examined. A.R.H.

N85-26118*# Management and Technical Services Co., Houston, Tex.

ANALYSIS OF HEAD-DOWN TILT AS AN ANALOG OF WEIGHTLESSNESS USING A MATHEMATICAL SIMULATION MODEL

J. I. LEONARD 4 Sep. 1984 86 p refs
 (Contract NAS9-15487; NAS9-16328; NAS9-15850; NAS9-17151)
 (NASA-CR-171870; NAS 1.26:171870; TIR-2114-MED-4003)
 Avail: NTIS HC A05/MF A01 CSCL 06S

Antiorthostasis or head down tilt of a moderate degree was used as a ground based analog of weightless space flight to study headward fluid shifts, decreased plasma volume, orthostatic intolerance and muscular skeletal degradation. A mathematical model was used to help interpret these observations. The model proved most valuable for these studies was originally developed as a description of the major circulatory, fluid and electrolyte control systems. Two different experimental studies are employed to validate the model. The first is a 24 hour head down tilt study and the second is a 7 day head down bed rest study. The major issues addressed include the reduction in plasma volume, the dynamic changes of venous pressure and cardiac output, the extent of central hypervolemia during long term zero g exposure, the existence of an early diuresis, the mechanisms which alter the renal regulating hormones during the short term and long term periods, the significance of potassium loss on other zero g responses, and the role of transcapillary filtration in adjusting fluid shifts. The use of mathematical models as an interpretive and analysis technique for experimental research for space life science is illustrated. E.A.K.

N85-26119*# Management and Technical Services Co., Houston, Tex.

PREDICTIONS OF CARDIOVASCULAR RESPONSES DURING STS REENTRY USING MATHEMATICAL MODELS

J. I. LEONARD and R. SRINIVASAN 4 Sep. 1985 36 p refs
 (Contract NAS9-17151)
 (NASA-CR-171871; NAS 1.26:171871; TIR-2114-MED-4002)
 Avail: NTIS HC A03/MF A01 CSCL 06S

The physiological adaptation to weightless exposure includes cardiovascular deconditioning arising in part from a loss of total circulating blood volume and resulting in a reduction of orthostatic tolerance. The crew of the Shuttle orbiter are less tolerant to acceleration forces in the head-to-foot direction during the reentry phase of the flight at a time they must function at a high level of performance. The factors that contribute to orthostatic intolerance during and following reentry and to predict the likelihood of impaired crew performance are evaluated. A computer simulation approach employing a mathematical model of the cardiovascular system is

employed. It is shown that depending on the severity of blood volume loss, the reentry acceleration stress may be detrimental to physiologic function and may place the physiologic status of the crew near the borderline of some type of impairment. They are in agreement with conclusions from early ground-based experiments and from observations of early Shuttle flights.

E.A.K.

N85-26120*# Management and Technical Services Co., Houston, Tex.

SIMULATION OF A G-TOLERANCE CURVE USING THE PULSATILE CARDIOVASCULAR MODEL

M. SOLOMON and R. SRINIVASAN 31 Jan. 1985 19 p refs
(Contract NAS9-17151)
(NASA-CR-171873; NAS 1.26:171873; TIR-2114-MED-4007)
Avail: NTIS HC A02/MF A01 CSCL 06S

A computer simulation study, performed to assess the ability of the cardiovascular model to reproduce the G tolerance curve (G level versus tolerance time) is reported. A composite strength duration curve derived from experimental data obtained in human centrifugation studies was used for comparison. The effects of abolishing autonomic control and of blood volume loss on G tolerance were also simulated. The results provide additional validation of the model. The need for the presence of autonomic reflexes even at low levels of G is pointed out. The low margin of safety with a loss of blood volume indicated by the simulation results underscores the necessity for protective measures during Shuttle reentry.

E.A.K.

N85-26121*# Management and Technical Services Co., Houston, Tex.

AKTERATIONS/CORRECTIONS TO THE BRASS PROGRAM

S. N. BRAND 8 Apr. 1985 2 p
(Contract NAS9-17151)
(NASA-CR-171874; NAS 1.26:171874; TIR-2114-MED-5007)
Avail: NTIS HC A02/MF A01 CSCL 06S

Corrections applied to statistical programs contained in two subroutines of the Bed Rest Analysis Software System (BRASS) are summarized. Two subroutines independently calculate significant values within the BRASS program.

R.J.F.

N85-26122*# Management and Technical Services Co., Houston, Tex.

DESCRIPTION, VALIDATION, AND MODIFICATION OF THE GUYTON MODEL FOR SPACE-FLIGHT APPLICATIONS. PART A. GUYTON MODEL OF CIRCULATORY, FLUID AND ELECTROLYTE CONTROL. PART B. MODIFICATION OF THE GUYTON MODEL FOR CIRCULATORY, FLUID AND ELECTROLYTE CONTROL

J. I. LEONARD 1985 27 p refs
(Contract NAS9-17151)
(NASA-CR-171876; NAS 1.26:171876; TIR-2114-MED-5006)
Avail: NTIS HC A03/MF A01 CSCL 06P

The mathematical model that has been a cornerstone for the systems analysis of space-flight physiological studies is the Guyton model describing circulatory, fluid and electrolyte regulation. The model and the modifications that are made to permit simulation and analysis of the stress of weightlessness are described.

E.A.K.

N85-26123*# Management and Technical Services Co., Houston, Tex.

THE BEHAVIOR OF RENAL-REGULATING HORMONES DURING HYPOGRAVIC STRESS

J. I. LEONARD 1985 62 p refs
(Contract NAS9-15487; NAS9-15850; NAS9-17151)
(NASA-CR-171877; NAS 1.26:171877; MTSC-2114-MED-5002)
Avail: NTIS HC A04/MF A01 CSCL 06S

The regulation of fluid and electrolyte behavior during space flight is believed to be under control, in large part, of a group of hormones which have their major effects on renal excretion. The hormones studied include renin-angiotensin, aldosterone, and antidiuretic hormone (ADH). The regulatory systems of these

renal-regulating hormones as they act individually and in concert with each other are analyzed. The analysis is based on simulations of the mathematical model of Guyton. A generalized theory is described which accounts for both short-term and long-term behavior of this set of hormones.

E.A.K.

N85-26124*# Management and Technical Services Co., Houston, Tex.

FLUID-ELECTROLYTE RESPONSES DURING PROLONGED SPACE FLIGHT: A REVIEW AND INTERPRETATION OF SIGNIFICANT FINDINGS

J. I. LEONARD 1985 37 p refs
(Contract NAS9-17151)
(NASA-CR-171878; NAS 1.26:171878; MTSC-2114-MED-5008)
Avail: NTIS HC A03/MF A01 CSCL 06S

The most important results of the Skylab studies related to fluid-electrolyte regulation are summarized. These data are the starting point of a systems analysis to study adaptation to the weightlessness environment. A summary of the systems analysis study, including an interpretation of Skylab results, is included.

E.A.K.

N85-26125*# Management and Technical Services Co., Houston, Tex.

MATHEMATICAL MODELING OF FLUID-ELECTROLYTE ALTERATIONS DURING WEIGHTLESSNESS

J. I. LEONARD 26 Jul. 1984 56 p refs
(Contract NAS9-17151)
(NASA-CR-171881; NAS 1.26:171881; TIR-2114-MED-4001)
Avail: NTIS HC A04/MF A01 CSCL 06S

Fluid electrolyte metabolism and renal endocrine control as it pertains to adaptation to weightlessness were studied. The mathematical models that have been particularly useful are discussed. However, the focus of the report is on the physiological meaning of the computer studies. A discussion of the major ground based analogs of weightlessness are included; for example, head down tilt, water immersion, and bed rest, and a comparison of findings. Several important zero g phenomena are described, including acute fluid volume regulation, blood volume regulation, circulatory changes, longer term fluid electrolyte adaptations, hormonal regulation, and body composition changes. Hypotheses are offered to explain the major findings in each area and these are integrated into a larger hypothesis of space flight adaptation. A conceptual foundation for fluid electrolyte metabolism, blood volume regulation, and cardiovascular regulation is reported.

E.A.K.

N85-26126# Massachusetts Inst. of Tech., Cambridge, Man-Vehicle Lab.

EYE MOVEMENT IN RESPONSE TO SINGLE AND MULTIPLE TARGETS Final Report, 1 Oct. 1981 - 31 Dec. 1983

R. V. KENYON, Y. Y. ZEEVI, P. A. WETZEL, and L. R. YOUNG
Brooks AFB, Tex. AF Human Resources Lab. Feb. 1985 120 p

(Contract F33615-81-K-0011)
(AD-A151115; AFHRL-TR-84-29) Avail: NTIS HC A06/MF A01 CSCL 06P

Two major studies were pursued under this research program: one was devoted to eye-movement responses in multi-target situations, and the other to smooth scanning behavior when viewing eye-slaved targets. For multiple targets, a computer-controlled arc perimeter display comprised of 21 LED point targets (5 arc-minutes) placed 5 degrees apart was utilized. Results showed that oculomotor reaction time increased from 200 ms for single targets to 240 ms for multiple targets (20% to 25% increase). Furthermore, delaying the appearance of one of the targets by 10 ms increased the reaction time even further, to about 300 ms. Further increases in second target delay produced a monotonically decreasing function of response time versus delay, until at delays of 100 ms, the reaction times were normal. For the experiments on eye-slaved target scanning behavior, the subject was presented with a target controlled by that person's own eye position. This eye-slaved target was then delayed 1 to 200 ms before being presented to the

subject. With no delay, subjects were able to move their eyes smoothly across the screen and back; i.e., self-initiated smooth pursuit. Small delays (40 to 60 ms) tended to increase the smooth pursuit oscillations in both velocity and amplitude. The results suggest that smooth pursuit is facilitated by small delays in the eye-position feedback signal. At larger delays (100-200 ms), smooth pursuit was not obtained. The implications of these results for eye-slaved, area-of-interest displays are discussed.

Author (GRA)

N85-26127# Human Engineering Labs., Aberdeen Proving Ground, Md.

MODIFIED LANDOLT C-RING TEST TO MEASURE THE EFFECTS OF LASER FILTERS ON VISUAL ACUITY Final Report

O. ZUBAL Jan. 1985 35 p
(AD-A151164; HEL-TN-2-85) Avail: NTIS HC A03/MF A01
CSCL 05E

The utility of the modified Landolt C-ring test in predicting gunner performance when optical (laser) filters were incorporated in the gunner's aiming/tracking sights was examined. Sixty-four qualified TOW and tank gunners participated in a quasi-tactical exercise during which they had to locate, identify, and simulate firing at targets using their respective sights. Sixty-three of the gunners were used to measure variations in their visual acuity caused by the filters which were being used in the tactical scenarios. GRA

N85-26128# School of Aerospace Medicine, Brooks AFB, Tex.
AIRSICKNESS CONTROL USING BIOFEEDBACK TO SELF-REGULATE PSYCHOPHYSIOLOGICAL RESPONSES Final Report, Aug. 1979 - May 1982

D. R. JONES, R. A. LEVY, L. GARDNER, R. W. MARSH, and J. C. PATTERSON Dec. 1984 17 p
(AD-A151167; USAFSAM-TR-84-34) Avail: NTIS HC A02/MF A01 CSCL 06S

Investigators of the Neuropsychiatry Branch, Clinical Sciences Division, U. S. Air Force School of Aerospace Medicine (USAFSAM), provided biofeedback-moderated behavioral treatment to 53 fliers grounded for chronic, severe motion sickness, and followed each flier for 2 years after treatment completion. Success was defined as returning to and maintaining satisfactory operational flying status. Forty-two fliers (79%) met this criterion; three (6%) were partially successful, and eight (15%) were subsequently grounded for recurrent airsickness. Follow-on studies will investigate psychophysiological mechanisms through which this method of treatment works. GRA

N85-26129# School of Aerospace Medicine, Brooks AFB, Tex.
PSYCHOMETRIC EVALUATION OF HEAD INJURY AMONG FLIERS REFERRED TO THE AF SCHOOL OF AEROSPACE MEDICINE Final Report, 1 Jun. 1974 - 1 Mar. 1981

R. D. WHEATLEY Dec. 1984 26 p
(Contract AF PROJ. 7755)
(AD-A151479; USAFSAM-TR-84-47) Avail: NTIS HC A03/MF A01 CSCL 05J

In support of U.S. Air Force Regulation 160-43, Medical Examination and Medical Standards, the Neuropsychiatry Branch of the USAF School of Aerospace Medicine (SAM) maintains consultation services in neurology, psychiatry, and clinical psychology for the aeromedical evaluation of fliers. From June 1974 to March 1981, 40 consecutive cases of closed head injury accumulated in the Branch; and each case received the thorough SAM Flight Medicine workup, plus psychometric and neurologic evaluations. The psychometric battery included measures of intellect, memory, neuropsychologic and personality functioning. Of the head injury referrals, 60% received waivers to resume cockpit duties; and the results of their psychometric and neurologic evaluations were compared with those of fliers disqualified for flying duties. In this report are presented: a summary of differences between the groups; and a discussion of the apparent clinical as well as nonclinical determinants of flying status disposition after the SAM evaluation for closed head injury. GRA

N85-26130# Texas Univ., Austin.

MATHEMATICAL MODELS RELATING TO HUMAN THERMOREGULATION: BASIC ASSUMPTIONS, VALIDATION, AND APPLICATION. PARTS A AND B Final Report, 2 Mar. 1982 - 28 Feb. 1983

E. H. WISSLER 2 Nov. 1984 190 p Presented at a workshop, Austin, Tex., 13-15 Dec. 1982 Dec. 1982
(Contract AF-AFOSR-MIPR-82-0214)
(AD-A151556; AFOSR-85-0181TR-PT-A/B) Avail: NTIS HC A09/MF A01 CSCL 12A

A workshop was held at The University of Texas at Austin in December 1982. The workshop evaluated available mathematical models which could be used to simulate human thermal behavior under various conditions. The program involved the following four activities; (1) obtain copies of the mathematical models, install them on computers located at the University of Texas, and verify that they were operating correctly, (2) collect sets of data suitable for testing mathematical models and enter them into a machine readable data base, (3) use the models to simulate the conditions represented by the experimental data, (4) discuss the simulated results with the authors of the models and a group of outstanding thermal physiologists who offer constructive criticism and suggestions for improving the models. Author (GRA)

N85-26131# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

COMPUTERIZED BIOPHYSICAL DATA ACQUISITION SYSTEM FOR MOTION SICKNESS STUDIES M.S. Thesis

D. G. FITZPATRICK, M. A. ROGERS, and R. WILLIAMS Dec. 1984 222 p
(AD-A151691; AFIT/GE/GCS/ENG/84D-30) Avail: NTIS HC A10/MF A01 CSCL 09B

A biophysical data acquisition system was integrated with a MASSCOMP MC500 computer to provide the foundation for a computerized motion sickness rehabilitation program. A user-friendly data acquisition system was developed to process several different channels of biophysical information from a subject. This system processes the data to create graphics for operator interaction on a real-time basis and stores data for later retrieval and analysis. The electrical schematics and frequency responses of the fabricated physiological monitoring equipment used to measure heart rate, gastric motility, respiration rate, skin pallor, intestinal tone, and eye movement were completed. GRA

N85-26132# Naval Health Research Center, San Diego, Calif.
ASSESSING THE SHORT- AND LONG-TERM HEALTH EFFECTS OF DECOMPRESSION SICKNESS AMONG US NAVY DIVERS Interim Report

A. HOIBERG Dec. 1984 18 p
(AD-A151887; NAVHLTHRSCHC-84-30) Avail: NTIS HC A02/MF A01 CSCL 06E

This study identified the short- and long-term health effects among U.S. Navy divers who suffered decompression sickness (DCS) during more than a decade ($n = 362$) and compared their hospitalization rates with a matched sample of divers who had no recorded diving accidents ($n = 1,086$). Of the 332 divers included in the analyses, results identified 251 individuals (75.6%) whose records contained no diving-related medical events after the DCS incident; no deaths and only three physical disabilities were attributed to DCS or diving. DCS divers had significantly higher rates than controls for total hospitalizations, symptoms and headache, diseases of the arteries and veins, and diseases of the pancreas, intestines, and gallbladder. No specific disease or time interval was identified as attributable to the DCS incident. Subsequent research should include medical information from outpatients' records and divers' questionnaires to determine with greater confidence the health risks that divers face as they pursue this Navy occupation. GRA

N85-26133# California Univ., Los Angeles. Dept. of Anatomy.
**MEASUREMENT AND MODIFICATION OF SENSORY SYSTEM
 EEG (ELECTROENCEPHALOGRAPHIC) CHARACTERISTICS
 DURING VISUAL-MOTOR PERFORMANCE Annual Report, 30
 Sep. 1983 - 29 Sep. 1984**

M. B. STERMAN 31 Oct. 1984 18 p
 (Contract AF-AFOSR-0335-82)
 (AD-A151901; AFOSR-85-0247TR) Avail: NTIS HC A02/MF
 A01 CSCL 06P

Electroencephalographic (EEG) and performance measures were obtained from eight adult male subjects during a sequence of 18 trials over a six-hour period consisting of alternating performance and non-performance epochs in a flight simulation task. EEG data were subjected to a limited bandpass frequency analysis. Task engagement (performance) was associated with greater density in central cortical rhythmic patterns, while a reciprocal decrease was observed in parietal-occipital activity. The opposite relationship was observed during non-performance segments, with density greater in parietal-occipital data. This reciprocity was most consistent in the central 8-11 Hz and parietal-occipital 4-7 Hz bands. EEG activity from these two areas was also found to be modulated over time, with linear trends related to performance epochs. Central rhythmic activity tended to increase progressively over trials in performance epochs while parietal-occipital patterns showed the opposite trend. Parietal-occipital activity was greatest during non-performance epochs and both areas showed an in-phase periodic pattern, with a cycle duration approximating 90 minutes. GRA

N85-26134# Washington Univ., St. Louis, Mo. Dept. of Psychology.

**A COMPARISON OF ALTERNATIVE ANALYTIC MODELS FOR
 EVENT RELATED POTENTIAL RECORDS Final Report**

E. HUNT and P. TIANWATTANATATA Nov. 1984 26 p
 (Contract AF-AFOSR-0289-83)
 (AD-A151977; AFOSR-85-0249TR) Avail: NTIS HC A03/MF
 A01 CSCL 12A

Principal Component Analysis is a technique that is widely used to extract component wave forms from event related potential (ERP) records. Analysis of simulated ERP records indicate that Principal Component Analysis may produce biased solutions in some cases. Two alternative methods of analysis are considered; confirmatory factor analysis and time series analysis. Confirmatory factor analysis provides superior results if the experimenter has reason to reject some component wave forms on a priori grounds. Time series analysis is preferable in situations in which the analysis can be conducted on only a few records. The ERP is a record of the electrical activity detected in the brain following the presentation of a stimulus. GRA

N85-26135# Army Research Inst. of Environmental Medicine,
 Natick, Mass.

**PHYSIOLOGICAL DIFFERENCES BETWEEN MEN AND WOMEN
 IN EXERCISE-HEAT TOLERANCE AND HEAT ACCLIMATION**

K. B. PANDOLF, M. N. SAWKA, and Y. SHAPIRO Feb. 1985
 28 p
 (Contract DA PROJ. 3E1-62777-A-879)
 (AD-A152048; USARIEM-M-20/85) Avail: NTIS HC A03/MF
 A01 CSCL 06P

The responses of men to changes in environmental temperature have provided a basis for the understanding of human heat tolerance and thermoregulation. There appears to be less certainty about the thermoregulatory patterns of women. Physiological responses to heat stress may differ between genders due to several factors which include the lower cardiorespiratory fitness, higher body fat content, lower body weight, and lower skin surface area and higher surface area-to-mass ratio of women compared to men. In addition, fluctuating hormonal levels of estrogen and progesterone accompanying the menstrual cycle may influence women's tolerance to heat stress. Since the US Army is currently composed of greater than 10% females, it has become necessary to examine heat responses of females to exercise-heat stress and heat acclimation. Our Institute has conducted experiments comparing

men and women for exercise-heat tolerance and acclimation over a wide range of environmental conditions. GRA

N85-26136# Los Alamos Scientific Lab., N. Mex.
**AEROSOL DEPOSITION ALONG THE RESPIRATORY TRACT
 AT ZERO GRAVITY: A THEORETICAL STUDY**

B. H. LEHNERT, D. M. SMITH, L. M. HOLLAND, M. I. TILLERY,
 and R. G. THOMAS 1984 16 p refs Presented at the Lunar
 Bases and Space Activities of the 21st Century Meeting,
 Washington, D.C., 29 Oct. 1984
 (Contract W-7405-ENG-36)
 (DE85-006703; LA-UR-85-362; CONF-8410230-1) Avail: NTIS
 HC A02/F A01

The aerosol deposition model of the Task Group on Lung Dynamics is used to assess the regional deposition of particles ranging from 0.01 to 10 (MU)m diameter at two particulate densities, 1 and 4, during simulated tidal breathing and breathing during moderate to heavy exercise. The results suggest the gas exchange regions of the lungs of space travelers and residents are afforded some protection, relative to their Earth bound counterparts, against the deposition of particles due to the absence of gravity; and approximately 2 to 10 fold reduction in the efficiency of collection of particles 0.5 (MU)m in diameter occurred in the pulmonary region during resting conditions and exercise. Deposition along the tracheobronchial tree, however, is not markedly altered in the absence of gravity, indicating airway sites contributing to this structure remain susceptible to insults by inhaled aerosols. DOE

N85-26137# Southwest Research Inst., San Antonio, Tex. Dept.
 of Bioengineering.

**FUNCTIONAL IMPAIRMENT AND STRUCTUREAL CERVICAL
 INJURIES IN HUMAN SURROGATES Final Report, 31 Mar. 1980
 - 31 Dec. 1983**

J. B. LENNOX, O. M. ANDERSON, C. D. WHITE, and G. T.
 MOORE Feb. 1984 106 p refs Sponsored by National
 Highway Traffic Safety Administration.
 (PB85-167436; DOT-HS-806-635) Avail: NTIS HC A06/MF A01
 CSCL 13L

A series of experiments was initiated for identifying injury mechanisms and developing criteria suitable for representing the spectrum of significant functional and structural neck injuries that could be sustained by car crash occupants. The first four experiments of a pilot, static, neck loading test series were conducted on anesthetized and/or fresh cadaveric, adult, female baboons. Mid-sagittal, planar, tensile head loading was increased until definitive structural failure (atlas-occipital subluxation) occurred. Neurophysiological testing demonstrated that cervical spinal cord function was seriously impaired at 17 to 52 percent of the structural failure load. The potential implications of these findings are discussed, relative to the understanding of injury mechanisms. GRA

N85-26599*# National Aeronautics and Space Administration.
 Ames Research Center, Moffett Field, Calif.

WHAT IS BEING DONE TO CONTROL MOTION SICKNESS?

Y. D. HALL *In its* NASA Ames Summer High School Apprenticeship
 Res. Program p 53-56 Apr. 1985 refs
 Avail: NTIS HC A06/MF A01 CSCL 06E

AFT (Autogenic Feedback Training) involves practicing a series of mental exercises to speed up or slow down the control of autonomic activity. This produces a reduced tendency for autonomic activity levels to diverge from baseline (at rest) under stressful motion-sickness-inducing conditions. Subjects conditions. Subjects engaged in applying AFT exercises are required to closely monitor their own bodily sensations during motion-sickness-eliciting tests. These tests include the Coriolis Sickness Susceptibility Index (CSSI), which consists of sitting a subject into a rotating chair that moves at various speeds while a visual background turns at differing speeds and directions, and the Vertical Acceleration Rotation Device (VARD) test, which involves the placing of a subject in a drum that moves in an upward and downward motion until he or she is sick, while simultaneously monitoring the subject's vital signs. These tests provide investigators with evidence of slight

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changes in autonomic activities such as increases in heart rate, skin temperature, and sweat. All of these symptoms occur in subjects that experience bodily weakness or discomfort with the onset of motion sickness. G.L.C.

N85-26607*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CARDIOVASCULAR EFFECTS OF WEIGHTLESSNESS

K. SHORT *In its* NASA Ames Summer High School Apprenticeship Res. Program p 99-103 Apr. 1985 refs
Avail: NTIS HC A06/MF A01 CSCL 06P

Physiological changes resulting from long term weightlessness are reviewed and activities conducted to study cardiovascular deconditioning at NASA Ames are discussed. Emphasis is on using monkeys in chair rest, water immersion, and tilt table studies to simulate space environment effects. A.R.H.

N85-27130# Washington Univ., Seattle. Bioelectromagnetics Research Lab.

THERMAL CONSEQUENCES OF LOCALIZED SAR FROM RFR EXPOSURES

A. W. GUY *In* AGARD The Impact of Proposed Radio Frequency Radiation Standards on Mil. Operations 18 p Mar. 1985 refs
Avail: NTIS HC A08/MF A01

Local SAR levels from 50 to 170 W/kg are used for therapeutic heating in clinical medicine. These levels cause tissue temperatures to rapidly increase and stimulate a rapid increase in blood flow. Localized high levels of SAR destroy tumors with minimal damage to healthy surrounding tissue due to the difference in blood cooling rates and thermal sensitivity of neoplastic as compared to normal tissues. SARs of 140 W/kg or greater produce cataracts in the eyes of rabbits that are exposed locally to 150 mW/sq cm cm 2450 MHz microwave radiation but similar levels of exposure does not produce cataractogenic levels of SAR in primates. Experiments show that SAR levels of 72 W/kg or greater applied for 1.5 to 6 min to the brain of cats will produce temperature rise of 4.4 to 6.5 C resulting in pulse rate increases, hyperventilation, bradycardia, and intense tachypnea for 15 to 20 minutes after exposure. No pathological changes are noted in the cat due to these localized exposure levels. Localized exposure of living cat brain at SAR levels of 2.5 to 5 W/kg produce measureable temperature rises and change in latency of evoked potentials. A thermal response occurring at the lowest known level of applied energy is that of microwave pulse hearing. Author

N85-27132# School of Aerospace Medicine, Brooks AFB, Tex.
THE CUMULATIVE EFFECTS OF LONG TERM EXPOSURE TO LOW LEVELS OF RADIOFREQUENCY RADIATION (RFR)

J. H. KRUPP *In* AGARD The Impact of Proposed Radio Frequency Radiation Standards on Mil. Operations 14 p Mar. 1985 refs
Avail: NTIS HC A08/MF A01

One of the concerns for the effects of nonionizing radiofrequency radiation (RFR) is the accumulation of subtle injury over a long period of time, resulting in a delayed expression of deleterious effect. Of the more than 6,000 articles in the literature today, the vast majority involve acute exposures at levels where significant thermal energy is deposited. The resulting effects, in most cases, could be explained on the basis of the specific energy absorption, expressed as watts per kilogram (W/kg), with a generally accepted threshold for effects of 4 W/kg. The advocacy of nonthermal mechanisms by means of mathematical modeling, theoretical predictions, and in vitro studies, raised the possibility of subtle injury or alteration in function which, over time, would be expressed as a harmful bioeffect. Over a 4-year period of planning, pilot study, and definitive experiment, a lifetime exposure is given to a population of 1st animals (100) whose state of health, growth, and cause of death are closely monitored. An equal number of sham expected animals served as a comparison population. After 25 months of exposure, and at the point where there is 90% mortality in both groups, the remaining subjects are sacrificed and assayed. The overall conclusion is that no cumulative ill effects could be attributed to the life long exposure at absorption rates of 0.4 W/kg or less. Author

N85-27133# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.

THE MEDICAL RESULTS OF HUMAN EXPOSURES TO RADIO FREQUENCY RADIATION

R. B. GRAHAM *In* AGARD The Impact of Proposed Radio Frequency Radiation Standards on Mil. Operations 8 p Mar. 1985 refs

Avail: NTIS HC A08/MF A01

The United States Air Force conducted a clearly defined and effective radio frequency radiation (RFR) protection program since 1970. As an important part of the program, since 1972 the Air Force Medical Service investigated RFR exposure incidents involving more than 330 individuals; of which 58 are determined to have been actually overexposed with another 17 found to have been inconclusive. Medical evaluations of the exposures are extensive and the findings almost universally unremarkable. A short history of the program's evolution is presented and some examples of exposure incidents and some general impressions of the clinical evaluations of the confirmed exposures are also presented. Author

N85-27134# Rochester Univ., N. Y. Dept. of Medicine.

REVIEW OF EPIDEMIOLOGICAL STUDIES OF HUMAN EXPOSURES TO RADIOFREQUENCY RADIATION

N. J. ROBERTS, JR. and S. M. MICHAELSON *In* AGARD The Impact of Proposed Radio Frequency Radiation Standards on Mil. Operations 6 p Mar. 1985 refs

(Contract F33615-84-C-0608; DE-AC02-76EV-03490; NIH-N01-AL-15547; NIH-N01-ES-03239)

Avail: NTIS HC A08/MF A01

The health effects of exposure to radiofrequency radiation (RFR) remain underdefined and controversial. Epidemiological studies of human exposures to RFR are confounded by difficulties in determining the type and true extent of exposures, in selecting an appropriate control group for comparisons, in determining the existence and influence of many concomitant environmental factors, and in establishing the presence or measuring the frequency or severity of subjective complaints as well as objective findings in the studied populations. Reported RFR effects on general health, growth and development, physiological systems such as the cardiovascular and nervous systems, and organs such as the eye are reviewed. Criteria for reliable epidemiological studies are presented to allow critical analysis of such reports. Author

N85-27135# Bundesgesundheitsamt, Neuherberg (West Germany). Inst. for Radiation Hygiene.

EVALUATION OF HUMAN EXPOSURES TO LOW FREQUENCY FIELDS

J. H. BERNHARDT *In* AGARD The Impact of Proposed Radio Frequency Radiation Standards on Mil. Operations 18 p Mar. 1985 refs

Avail: NTIS HC A08/MF A01

The biophysical model concept described might be suited as a basis of discussion to determine and define limits of exposure to electric or magnetic fields below 100 kHz, including 50/60 Hz. The electric field strength within the tissue in the environment of excitable neurons and muscle cells is considered decisive for the biological effect. Threshold values of field strength or current density, inducing biological effects are compiled from experimental and theoretical studies. On the basis of these data it is possible to establish safe, dangerous and hazardous current density curves as a function of frequency. The criterion for the definition of injury is the elicitation of ventricular fibrillation which must be avoided. To define exposure limits, the field strength or current density causing injury should be reduced by a factor exceeding 100. The arguments supporting this wide safety margin are discussed. The electric and magnetic field strength in the human environment is correlated with the corresponding electric current density induced in the human body. This enable safe, dangerous and hazardous levels of current density in the human body to be correlated with the external electric or magnetic field strength. Parts of the concept presented are adopted as the scientific basis for the lower frequency range of the standard DIN 57848/VDE 0848: Hazards

by electromagnetic fields; Protection of persons in the frequency range from 10 kHz to 3.000 GHz. Author

N85-27136# Washington Univ., Seattle. Center for Bioengineering.

HAZARDS OF VLF ELECTROMAGNETIC FIELDS

A. W. GUY *In* AGARD The Impact of Proposed Radio Frequency Radiation Standards on Mil. Operations 20 p Mar. 1985 refs Avail: NTIS HC A08/MF A01

Biological hazards to humans exposed to Very Low Frequencies (VLF) electromagnetic fields may result from electric shock, spark discharge, elevation of tissue temperature and burns. A number of nonthermal nonshock effects, such as the neurasthenic syndrome are reported widely in the Soviet and East-European literature. Generally a subject exposed to even the highest electromagnetic fields in the environment will not experience an electric shock unless he comes in contact with the ground or objects such as vehicles, crane cables and guy wires. The steady state current from touching objects increases directly with the frequency. On the other hand, the physiological shock effects of the current are less pronounced with increasing frequency. However, at frequencies where the shock hazard is negligible, deleterious heating of the body occurs for whole body average Specific Absorption Rates (SAR) greater than 4 W/kg and localized values of SAR greater than 80 W/kg so VLF exposure levels should be limited to prevent SAR from reaching one tenth of these levels. Free space exposures to fields of less than 1 kV/m electric field strength should be safe if proper precautions are taken to limit direct body contact with conducting objects.

Author

N85-27137# School of Aerospace Medicine, Brooks AFB, Tex. **DEVELOPMENT AND APPLICATION OF NEW RADIOFREQUENCY RADIATION SAFETY STANDARDS**

J. C. MITCHELL *In* AGARD The Impact of Proposed Radio Frequency Radiation Standards on Mil. Operations 13 p Mar. 1985 refs Avail: NTIS HC A08/MF A01

Radiofrequency radiation (RFR) is defined to cover the frequency range from 10 kHz to 300 GHz and includes microwaves. Absorption and distribution of RFR are strongly dependent on the size of the irradiated object and the frequency of the incident energy. It is common practice to report biological effects of RFR as a function of specific absorption rate (SAR) expressed as W/kg. The most widely held view is that the threshold for adverse effects lies above 4 W/kg. This value underlies the rationale for most standards that have emerged since 1982. Using a safety factor of 10, the American National Standards Institute developed RFR protection guides that limit all human whole body exposures to incident energy that results in an SAR no greater than 0.4 W/kg. This allows incident average power densities from 1 to 100 mW/cm², depending on the frequency of the radiation. New safety guidelines are compared with many other RFR standards used throughout the world today including NATO STANAG 2345.

Author

N85-27514* National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 271, MAY 1985

May 1985 121 p (NASA-SP-7011(271); NAS 1.21:7011(271)) Avail: NTIS HC \$7.00 CSCL 06E

This bibliography lists 421 reports, articles and other documents introduced into the NASA scientific and technical information system in April 1985. Author

N85-27515 Wisconsin Univ., Madison.

EFFECTS OF POSTURE AND WATER IMMERSION ON DIAPHRAGMATIC FUNCTION Ph.D. Thesis

A. HASHIMOTO 1984 270 p Avail: Univ. Microfilms Order No. DA8428879

Upon changing posture from the upright to supine position on land or with water immersion, a significant decrease in the functional residual capacity (FRC) occurs. This is due to changes in orientation of the gravitational effect and hydrostatic pressure acting on the body. The reduced FRC is accompanied by a distortion of the chest wall, which may affect diaphragmatic function. To evaluate the effects of posture and immersion on function of the chest wall, particularly the diaphragm, at rest, during forced vital capacity (FVC) and maximal voluntary ventilation (MVV) maneuvers, and exercise, normal males were studied under four conditions: the upright and supine posture on land and upright and prone immersed condition. The different function between the crural and the costal part of the diaphragm with posture and immersion did not affect ventilatory performance during exercise, MVV or FVC. During MVV, regardless of the condition, the diaphragm seemed to act as a fixator of the rib cage, concomitant with tonic activity of the abdominal muscles. Dissert. Abstr.

N85-27516*# National Aeronautics and Space Administration, Washington, D. C. Terrestrial Applications Program.

BIOENGINEERING AND REHABILITATION: WINDOWS OF OPPORTUNITY PAST, PRESENT AND FUTURE Progress Report

1985 52 p Original contains color illustrations (NASA-EP-216; NAS 1.19:216) Avail: NTIS MF A01; SOD HC \$4.50 as 033-000-00945-3 CSCL 06B

The applications of NASA research in the areas of bioengineering and rehabilitation are discussed. Wheelchairs, gait analysis, blood analyzers, programmable pacemakers and cardiology mannequins are among the topics covered. R.J.F.

N85-27517*# Federation of American Societies for Experimental Biology, Bethesda, Md. Life Sciences Div.

RESEARCH OPPORTUNITIES IN LOSS OF RED BLOOD CELL MASS IN SPACE FLIGHT

J. M. TALBOT and K. D. FISHER Apr. 1985 55 p refs (Contract NASW-3924)

(NASA-CR-175808; NAS 1.26:175808) Avail: NTIS HC A04/MF A01 CSCL 06S

Decreases of red blood cell mass and plasma volume have been observed consistently following manned space flights. Losses of red cell mass by United States astronauts have averaged 10 to 15% (range: 2 to 21%). Based on postflight estimates of total hemoglobin, Soviet cosmonauts engaged in space missions lasting from 1 to 7 months have exhibited somewhat greater losses. Restoration of red cell mass requires from 4 to 6 weeks following return to Earth, regardless of the duration of space flight. G.L.C.

N85-27518*# San Francisco Univ., Calif.

HISTOLOGICAL AND COMPOSITIONAL RESPONSES OF BONE TO IMMOBILIZATION AND OTHER EXPERIMENTAL CONDITIONS Semiannual Report, 1984 - 1985

R. J. BROWN and W. J. NIKLOWITZ 1985 30 p refs (Contract NCC2-135)

(NASA-CR-175837; NAS 1.26:175837) Avail: NTIS HC A03/MF A01 CSCL 06S

Histological techniques were utilized for evaluating progressive changes in tibial compact bone in adult male monkeys during chronic studies of immobilization-associated osteopenia. The animals were restrained in a semirecumbent position which reduces normally occurring stresses in the lower extremities and results in bone mass loss. The longest immobilization studies were of seven months duration. Losses of haversian bone tended to occur predominantly in the proximal tibia and were characterized by increased activation with excessive depth of penetration of osteoclastic activity. There was no apparent regulation of the size and orientation of resorption cavities. Rapid bone loss seen during 10 weeks of immobilization appeared to be due to unrestrained

osteoclastic activity without controls and regulation which are characteristic of adaptive systems. The general pattern of loss persisted throughout 7 months of immobilization. Clear cut evidence of a formation phase in haversian bone was seen only after two months of reambulation. B.W.

N85-27519# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DIAGNOSTIC SYSTEM [SISTEMA DIAGNOSTICO]

S. A. SANDRI Nov. 1984 4 p refs Presented at 2nd Simp. Fluminense de Logica, Filosof. e Teoria da Cienc., Niteroi, Brazil, 15-19 Oct. 1984 Submitted for publication (INPE-3350-PRE/659) Avail: NTIS HC A02/MF A01

The diagnostic system developed as a link to the MYCIN and EMYCIN systems is described. The decision models used in the diagnostic system are discussed. The three modules comprising the system are the acquisition module, consultation module, and explanation module. Use of computer-based medical information systems is discussed. Transl. by B.G.

N85-27520# Duke Univ., Durham, N. C. Lab. for Environmental Research.

A COMPREHENSIVE STRATEGY FOR SATURATION DECOMPRESSION WITH NITROGEN-OXYGEN

R. D. VANN 4 Feb. 1985 46 p (Contract N00014-84-C-0163) (AD-A151800) Avail: NTIS HC A03/MF A01 CSCL 06S

This paper began by discussing an empirical method for finding the ascent rates from saturation dives. These rates were estimated in a subsequent analysis. The estimates are easily modified and can be refined with additional data and other decompression models. A brief review of Doppler bubble measurements suggests several conclusions. First, the relationship between bubbles and decompression sickness is qualitatively similar for a variety of decompression exposures. Second, most decompression sickness is associated with high bubble grades. Third, Doppler bubble detectors can monitor the progressive development of bubbles during a saturation decompression, and the extent of these bubbles can be reduced by decreasing the rate of ascent. A final conclusion relates to the purpose of this workshop. Likelihood and Doppler bubble detection methods are powerful theoretical and experimental tools for solving the problems of decompression. If these tools are to be used effectively, however, adequate support for research must be available and sufficient data from experimental and operational diving must be accurately recorded and published for general use. GRA

N85-27521# Army Research Inst. of Environmental Medicine, Natick, Mass.

EVALUATION OF A FIELD EXPEDIENT TECHNIQUE FOR SWEAT SAMPLE COLLECTION

L. E. ARMSTRONG, W. T. MATTHEW, P. C. SZLYK, R. W. HUBBARD, and I. V. SILS Nov. 1984 54 p (AD-A151916; USARIEM-T-2/85) Avail: NTIS HC A04/MF A01 CSCL 06P

This series of laboratory experiments was conducted to evaluate a potential field expedient sweat collection technique (polyethylene arm bags) and to observe the Sweat rate and electrolyte losses of human sweat glands during thermal stimulation. The development of the methodology in this report has resulted in a technique that offers: (1) a clean skin surface prior to sweat sample collection; (2) a known skin surface area inside the arm bag, (3) quantitative recovery (97.3%) of sweat electrolytes, and (4) sweat electrolyte concentrations which agree well with values reported by other laboratories. Polyethylene arm bags were found to induce changes in the local forearm microenvironment (when compared to OPEN arms); increases in skin temperature, relative humidity, sodium excretion, and potassium excretion were observed. In spite of these changes in local microenvironment, this technique is useful as a relative measure by day-to-day (or hour-to-hour) changes in sweat collection techniques, such as large sample size, ease of use and field portability. Measurements such as sweat electrolyte

losses during exercise in the heat, or sweat rates during heat acclimatization, are feasible with this technique. GRA

N85-27522# Defence Research Establishment, Ottawa. (Ontario).

INVESTIGATION OF THE REQUIREMENT FOR AUXILIARY HEATING OF CANADIAN FORCES PERSONNEL

S. D. LIVINGSTONE, R. W. NOLAN, and S. W. CATTROLL Aug. 1984 26 p (AD-A151950; DREO-TN-84-17) Avail: NTIS HC A03/MF A01 CSCL 06Q

In order to investigate the requirement for auxiliary heating by the Canadian Forces, a questionnaire was administered to approximately 1500 CF personnel with experience working outdoors in cold weather. In addition to analyzing the respondents' actual replies, the authors also interpreted the completed questionnaires regarding the need for auxiliary heat. It was concluded that auxiliary heating would be beneficial to more than 50% of personnel with problems associated with working in the cold and that most of these problems were due to cold extremities (hands and feet). In the past, various auxiliary heating devices (handwarmers, electrically-heated gloves and socks, etc.) have been assessed for potential application in military operations in cold weather. Many of these assessments have been ad hoc trials of items off-the-shelf which, because of the design, physiological factors, or special military requirements involved, were poorly suited to the needs of the military. Certain delegates at NATO R&D conferences have shown a continuing interest in the potential of auxiliary heating, and a continuing concern that a systems approach be employed to provide better equipment and a better understanding of the applications and limitations of auxiliary heating. GRA

N85-27523# Army Research Inst. of Environmental Medicine, Natick, Mass.

COMPARATIVE ANAEROBIC POWER OF MALES AND FEMALES

M. M. MURPHY, J. F. PATTON, and F. A. FREDERICK Mar. 1985 19 p (AD-A151960; USARIEM-M21/85) Avail: NTIS HC A02/MF A01 CSCL 06N

The purpose of this study was to determine the differences in anaerobic power between males and females and the contribution of anthropometric variables in accounting for these differences. Eighteen female and nineteen male subjects performed the Wingate test as a measure of anaerobic power (AnP). Each subject pedaled maximally for 30s against a resistance of 4.41 joules/pedal revolution/kg body weight on a modified Monark ergometer which allowed instantaneous application of resistance. Revolutions were determined by a computer interfaced frequency counter. Thigh volume (TV) by water displacement, lean body mass (LBM) from skinfolds and body weight (BW) were used as anthropometric variables. Absolute AnP of males was significantly higher than females, as were pedal revolutions. The difference between genders decreased when power was expressed in terms of TV, BW and LBM, in that order. These data reveal that a larger portion of the between gender variation compared to the within gender variation in AnP can be accounted for by the anthropometric variables. However, a significant portion remains that must be explained by the individual muscles' potential for glycolytic energy production. GRA

N85-27524# New Hampshire Univ., Durham. Vision Research Lab.

SPATIAL AND TEMPORAL VISUAL MASKING AND VISIBILITY Final Report, 1 Oct. 1979 - 29 Sep. 1984

R. A. SMITH 1 Oct. 1984 39 p (Contract AF-AFOSR-0045-80) (AD-A151968; AFOSR-85-0245TR) Avail: NTIS HC A03/MF A01 CSCL 06P

Two major studies have been completed this year, and several others are in progress. In visual masking, we have studied the effect of different detection criteria and find that criterion has a more profound effect than is usually believed. Not only does

criterion change alter overall sensitivity, but the qualitative nature may yield either Weber's Law behavior or power-law behavior, depending on criterion. We conclude that much of the literature on spatial frequency masking is essentially unreplicable, since criterion was uncontrolled, and we offer possibility of using motion to enhance the visibility of displayed images, we have been studying hypothetical detectors for moving objects. We began this study with the simplest possible stimulus, a pair of briefly-flashed lines, separated in space and time (a variant of the apparent motion paradigm). Although lateral interactions between line segments have generally been reported to be inhibitory, with this paradigm, we find a range of excitatory interactions which suggest a motion detector with a tuned velocity of about 3 deg/sec. Additional keywords: Vision, Visibility, Charts. GRA

N85-27525# Army Research Inst. of Environmental Medicine, Natick, Mass.

EFFECTS OF DEHYDRATION OR COLD EXPOSURE AND RESTRICTED FLUID INTAKE UPON COGNITIVE PERFORMANCE

L. E. BANDERET, D. M. MACDOUGALL, D. E. ROBERTS, D. TAPPAN, and M. JACEY 22 Oct. 1984 15 p
(AD-A151973; USARIEM-M38/84) Avail: NTIS HC A02/MF A01 CSCL 05J

The present study examined the effects of initial hydration state upon cognitive performance during the cold exposure. Five tests (Coding, Number Comparison, Computer Interaction, Pattern Comparison, and Grammatical Reasoning) were used to assess the cognitive performance of 36 male Marine volunteers. All subjects practiced the tests extensively the 3 days before the cold exposure. Two groups of 18 subjects each were studied, 21 days apart, for 10 consecutive days. The second group of subjects was dehydrated by 2.5% of their body weight by severe fluid restriction and exercise-induced sweating the day before the cold exposure; the first group was normally-hydrated. All subjects spent 5 days in an environmental chamber where temperatures during the day were -23 to -25 C with 4 km/h winds and night conditions ranged from -4 to -10 C without wind. In the cold the subjects wore protective Arctic Uniforms; afterwards, recovery was evaluated for 27 hours. All cognitive assessment was interspersed with extensive physical work. The results indicate that dehydration or cold temperature with limited intake of fluids impairs cognitive performance. GRA

N85-27526# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

A MULTIPOLE MODEL OF THE OBSERVED CEREBRAL CORTEX MAGNETIC FIELD M.S. Thesis

P. J. DEREGO Dec. 1984 162 p
(AD-A152237; AFIT/GE/ENG/84D-23) Avail: NTIS HC A08/MF A01 CSCL 06P

A Multipole model of magnetic field sources in the cerebral cortex was developed as an expansion of Grynspan's single dipole in a conducting sphere model. Both computer simulation and actual conducting sphere experiments were used to generate field plots in five separate dipole configurations. These include one case of a single dipole, three cases of three dipoles on a single radial, and one case of two dipoles on independent radials. The results show that dipoles oriented on a single radial do not produce multiple flux peaks, but rather a twisted version of the single dipole field. Sufficiently distant dipoles on independent radials, however, do produce multiple peaks. The largest field distortions occurred when nonconducting masses were in close proximity to the active dipoles. GRA

N85-27527# Health Effects Research Lab., Research Triangle Park, N. C.

BIOLOGICAL INFLUENCES OF LOW-FREQUENCY SINUSOIDAL ELECTROMAGNETIC SIGNALS ALONE AND SUPERIMPOSED ON RF CARRIER WAVES

C. F. BLACKMAN Jan. 1985 19 p refs
(PB85-161248; EPA-600/D-85-010) Avail: NTIS HC A02/MMF A01 CSCL 06R

The experiments that were performed to examine the biological responses caused by exposure to low frequency electromagnetic radiation directly or as modulation of RF carrier waves are described in a historical context. The independently-replicated fundamental finding, the field enhanced efflux of calcium ions from brain tissue in vitro, as well as reports of CNS-related changes caused in synaptosome preparations, neuroblastoma cell cultures and intact whole animals are reviewed. Non-CNS tissue has shown positive results caused by exposure to these electromagnetic fields including work with pancreatic tissue slices and lymphocytes. Recent results demonstrating the influence of the Earth's magnetic field are also discussed, along with their implications for the design of future experiments. Lastly, the mechanism of action is conceptualized, and recommendations are made to assist in attempts to correlate the results obtained with diverse biological systems. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A85-33621

PERCEIVED POSITION AND SACCADIC EYE MOVEMENTS

A. MACK, R. FENDRICH, D. CHAMBERS, and F. HEUER (New School for Social Research, New York, NY) Vision Research (ISSN 0042-6989), vol. 25, no. 4, 1985, p. 501-505. refs
(Contract NIH-EY-00135)

The finding that saccades to remembered positions are influenced by perception is noted to be consistent with current understanding of the relation between perception and pursuit eye movements. The evidence presently considered further indicates that perception, in this case perceived movement, governs pursuit only when the tracked target has no retinal counterparts. The relevance of these findings to schema theories stems from the theories' contention that the eyes are directed to some place in space which, if the schema is valid, will present some particular configuration. The evidence indicates that the capacity of perception or a perceptual map to govern eye movements is extremely limited. O.C.

A85-33858

SUSTAINED PERFORMANCE WITH SHORT EVENING AND MORNING SLEEPS

A. N. NICHOLSON, P. A. PASCOE, M. B. SPENCER, B. M. STONE (RAF, Institute of Aviation Medicine, Farnborough, Hants., England), T. ROEHRS, T. ROTH, and F. ZORICK (Henry Ford Hospital, Detroit, MI) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Feb. 1985, p. 105-114. refs

The effect which early evening sleep may have on overnight and subsequent daytime performance, and the effect which morning sleep may have on daytime performance after overnight sleep deprivation has been studied in six healthy male volunteers. It would appear that relatively short periods of natural and drug induced (brotizolam 0.125 mg) sleep have a beneficial effect on subsequent performance even in the absence of preceding sleep debt. In the event of disturbed sleep in shift-work an hypnotic may be helpful, and in this context, one which is rapidly eliminated and sustains sleep is appropriate. Author

A85-34578

AGREEMENT BETWEEN INDIRECT MEASURES OF PERCEIVED DISTANCE

W. C. GOGEL, J. M. LOOMIS, N. J. NEWMAN, and T. J. SHARKEY (California, University, Santa Barbara, CA) Perception and Psychophysics (ISSN 0031-5117), vol. 37, Jan. 1985, p. 17-27. refs

(Contract PHS-MH-39457)

It can be shown geometrically that the relative motion on the retina of images of physically stationary objects, such as the present study's test object and a particular polka dot, is entirely determined by the physical positions of the objects relative to the observer. The apparent motion of the test point, and therefore its apparent motion relative to the particular polka dot, can be changed in both magnitude and direction by changing the apparent distance of the test point. An analysis of the present results lends support to the conclusion that the apparent distance/pivot distance hypothesis applies equally to situations in which objects, in addition to the test object, are present. O.C.

A85-34579

INTEROCULAR INTERMITTENCE, RETINAL ILLUMINANCE, AND APPARENT DEPTH DISPLACEMENT OF A MOVING OBJECT

G. S. HARKER and P. D. JONES (Louisville, University, Louisville, KY) Perception and Psychophysics (ISSN 0031-5117), vol. 37, Jan. 1985, p. 50-58. refs

In the present viewing of a moving object in delayed, interocular intermittent exposures of equal duration to the two eyes, a range of period-of-common-view was presented in conjunction with two levels of luminance manipulated by optical filter. The physical delay of interocular intermittence was found to be additive with interocular average luminance difference, in the sense that the 'dimmed eye' was equivalent to the 'lead eye'. Increased apparent depth was obtained for physical delay when overall luminance was decreased. Interocular interaction is suggested as a framework for the interpretation of these results. O.C.

A85-34580

SPATIAL DETERMINANTS OF THE DISTRIBUTION OF ATTENTION

G. L. SHULMAN, J. WILSON, and J. B. SHEEHY (Pennsylvania State University, University Park, PA) Perception and Psychophysics (ISSN 0031-5117), vol. 37, Jan. 1985, p. 59-65. Research supported by Pennsylvania State University. refs

A simple reaction time technique was used to investigate the distribution of attention at different eccentricities. Subjects were asked to shift their attention to a cued spatial location and respond to a subsequently presented target light. Although the target was often flashed at the cued location, targets were sometimes presented at other eccentricities. By examining the reaction time to the target as a function of the distance of the target from the cue and the eccentricity of the cue, the distribution of attention at different eccentricities could be determined. Reaction time generally increased with distance, and a smaller effect of the attention manipulation was found with peripheral cues. Author

A85-35822

PSYCHOLOGY FOR PILOTS (2ND REVISED AND ENLARGED EDITION) [LETCHEIKU O PSIKHOLOGII /2ND REVISED AND ENLARGED EDITION/]

B. L. POKROVSKII Moscow, Voenizdat, 1984, 85 p. In Russian.

The basic psychological principles related to the operation of aircraft are discussed. Consideration is given to the unique psychological demands of the flight environment, including increased attention and increased stress and anxiety, with emphasis on the stresses of aircraft combat. Techniques developed by the Soviet Air Force to reduce occurrence of pilot error due to stress and other psychological factors are also described. I.H.

A85-36851

COGNITIVE INTERFERENCE IN PRISM ADAPTATION

G. M. REDDING (Illinois State University, Normal, IL) and B. WALLACE (Cleveland State University, Cleveland, OH) Perception and Psychophysics (ISSN 0031-5117), vol. 37, March 1985, p. 225-230. refs

(Contract PHS-I-R03-MH-34383)

Visual and proprioceptive adaptation to optical displacement were found to decrease with increasing difficulty of mental arithmetic performed during hall exposure. The graded nature of such cognitive interference is consistent with the idea that limited-capacity central control processes are required to coordinate the discordant visual system with other sensorimotor systems. When central processing capacity is diverted to other tasks, the frequency of coordinated activity involving the discordant visual system is reduced, there are fewer occasions for the discordance to pose a problem, and there is less need for adaptive recalibration in any sensorimotor system. Author

A85-36852

HOW DOES SPEED CHANGE AFFECT INDUCED MOTION?

R. BECKLEN (Sarah Lawrence College, Bronxville, NY) and H. WALLACH (Swarthmore College, Swarthmore, PA) Perception and Psychophysics (ISSN 0031-5117), vol. 37, March 1985, p. 231-236. refs

(Contract PHS-11089)

The nature of a recently reported effect of speed on induced motion was investigated. Wallach and Becklen (1983) had found that the extent of induced motion decreases linearly with increases in presentation speed. We found that this speed effect occurred only in induced motion and not under conditions in which configurational change, which is responsible for induced motion, operated veridically. It took place whether configurational change was in conflict with ocular pursuit or with image displacement, and seemed to consist in diminished effectiveness of configurational change when it competed with one of these subject-relative stimuli. Author

N85-26138 British Aerospace Dynamics Group, Bristol (England). Human Factors Dept.

VISUAL SEARCH STRATEGY PREDICTIONS: THE USE OF ASPECT RATIO AS A CUE

L. K. B. HOLMAN Dec. 1981 40 p refs

(BAE-BT-12565) Avail: Issuing Activity

The use of aspect ratio by observers, in addition to size and contrast, to guide fixations during search was studied. Results show that aspect ratio strongly affects search. The distribution of observer performance, based on size and contrast and aspect ratio effects, is described mathematically. An initial study of the effects of large differences in size or contrast between target and nontarget stimuli was also conducted. Author (ESA)

N85-26139*# Douglas Aircraft Co., Inc., Long Beach, Calif. MENTAL WORKLOAD MEASUREMENT: EVENT-RELATED POTENTIALS AND RATINGS OF WORKLOAD AND FATIGUE

M. A. BIFERNO Jun. 1985 23 p refs

(Contract NAS2-11860)

(NASA-CR-177354; NAS 1.26:177354) Avail: NTIS HC A02/MF A01 CSCL 051

Event-related potentials were elicited when a digitized word representing a pilot's call-sign was presented. This auditory probe was presented during 27 workload conditions in a 3x3x3 design where the following variables were manipulated: short-term load, tracking task difficulty, and time-on-task. Ratings of workload and fatigue were obtained between each trial of a 2.5-hour test. The data of each subject were analyzed individually to determine whether significant correlations existed between subjective ratings and ERP component measures. Results indicated that a significant number of subjects had positive correlations between: (1) ratings of workload and P300 amplitude, (2) ratings of workload and N400 amplitude, and (3) ratings of fatigue and P300 amplitude. These data are the first to show correlations between ratings of workload

or fatigue and ERP components thereby reinforcing their validity as measures of mental workload and fatigue. Author

N85-26140# Army Construction Engineering Research Lab., Champaign, Ill.

A PRACTICAL SYSTEM FOR COLLECTING RELIABLE DATA ON THE SPACE-TIME BEHAVIOR OF PEOPLE Final Report

R. M. DINNAT and A. J. AVERBUCH Apr. 1984 25 p
(AD-A151174; CERL-TR-P-152) Avail: NTIS HC A02/MF A01 CSCL 14B

Space-time behavior is determined by collecting data on people's movements and inferring a mathematical form which expresses their position in space with respect to time. Analysis of space-time behavior can potentially be useful to the military for training, security, and the planning and design of facilities for military installations. Data on time-space behavior is normally collected by human observers (usually by self-observation); therefore, its reliability is virtually impossible to determine. However, by replacing human operations with electronic operations, the major source of unpredictable error is eliminated. A conceptual system consisting of individual transmitters and receiver-recorders had been proposed to replace human operations with electronic operations for the collection of data on time-space behavior. This investigation examined the technical feasibility of this concept by testing a simple prototype system. The system was shown to be technically feasible, as well as simple to use, and affordable. GRA

N85-26141# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE MEASUREMENT OF HUMAN TIME ESTIMATING ABILITY USING A MODIFIED JERISON DEVICE M.S. Thesis

D. C. KINNEY Dec. 1984 80 p
(AD-A151870; AFIT/GSO/ENG/84D-2) Avail: NTIS HC A05/MF A01 CSCL 05I

The first objective of this research was to design and fabricate a variation of the Jerison time estimation device. This modified Jerison device has the requirement of being STS compatible; meaning it must be light weight, reliable, and totally self contained. The second objective of the research was to determine if providing feedback aids the subject in improving his TEA (Time Estimation Ability). When this research began the decision whether or not to provide the astronauts with a readout of their estimated time had not been made. The final objective of the research was to tailor the experiment to fit the STS environment and astronaut workloads. GRA

N85-26142# Massachusetts Inst. of Tech., Cambridge. Dept. of Psychology.

VISION ALGORITHMS AND PSYCHOPHYSICS Annual Scientific Report, 15 Jul. 1983 - 14 Jul. 1984

W. A. RICHARDS Sep. 1984 24 p
(Contract F49620-83-C-0135)
(AD-A151888; AFOSR-85-0248TR) Avail: NTIS HC A02/MF A01 CSCL 06P

Vision by man or machine is the useful symbolic descriptions form images of the world. Studies of human visual system provide valuable insights into the kinds of descriptions that will be the most useful, but little insight into the computational problems involved in deriving and manipulating these descriptions. This research examines several computational problems associated with aspects of two- and three-dimensional vision. The solution to these problems includes the design and implementation of particular algorithms. Their efficiency and flexibility is compared with that of the human visual processor. GRA

N85-26143# Colorado Univ., Boulder.

SKILLED MEMORY Status Report, 1 Mar. 1984 - 15 Jan. 1985

K. A. ERICSSON 1985 39 p
(Contract N00014-84-K-0250)
(AD-A152063) Avail: NTIS HC A03/MF A01 CSCL 05J

The Principle Investigator proposes to investigate memory processes underlying expertise. For their earlier contract period, he and Bill Chase studied the development of memory skills,

concentrating primarily on individuals who have trained their digit spans from a normal span of about 7 digits to spans as high as 85 digits. Recently, they have also analyzed the memory skills of a mental calculation expert, the mnemonic skills of a waiter who is able to remember at least 20 menu orders without any form of memory aid, and normal people's memory for exact wording of prose material. The methodology, they have employed involves a combination of protocol analysis, computer simulation modeling, and experimental hypothesis testing. They have also been primarily concerned with extensive analyses of expert subjects and long-range training of dedicated subjects over hundreds of hours, although they have also conducted short-range studies with larger samples of subjects. Because they are interested in expert-level memory performance, their methodology is inherently constrained by the time-consuming nature of expertise. GRA

N85-26144# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.

CORRELATIONS BETWEEN SELECTION RATINGS AND SUCCESS AS ARMY AVIATORS

A. CARLSTROEM Dec. 1984 30 p refs
(FOA-C-53020-H2; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

The correlations between selection ratings and performance of Swedish Army aviation trainees were calculated. The results show very low and mostly insignificant correlations, possibly due to the selection procedures already passed by the applicants. Author (ESA)

N85-27528*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE INTRODUCTION OF NEW COCKPIT TECHNOLOGY: A HUMAN FACTORS STUDY

R. E. CURRY May 1985 71 p refs
(NASA-TM-86659; REPT-86659; NAS 1.15:86659) Avail: NTIS HC A04/MF A01 CSCL 05H

A joint Airline/NASA field study of B-767 training and operations was conducted during the period this aircraft was being introduced into line service. The objectives of the study were: (1) to identify any adverse reactions to the new technology; (2) to provide a clearing house of information for the airlines and pilots during the introductory period; (3) to provide feedback on airline training programs for the new aircraft; and (4) to provide field data to NASA and other researchers to help them develop principles of human interaction with automated systems. It is concluded that: (1) a large majority of pilots enjoy flying the B-767 more than the older aircraft; (2) pilots accept new cockpit technology and find it useful; (3) pilots are aware of the potential loss of flying skills because of automation, and take steps to prevent this from happening; (4) autopilot/autothrottle interactions and FMS operations were sometimes confusing or surprising to pilots, and they desired more training in this area; and (5) highly automated cockpits can result in a loss of effective monitoring performance. B.W.

N85-27529# Naval Health Research Center, San Diego, Calif.
PREDICTORS OF COLD WEATHER HEALTH BEHAVIORS Interim Report

R. R. VICKERS, JR. and L. K. HERVIG Oct. 1984 26 p
(AD-A151910; NAVHLTHRSCHC-84-46) Avail: NTIS HC A03/MF A01 CSCL 05J

This study screened potential predictors of maladaptive cold weather behaviors. Male Marine Corps volunteers (n = 161) completed questionnaires providing a battery of predictor measures, including: (1) Personal history variables related to cold injuries, (2) Health beliefs concerning personal susceptibility to and severity of illness, and the efficacy of preventive behaviors, and perceived control of health outcomes by personal actions, professionals skills, and chance, (3) Health habits, and (4) Situational variables including mood, perceived leadership, weather conditions, workload, and morale. Self-reported liquid intake, food intake, and foot care during field exercises in cold weather training were the dependent variables. The combined predictors explained 22.1% of the variance

in food intake, 15.1% of the variance in foot care, but only 2.3% of the variance in liquid consumption. The initial findings suggest that refined models can be developed with further work which will have higher predictive accuracy and provide a basis for developing programs to improve cold weather health behaviors. GRA

N85-27530# Air Force Human Resources Lab., Brooks AFB, Tex.

TRENDS SHAPING ADVANCED AIRCREW TRAINING CAPABILITIES THROUGH THE 1990S Final Report, Jul. 1983 - Jul. 1984

R. G. HUGHES and L. BROWN Mar. 1985 20 p
(Contract AF PROJ. 1123)
(AD-A152277; AFHRL-TP-84-52) Avail: NTIS HC A02/MF A01
CSCL 051

Simulation will become a major training system resource for the support of tactical aircrew training in the 1990s. Technologies in this area will be driven by the desire to extend the traditional notion of a simulator to that of a multi-cockpit multi-sensor device capability by the late 1980s. The ultimate user goal will be to arrive at those configurations of this new technology which prove to be cost effective for fielding the base (wing and/or squadron) level. Critical technologies for making such unit-level basing possible lie chiefly in the area of visual system display. In particular, unit-level basing of an advanced simulation capability will depend in large part on the success of headand eye-coupled display technology and the anticipated reductions in overall system costs associated with adoption of such an approach. Near-term training device research and development (R/D) goals call for the functional integration of a multiple-cockpit, multi-sensor device capability (using head and eye coupling either in a helmet display or dome configuration) with a state-of-the-art, instrumented range facility by the early to mid-1990s. This centralized, center concept represents a significant R/D goal as well as an operational milestone with respect to planning for future aircrew training systems. GRA

N85-27531# Airbus Industrie, Blagnac (France). Dept. des Operations

STATISTICAL STUDY OF THE DYNAMIC ANALYSIS OF THE WORKLOAD IN THE A310 CERTIFICATION CAMPAIGN [ETUDE STATISTIQUE DES COTATIONS DE CHARGES DE TRAVAIL DE L'ANALYSE DYNAMIQUE DE LA CAMPAGNE DE CERTIFICATION DE L'A310]

12 Apr. 1984 209 p In FRENCH
(Contract DRET-83-1145)
Avail: NTIS HC A10/MF A01

Airbus A310 crew workload assessment is described. At any moment of the flight the workload is subjectively estimated by the onboard personnel or by a qualified observer. The evaluating team is composed of two pilots, an observer and a flight director. A quantitative scale was adopted. Thousands of evaluations were analyzed, validating the method of analysis. The results show that the workload is equal to or less than the workload observed in the A 300 FF aircraft tests. Author (ESA)

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A85-33427#

ANGEL'S WINGS FROM OFF THE SHELF

R. DEMEIS Aerospace America (ISSN 0740-722X), vol. 23, May 1985, p. 42, 43.

The Space Shuttle astronauts' Manned Maneuvering Unit (MMU) is designed largely on the basis of off-the-shelf components from

previous, successful spacecraft, and even, in the case of its gaseous nitrogen propellant tanks, from a helicopter. Many of these components have nevertheless been requalified for MMU employment. The MMU furnishes full six-degree-of-freedom movement control for extravehicular activities including satellite servicing and repair, such as the retrieval of the Palapa and Westar communications satellites in February 1984. O.C.

A85-33430*# Martin Marietta Corp., Denver, Colo.

THE MANNED MANEUVERING UNIT - 'A NICE FLYING MACHINE'

W. W. BOLLENDONK (Martin Marietta Aerospace, Space and Electronics Div., Denver, CO), B. MCCANDLESS, II, and C. E. WHITSETT, JR. (NASA, Johnson Space Center, Houston, TX) Aerospace America (ISSN 0740-722X), vol. 23, May 1985, p. 56-58.

The need for untethered maneuvers in extravehicular space was recognized early in the NASA manned spaceflight program, leading to experiments during the Gemini flights. The Space Shuttle crews are now equipped with a Manned Maneuvering Unit (MMU) which employs 24 gaseous nitrogen thrusters to furnish six-degree-of-freedom mobility and is fitted with fully redundant electronics, electrical, and propulsion subsystems. The MMU thrusters are operated with translational and rotational hand controllers at the ends of the MMU arms. O.C.

A85-33431#

EMU - WELL SUITED FOR WORK IN SPACE

A. J. HOFFMAN (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) Aerospace America (ISSN 0740-722X), vol. 23, May 1985, p. 60-62.

An account is given of the development histories of the Apollo and Gemini programs' Extravehicular Mobility Units (EMUs), or spacesuits, in order to assess the comparative advantages of the current Space Shuttle EMU design. From the STS-6 mission of April 1983, through STS-51A in November of 1984, the Space Shuttle EMUs were employed during 16 separate extravehicular activities. This EMU design has been standardized dimensionally to fit five sizes, with fully replaceable arms of various, custom-fitted lengths. O.C.

A85-33434#

CANADARM STRETCHES SHUTTLE REACH

G. M. LINDBERG (National Aeronautical Establishment, Ottawa, Canada) Aerospace America (ISSN 0740-722X), vol. 23, May 1985, p. 70-72, 74.

The Canadian contribution to the Space Shuttle takes the form of the Remote Manipulator System (RMS) flight hardware and ground support elements. RMS specifications call for the deployment or retrieval of payloads of up to 65,000 lb having a maximum envelope of 15 x 60 ft, with fail-safe design and a 100-mission life. Each of the six joints in the arm is powered by an optically commutated, brushless DC motor which is driven by a servo power amplifier within the arm. The RMS's ability to deploy and retrieve free-flying payloads was demonstrated on STS-7, and satellite repair was conducted on STS-13. O.C.

A85-33472

PRELIMINARY STUDY OF MAN-MACHINE PROBLEMS IN HOVERING ABOVE A MOVING PLATFORM

M. NEGRIN, A. GRUNWALD, and A. ROSEN (Technion - Israel Institute of Technology, Haifa, Israel) (European Rotorcraft Forum, 9th, Stresa, Italy, Sept. 13-15, 1983) Vertica (ISSN 0360-5450), vol. 9, no. 1, 1985, p. 51-64. refs

A one-dimensional problem of hovering over a moving platform is investigated analytically on the basis of optimal control theory, with the main objective of determining the optimal configuration of the display augmentation systems. A fixed-base simulation experiment was conducted, with the pilot instructed to maintain a constant inertial height (vertical motion only) above a small ship platform. Good correlation is noted to exist between the experimental and analytical results. It is inferred that pilot's absolute measurements in the absence of display augmentation are

inaccurate; in the presence of display augmentation the observations noise levels were considerably lower. L.T.

A85-33732* Hamilton Standard, Windsor Locks, Conn.
DEVELOPMENT OF A ZERO-PREBREATHE SPACESUIT

C. W. FLUGEL (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT), J. J. KOSMO (NASA, Johnson Space Center, Houston, TX), and J. R. RAYFIELD (ILC Industries, Inc., ILC Dover, Frederica, DE) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 13 p.
 (SAE PAPER 840981)

This paper presents the results of a program to develop an improved high pressure (zero-prebreathe) spacesuit utilizing the latest joint technology as well as materials and processes which are consistent with the space environment and suit production techniques. Other development objectives include: longer life, lower joint torques with increased ranges, improved reproducibility and reliability, facilitated resizing ability and increased overall performance capability when compared to the present Shuttle Orbiter Spacesuit at the higher pressures. Author

A85-33739* National Aeronautics and Space Administration.
 Marshall Space Flight Center, Huntsville, Ala.

FLIGHT EVALUATION OF SPACELAB 1 PAYLOAD THERMAL/ECS INTERFACES

C. D. RAY, W. R. HUMPHRIES, and W. C. PATTERSON (NASA, Marshall Space Flight Center, Life Support and Environmental Branch, Huntsville, AL) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 16 p. refs
 (SAE PAPER 840925)

The Spacelab (SL-1) thermal/Environmental Control Systems (ECS) are discussed. Preflight analyses and flight data are compared in order to validate payload to Spacelab interfaces as well as corroborate modeling/analysis techniques. In doing so, a brief description of the Spacelab 1 payload configuration and the interactive Spacelab thermal/ECS systems are given. In particular, these interfaces address equipment cooling air, thermal and fluid conditions, humidity levels, both freon and water loop temperatures and load states, as well as passive radiant environment interfaces. Author

A85-33742* Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.

ECLS FOR THE NASA CDG SPACE STATION MODEL

R. J. CUSHMAN (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and G. ROBINSON (NASA, Washington, DC) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 10 p.
 (SAE PAPER 840929)

This paper describes the approaches to Environmental Control and Life Support (ECLS) loop closure that have been studied for a permanently manned Space Station, by the NASA Concept Development Group (CDG) and industry. The paper explains the rationale behind the level of the loop closure chosen for ECLS expendables and why this level was chosen. The paper also explains potential synergistic interactions, between ECLS subsystems and other vehicle systems, which can lessen vehicle expendable penalties and help simplify required ECLS hardware, interfaces and control. Of particular significance are the potential interfacing of the ECLS subsystem which concentrates the metabolic CO₂ removed from the atmosphere, with propulsion system resistojets and the use of cryogenic boiloff to satisfy crew metabolic needs. The paper shows the trade-offs that must be performed in order to make a selection from available options. Author

A85-33744* National Aeronautics and Space Administration.
 Marshall Space Flight Center, Huntsville, Ala.

SPACE STATION ACCOMMODATION ENGINEERING FOR LIFE SCIENCES RESEARCH FACILITIES

J. HILCHEY (NASA, Marshall Space Flight Center, Huntsville, AL), E. GUSTAN (Boeing Aerospace Co., Seattle, WA), and C. E. RUDIGER (Lockheed Missiles and Space Co., Inc., Huntsville, AL) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 18 p. refs
 (SAE PAPER 840931)

Exploratory studies conducted by NASA Marshall Space Flight Center and several contractors in connection with defining the design requirements, parameters, and tradeoffs of the Life Sciences Research Facilities for nonhuman test subjects aboard the Space Station are reviewed. The major system discriminators which determine the size of the accommodation system are identified, along with a number of mission options. Moreover, characteristics of several vivarium concepts are summarized, focusing on the cost, size, variable-g capability, and the number of specimens accommodated. Finally, the objectives of the phase B studies of the Space Station Laboratory, which are planned for FY85, are described. L.T.

A85-33745

HUMAN PRODUCTIVITY IN THE SPACE STATION PROGRAM - THE IMPACT OF THE ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM

C. A. POYTHRESS (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 8 p.
 (SAE PAPER 840932)

The Environmental Control and Life Support (ECLS) System can be a major contributor to Space Station productivity through creative approaches to analysis and design, installation and maintenance. Emulation/simulation computer modeling can enhance ECLSS design, performance predictions and anomaly investigations. Innovative design approaches can yield an integrated ECLSS that provides a more manageable work package, improves ground processing and crew operations. Productivity can also be enhanced by proper attention to equipment design and integration, especially in terms of accessibility for maintenance and the selected level for on-orbit replacement. Author

A85-33746*

A NOVEL REVERSE-OSMOSIS WASH WATER RECYCLE SYSTEM FOR MANNED SPACE STATIONS

R. J. RAY, W. C. BABCOCK, R. P. BARSS, T. A. ANDREWS, and E. D. LACHAPPELLE AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 11 p. refs
 (Contract NAS9-17031)
 (SAE PAPER 840933)

The preliminary development of a wash water recycle system utilizing an inside-skinned hollow-fiber membrane is described. This module configuration is based on tube-side feed and is highly resistant to fouling with a minimum of pretreatment. During an ongoing research program for NASA, these modules were operated on actual wash waters with no significant fouling for a period of 40 days. Due to the tube-side-feed flow in these hollow-fiber membranes, the fibers themselves become the pressure vessels, allowing the development of extremely lightweight membrane modules. During the NASA research program, a pre-prototype membrane module capable of processing 6 gallons per day of wash water at 97 percent recovery was developed that can be dry-stored and that weighs 120 g. Author

A85-33747* Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.

THERMOELECTRIC INTEGRATED MEMBRANE EVAPORATION SUBSYSTEM OPERATIONAL IMPROVEMENTS

G. F. DEHNER (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT), H. E. WINKLER (NASA, Johnson Space Center, Houston, TX), and R. P. REYSA (Boeing Aerospace Co., Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 14 p. refs (SAE PAPER 840934)

A three-man preprototype Thermoelectric Integrated Membrane Evaporation Subsystem (TIMES) has been developed to provide high quality water recovery from waste fluids on extended duration space flights. In the most recent effort, a number of improvements have been made to simplify subsystem operation and increase performance. These modifications include changes to the hollow fiber membrane evaporator, the condensing section of the thermoelectric heat pump, and the electronic controller logic and display. This paper describes the results of the test program that was conducted to evaluate the implemented improvements. In addition, an advanced design concept is discussed that will provide lower electrical power consumption, greater water production capacity, lower weight, and a smaller package than the present subsystem configuration. Author

A85-33749* Broome Community Coll., N. Y.

A STUDY OF SABATIER REACTOR OPERATION IN ZERO 'G'

R. K. FORSYTHE (Broome Community College, Binghamton, NY), C. E. VEROSTKO, R. J. CUSICK (NASA, Johnson Space Center, Houston, TX), and R. L. BLAKELY (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 10 p. (SAE PAPER 840936)

The results of zero-g computer model simulation of the operation of a Sabatier reactor, which relies on the effects of buoyant forces, are presented. The reactor was also operated in an experiment with inlet flow rates of carbon dioxide that correspond to continuous operation of the reactor at three, five, eight, and ten-man loading conditions; the three and five-man conditions are noted to be within the design capabilities of the reactor. The loss of carbon dioxide conversion predicted by the model for zero-g environment is noted to be substantial, ranging from 12 to 18.2 percent for five-man to ten-man loading. The simulated normal-gravity values are within 0.9 percent of the experimental conversions. Finally, the results indicate a much hotter operation of the reactor in zero-g due to the loss of natural convective cooling effect. L.T.

A85-33750* Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.

DEVELOPMENT OF SOLID AMINE CO₂ CONTROL SYSTEMS FOR EXTENDED DURATION MISSIONS

K. J. DRESSER (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and R. J. CUSICK (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 12 p. refs (SAE PAPER 840937)

This paper briefly discusses the development history of solid amine CO₂ control systems, describes two distinct CO₂ control system concepts, and presents the performance characteristics for both system concepts. The first concept (developed under NASA Contract NAS9-13624) incorporates a solid amine canister, an automatic microprocessor controller, and an accumulator to collect CO₂ and to provide regulated CO₂ delivery to an oxygen recovery system. This system is currently operating in the Crew Systems Division's Advanced Life Support Development Laboratory (ALSDL). The second system concept (being developed under NASA Contract NAS9-16978) employs multiple solid amine canisters, an advanced automatic controller and system status display, the ability to regulate CO₂ delivery for oxygen recovery,

and energy saving features that allow system operation at lower power levels than the first concept. Author

A85-33756

EUROPEAN LIFE SCIENCES

A. I. SKOOG (Dornier System GmbH, Friedrichshafen, West Germany) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 13 p. refs (SAE PAPER 840945)

Descriptions of several present and planned European life sciences program elements are given, and their status is discussed both from the scientific and hardware standpoints. The facilities include the Biorack multipurpose experimental facility which enables biological investigations to be carried out onboard the Spacelab on such life forms as plants, tissues, cells, bacteria, and insects. The botany facility is also described, which is intended for studies on higher plants and fungi. In addition, the Sled and Anthorack facilities, intended for human physiology studies in space, are detailed. These will specialize in human sensory balance, interaction of physical sensations, and cardiovascular/pulmonary metabolic sensorimotor studies. L.T.

A85-33757

PROPOSED LIFE SUPPORT SYSTEM FOR THE BOTANY FACILITY - A PAYLOAD OF THE EUROPEAN RETRIEVABLE CARRIER TO BE FLOWN WITH THE SPACE SHUTTLE

H. R. LOESER (ERNO Raumfahrttechnik GmbH, Bremen, West Germany) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 12 p. (SAE PAPER 840946)

Viable design options for the Botany Facility, planned for operation in 1987 aboard the European Retrievable Carrier (EURECA) are identified with respect to the weight, complexity, critical components, compatibility with microgravity, and cost. Based on the requirements posed by the physiology of plants/fungi it is suggested that the Life Support Subsystem be divided into a Ventilation and Soil/Air humidification loop and an Atmosphere Storage and Composition Control loop. Among the humidity control systems the concept of reclaiming the water by condensation is noted as most efficient in terms of the weight of consumables. It is pointed out that the large amount of consumables, associated with the long mission duration, may place a constraint on the plant size. L.T.

A85-33760* National Aeronautics and Space Administration, Washington, D. C.

ARTIFICIAL GRAVITY STUDIES AND DESIGN CONSIDERATIONS FOR SPACE STATION CENTRIFUGES

T. W. HALSTEAD (NASA, Life Sciences Div., Washington, DC), A. H. BROWN (Pennsylvania, University, Philadelphia, PA), C. A. FULLER (California, University, Riverside, CA), and J. OYAMA (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, CA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 14th, San Diego, CA, July 16-19, 1984. 13 p. refs (SAE PAPER 840949)

The requirements to and capabilities of a Space Station biological facility centrifuge are discussed on the basis of an assessment of the objectives and subjects of future microgravity biological experiments. It is argued that the facility should be capable of both acute and extended chronic exposure of test subjects and biological materials to altered-g loading. In addition, the experimental approaches and equipment for microgravity studies on a Space Station are outlined. Finally, the engineering requirements of such a centrifuge are examined, with consideration of radial gravity gradients, size, and physical access to animals. L.T.

A85-33925

COMPARISON OF THREE FIELD METHODS FOR MEASURING OXYGEN CONSUMPTION

V. LOUHEVAARA, J. ILMARINEN (Institute of Occupational Health, Helsinki, Finland), and P. OJA (Urho Kekkonen Institute for Health Promotion, Tampere, Finland) *Ergonomics* (ISSN 0014-0139), vol. 28, Feb. 1985, p. 463-470. refs

The performance of the new Oxylog (OX) apparatus for measuring oxygen consumption (VO₂) in subjects performing exercises was compared with the performance of the Douglas Bag (DB) and Kofranyi-Michailis gas meter (KM) equipment in current use. OX has a half face mask connected to a turbine flow meter on the inspirator and an expiratory base linked to an analyzer. Six male volunteers walked a treadmill and performed lifting work while VO₂ and EEG data were recorded. Comparisons were then made among the VO₂ data collected by the OX, DB and KM devices. Mean values of VO₂ indicated that the OX generated underestimates and the KM overestimates. The discrepancies were acceptably small, thereby commending the OX and KM equipment for field usage. M.S.K.

A85-34287

THERMOLUMINESCENT DOSE MEASUREMENTS ON-BOARD SALYUT TYPE ORBITAL STATIONS

IU. A. AKATOV, V. V. ARKHANGELSKII (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR), A. P. ALEKSANDROV (Akademiia Nauk SSSR, Sovet Interkosmos, Moscow, USSR), I. FEHER, S. DEME, B. SZABO, J. VAGYOLGYI, P. P. SZABO, A. CSOKE, M. RANKY (Magyar Tudomanyos Akademia, Kozponti Fizikai Kutato Intezet, Budapest, Hungary) et al. (COSPAR, Topical Meeting on Life Sciences and Space Research XXI(1), Graz, Austria, June 25-July 7, 1984) *Advances in Space Research* (ISSN 0273-1177), vol. 4, no. 10, 1984, p. 77-81. refs

Dosimetric experiments with the PILLE thermoluminescent dosimeter system, performed on the Salyut space station in 1980 and 1981 and on Salyut-7 in 1983 to study the dose-field distribution in the inhabited sections of the space stations and to determine the personal dose burdens of the crew during the space flight, are described. The results of dose-field measurements on Salyut-6, in which rates varied from 0.07 to 0.11 mGy/day, are presented. The dose rates (0.12-0.23 mGy/day) measured on Salyut-7, which employed a new PILLE system with an improved sensitivity of 1 micro Gy/digit, are also given. It is shown that the apparatus has applications for dose control during space walks and for phantom experiments. M.D.

A85-34352

RESPONSES OF ELECTRIC-FIELD PROBES NEAR A CYLINDRICAL MODEL OF THE HUMAN BODY

D. MISRA and K.-M. CHEN (Michigan State University, East Lansing, MI) *IEEE Transactions on Microwave Theory and Techniques* (ISSN 0018-9480), vol. MTT-33, June 1985, p. 447-452. refs

(Contract NSF ECS-80-01772-01)

A theoretical and experimental study on the response of an E-field probe near a cylindrical model of the human body has been conducted. The body is simulated with a long cylindrical dielectric shell filled with saline water, and a single E-field probe oriented in various directions, or an orthogonal probe is located near its surface. The model with the probe is illuminated by a TE or TM plane EM wave. The response of the probe was found to be strongly dependent on the probe location with respect to the direction of the incident EM wave, the probe separation from the model surface, the probe orientation, and the polarization of the incident EM wave. The effect due to the dielectric shell on the probe response, with and without the presence of saline water, was carefully investigated. In all cases, the agreement between theory and experiment was found to be very good. Author

A85-35273* Miami Univ., Coral Gables, Fla.

BEYOND THE STERILE COCKPIT

E. L. WIENER (Miami University, Coral Gables, FL) *Human Factors* (ISSN 0018-7208), vol. 27, Feb. 1985, p. 75-90. refs (Contract NCC2-152)

Consideration is given to some of the negative aspects of the trend toward increased automation of aircraft flight decks. The history of automated devices for navigation, communications and detection on board aircraft is reviewed. Instances of automatic system failure are identified which have led to accidents, and the events surrounding the downing of Korean Airlines Flight 747 are reexamined within the context of a computer-based system failure. Finally, new software and interactive systems to reduce navigational error due to inadequate computer-assisted flight instruction (CAI) are described, with emphasis given to speech processing and intelligent CAI systems. I.H.

A85-35398

WHOLE-BODY VIBRATION: EXPOSURE TIME AND ACUTE EFFECTS - A REVIEW

A. KJELLBERG and B.-O. WIKSTROM (National Bureau of Occupational Safety and Health, Research Dept., Solna, Sweden) *Ergonomics* (ISSN 0014-0139), vol. 28, March 1985, p. 535-544. refs

Research concerning duration effects of whole-body vibration on comfort, performance and physiological and biomechanical reactions is reviewed. It is concluded that there is only weak evidence for the existence of an increasing effect as a function of exposure time. The measures providing some support for such a conclusion have been auditory evoked potentials, biomechanical transmission, EMG and subjective estimates. However, from the research evidence it seems as if the time dependency proposed in the international standard for whole-body vibration, ISO 2631, constitutes an overestimation of the importance of exposure time for the strength of the effects. Author

A85-35399

WHOLE-BODY VIBRATION: EXPOSURE TIME AND ACUTE EFFECTS EXPERIMENTAL ASSESSMENT OF DISCOMFORT

A. KJELLBERG, B.-O. WIKSTROM, and U. DIMBERG (National Board of Occupational Safety and Health, Research Dept., Solna, Sweden) *Ergonomics* (ISSN 0014-0139), vol. 28, March 1985, p. 545-554. refs

The method of cross-modality matching was used to study the development of discomfort during a 1 hour exposure to whole-body vibration. The subject's task was to adjust a broadband noise to the level where it gave rise to the same degree of discomfort as a vibration. Random vertical vibrations were used with a resonance of either 3.1 or 6.3 Hz. The sound settings were transformed into vibration levels by means of sound-vibration functions determined for each subject. The sound-level settings increased as a function of exposure time and control measurements showed that this could not have been the effect of a lowered sensitivity to the noise. The increase, expressed as log acceleration, was a linear function of log exposure time. It is therefore concluded that results from studies of shorter exposure times might be extrapolated to exposure periods of at least 1 hour. Although the method employed probably led to an underestimation of the increase in discomfort over time, the experiment does imply that the increase is over-estimated by ISO standard 2631. Author

A85-35400

SLEEP DEPRIVATION, CHRONIC EXERCISE AND MUSCULAR PERFORMANCE

L. TAKEUCHI, G. M. DAVIS, M. PLYLEY, R. GOODE, and R. J. SHEPHARD (Toronto, University, Toronto, Canada) *Ergonomics* (ISSN 0014-0139), vol. 28, March 1985, p. 591-601. Research supported by the Defence and Civil Institute of Environmental Medicine. refs

Muscular performance was tested during 64 hours of sleep deprivation with and without intermittent exercise (treadmill walking of 28 percent of maximum oxygen intake). The subjects (12 males aged 22.7 + or - 2.2 years) carried out a cross-over trial with an

8 week interval separating the two periods of sleep deprivation. The sleep deprivation did not change the time for a 40 m dash, isometric handgrip force or balance (stabilometer test). Vertical jump height decreased, the change being significant for simple sleep deprivation, but not for the combination of deprivation and intermittent exercise. Sleep deprivation decreased isokinetic extension force at 60 deg/s, while intermittent walking decreased isokinetic extension force at both 60 and 180 deg/s; however, there was no significant difference between exercise plus sleep deprivation and sleep deprivation alone at either angular velocity. It is concluded that the modern intensity of physical activity likely in industrial work has little influence upon human performance under conditions of sleep deprivation. Author

A85-36382

THREE-DIMENSIONAL CONTOUR MAP HOLODISPLAY OF THE HEART'S ELECTRIC FIELD

Z. ANTALOCZY, I. BUKOSZA (Postgraduate Medical School, Budapest, Hungary), Z. FUEZESSY, and F. GYIMESI (Budapesti Muszaki Egyetem, Budapest, Hungary) Applied Optics (ISSN 0003-6935), vol. 24, June 1, 1985, p. 1564, 1565. refs

The benefits of using a three-dimensional holo-display of the heart's electric field are discussed. Several holographic techniques are reviewed. It is noted that white-light holograms represent a promising display because no special device, such as a computer memory or a display screen, is required, and the holograms can be stored easily. Consideration is also given to compound holography. An experimental verification of the three-dimensional contour map holo-display was performed using a 40-mW He-Ne laser. The method is shown to be advantageous due to its brightness and the elimination of the obscuration problem. L.T.

N85-26145 British Aerospace Dynamics Group, Bristol (England), Human Factors Dept.

PROCEEDINGS OF THE BAE HUMAN FACTORS SEMINAR

P. O. DAY Oct. 1981 41 p refs Proc. held at Filton, England (BAE-BT-11873) Avail: Issuing Activity

Vision modeling; assessment of cockpits for female pilots; display system design; systems human factors; aircraft assembly environments; flight crew workload measurement; remote operation of submersibles; man-computer interaction; and seat assessment techniques were discussed. Author (ESA)

N85-26146 British Aerospace Dynamics Group, Bristol (England), Human Factors and Acquisition Research Dept.

AN MRTD-COMPATIBLE BAR PATTERN RESPONSE MODEL FOR TV AND DIRECT VIEW SIGHTING SYSTEMS

I. OVERINGTON Nov. 1981 18 p refs (BAE-BT-12090) Avail: Issuing Activity

In order to be able to compare the performance of direct view telescopes and TV sighting systems directly with that of thermal imagers a bar pattern response model compatible with MRTD was set up. The need for caution in use of bar pattern models for general and absolute system performance assessment is stressed. Limitations are listed and extensions of bar pattern response are discussed. The ORACLE/CYCLOPS model is recommended for absolute performance modeling with aperiodic stimuli. Author (ESA)

N85-26147 British Aerospace Dynamics Group, Bristol (England), Human Factors Dept.

HUMAN FACTORS DEPARTMENT 1981 PUBLICATIONS

J. L. EVANS Jan. 1982 26 p refs (BAE-BT-12685) Avail: Issuing Activity

About 90 papers covering human factors of remotely controlled systems; gun aiming; sight performance modeling; man computer interaction; target acquisition; and vision modeling are listed. Author (ESA)

N85-26148# Ballistic Research Labs., Aberdeen Proving Ground, Md.

THE HUMAN ENGINEERING OF LABORATORY DATA ACQUISITION AND CONTROL SYSTEMS Final Technical Report

M. A. DEWILDE Dec. 1984 30 p (Contract DA PROJ. 1L1-61102-AH-43) (AD-A151576; AD-F300581; BRL-TR-2623) Avail: NTIS HC A03/MF A01 CSCL 05E

Some special considerations concerning the human element in the design of laboratory automation are discussed. Techniques for architecting entire systems, as well as applications programs, are discussed. GRA

N85-26149# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

FIRE PIT TESTS OF BLUE FLIGHT COVERALL PROGRAM Final Report

G. KYDD and J. C. MARANO Nov. 1983 33 p (AD-A151884; NADC-83118-60) Avail: NTIS HC A03/MF A01 CSCL 15E

Twelve test garments of the Blue Flight Coverall Program were tested for fire protection in the NADC Fuel Fire Test Facility. Manikins with their surfaces sensed for temperature and dressed in the Coverall were passed through the flames fueled by JP-4 for two second intervals. The mean percentage body burned was 26.83% with a range of 4.0 and 49.5%. These results are discussed in terms of the total system of protection available to the fully clothed airman. GRA

N85-26150# Research Inst. of National Defence, Stockholm (Sweden). Lab. for Man and Information Systems.

ACTIVITIES REPORT FOR FOA 53: LABORATORY FOR MAN AND INFORMATION SYSTEMS Annual Report, 1983 - 1984

Oct. 1984 17 p refs (FOA-C-53019-H; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

Research concerning color graphics and coding; image quality in graphical displays; a hand sized terminal for coded combat orders; mental models in information seeking; reading textual information from VDU's; dynamic decision making; a computer aided display system for surveillance; user centered design and the computers of 1990; electronic displays of flight information; and analyses of helicopter pilot performance is summarized. Author (ESA)

N85-26603*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

THE CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM

K. KO In its NASA Ames Summer High School Apprenticeship Res. Program p 77-78 Apr. 1985 refs Avail: NTIS HC A06/MF A01 CSCL 06K

A Controlled Ecological Life Support System (CELSS) is needed which would convert waste water to usable water, waste products to food, and CO₂ to O₂ to permit long duration space flight. Algae, representing the autotroph, and mice, representing the heterotroph are placed together in a controlled, gas closed environment to examine the gas exchange rate of O₂ and CO₂. The eventual goal is to develop biological controls that can stabilize atmospheres. B.G.

N85-26604*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS (CELSS)

M. MAJUMDAR In its NASA Ames Summer High School Apprenticeship Res. Program p 81-87 Apr. 1985 refs Avail: NTIS HC A06/MF A01 CSCL 06K

One of the major problems facing researchers in the design of a life support system is to construct it so that it will be capable of regulating waste materials and gases, while at the same time supporting the inhabitants with adequate food and oxygen. The basis of any gaseous life supporting cycle is autotrophs (plants)

that photosynthesize). The major problem is to get the respiratory quotient (RQ) of the animals to be equivalent to the assimilatory quotient (AQ) of the plants. A technique is being developed to control the gas exchange. The goal is to determine the feasibility of manipulating the plant's AQ by altering the plants environment in order to eliminate the mismatch between the plant's AQ and the animal's RQ. B.G.

N85-26658# Bodenseewerk Geraetetechnik G.m.b.H., Ueberlingen (West Germany).

A DESCRIPTION OF THE PROCESS OF ELABORATING MAN-MACHINE DIALOG IN AN AIRCRAFT EQUIPPED WITH CATHODE TUBES: ROLES AND SPECIFICATIONS OF PILOTTED SIMULATION METHODS [DESCRIPTION DU PROCESSUS DELABORATION DU DIALOGUE HOMME MACHINE DANS LES AVIONS DARMES EQUIPES DE TUBES CATHODIQUES ROLE ET DESCRIPTION MOYENS SIMULATION PILOTEE]

P. HELIE *In* AGARD Cost Effective and Affordable Guidance and Control Systems 12 p Feb. 1985 refs *In* FRENCH Avail: NTIS HC A13/MF A01

The use of cathode ray tubes (or systems permitting equivalent representations) on future military aircraft is envisioned as well as multiplexed commands implanted in joysticks and throttles, and a system of vocal dialog. Engineers studying man-machine dialog must reexamine established principles and develop other work methods. Documents developed for defining the different stages of development of such a system and tasks required for validating man-machine dialog are examined. The operational OASIS system developed for the Mirage 2000 aircraft for piloted simulation is described. Transl. by A.R.H.

N85-27532*# SRI International Corp., Menlo Park, Calif. NASA Technology Applications Team.

PRELIMINARY TECHNOLOGY UTILIZATION ASSESSMENT OF THE ROBOTIC FRUIT HARVESTER

J. WILHELM Oct. 1982 18 p refs (NASA-CR-175834; NAS 1.26:175834) Avail: NTIS HC A02/MF A01 CSDL 05H

The results of an analysis whose purpose was to examine the history and progress of mechanical fruit harvesting, to determine the significance of a robotic fruit tree harvester and to assess the available market for such a product are summarized. Background information that can be used in determining the benefit of a proof of principle demonstration is provided. Such a demonstration could be a major step toward the transfer of this NASA technology. G.L.C.

N85-27533# Naval Postgraduate School, Monterey, Calif. **SHAPE WITH AND WITHOUT REDUNDANT COLOUR AS CODING MECHANISM FOR SIMULATED RADAR DISPLAYS IN A TIME-EXTENDED SIMPLE VIGILANCE TASK M.S. Thesis**

U. HESSLING Sep. 1984 63 p (AD-A151683; AD-E751179) Avail: NTIS HC A04/MF A01 CSDL 05H

In this thesis a simple monitoring task was extended to eight hours to achieve a higher realism in testing human vigilance. An extremely low stimulus frequency, the confinement of the subjects during the test run, and the scheduling experiment from 10:00PM to 6:00AM were further tools to create a more operational environment. Subjects were treated in one of two conditions, simulating a shipborne tactical radar display with precoded information, to test a currently operational shape coding mechanism (control condition) for positive effects due to the addition of redundant color codes (experimental condition). The results did not support the hypothesis of positive effects in the experimental condition. In fact, the number of omissions was significantly higher in that condition. Longer reaction times in both conditions were found to be correlated to higher signal and display densities. GRA

N85-27534# Army Construction Engineering Research Lab., Champaign, Ill.

DESIGN OF COMPUTER-RELATED WORKSTATIONS IN RELATION TO JOB FUNCTIONS AND PRODUCTIVITY Final Report

C. C. LOZAR and R. D. NEATHAMMER Dec. 1984 100 p (Contract MIPR-80-939-5) (AD-A151938; CERL-P-85/09) Avail: NTIS HC A05/MF A01 CSDL 05E

This research analyzed offices at the Defense Systems Automation Center, Defense Logistics Agency, Columbus, OH, to determine workstation design criteria for computer-related job functions. This was done by determining the functional needs of employees and by a before and after renovation evaluation of a prototypical workstation area. The prototype was compared and evaluated to control groups. Certain hypotheses about spatial adequacy, privacy, and productivity were tested within the limits of the control group and the overall survey. The results of this analysis were related to previous research and then transplanted into recommended design actions which can be interpreted by interior designers, architects, and office managers. This will improve performance in computer-related job functions through layout, furnishings selection, and support services within the physical envelope and the management structure of the organization. GRA

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A85-34138 THE FIRST ORGANISMS

A. G. CAIRNS-SMITH *Scientific American* (ISSN 0036-8733), vol. 252, June 1985, p. 90-92, 94, 96-100.

The results of recent theoretical and experimental investigations supporting the hypothesis that clay crystals were the first evolving systems of 'organisms' on earth are summarized in a general review and illustrated with diagrams and micrographs. The conventional scenario of primitive evolution, in which RNA is formed by the combination of amino acids produced in chemical reactions in a primordial atmosphere, is examined critically; the theoretical requirements for the first organisms are shown to be simple but stringent (naked 'genes' capable of reproducing their specific composition and structure and of undergoing mutations); and the properties of clay layers which fulfill these requirements are discussed with a focus on the possible role of clay organisms as supportive environments for the (later) evolution of RNA. Arguments against the clay hypothesis and the design of future experiments to meet them are considered. T.K.

A85-35895 A STRONG DISTURBANCE OF MIRROR SYMMETRY AS THE NECESSARY CONDITION FOR SELF-REPLICATION [SIL'NOE NARUSHENIE ZERKAL'NOI SIMMETRII KAK NEOBKHODIMOIE USLOVIE VOZNIKNOVENIIA SAMOREPLIKATSII]

V. A. AVETISOV, S. A. ANIKIN, V. I. GOLDANSKII, and V. V. KUZMIN (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR) *Akademiia Nauk SSSR, Doklady* (ISSN 0002-3264), vol. 282, no. 1, 1985, p. 184-186. *In Russian.*

Reference is made to experiments on the matrix oligomerization of nucleotides (Joyce et al., 1984) which have demonstrated that the formation of chirally pure (i.e., containing only a single antipodal molecular form) polynucleotides is largely determined by the chiral composition of a medium. The results of these experiments and an analysis of a simple model proposed in the present study suggest that the existence and development of self-replicating systems are possible only in a chirally pure medium. Therefore,

self-replication must be preceded by a 'strong' disturbance of the mirror symmetry of an organic medium. V.L.

A85-36094* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PH PROFILE OF THE ADSORPTION OF NUCLEOTIDES ONTO MONTMORILLONITE. I - SELECTED HOMOIONIC CLAYS

J. G. LAWLESS, F. M. CHURCH, J. MAZZURCO (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA), A. BANIN (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA; Jerusalem, Hebrew University, Rehovot, Israel), R. HUFF, J. KAO, A. COOK, T. LOWE, J. B. ORENBERG (San Francisco State University, San Francisco, CA), and E. EDELSON (Exxon Chemical Co., Inc., Research and Development Div., Baytown, TX) *Origins of Life* (ISSN 0302-1688), vol. 15, no. 2, 1985, p. 77-88. refs (Contract NAGW-094)

The effect of pH and adsorbed ions on the adsorption of purine and pyrimidine nucleotides on montmorillonite clay was studied experimentally. The specific nucleotides examined were: 5 prime-AMP; 3-prime AMP; and 5 prime-CMP. The pH of the clay samples was adjusted to various levels in the 2-12 pH range using microliter volumes of concentrated acid (1N HCl) and base (1N NaOH). It was found that preferential adsorption among nucleotides was dependent on the pH level and on the characteristics of the substituted metal cation and anion exchange mechanisms. Below pH 4, adsorption was attributed to cation and anion exchange mechanisms. Above pH 4, however, adsorption was attributed to the complexation mechanisms occurring between the metal cations in the clay exchange site and in the biomolecule. The possible role of homoionic clays in the concentration mechanisms of biomonomers in the prebiotic environment is discussed. I.H.

A85-36095* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PH PROFILE OF THE ADSORPTION OF NUCLEOTIDES ONTO MONTMORILLONITE. II - ADSORPTION AND DESORPTION OF 5-PRIME-AMP IN IRON-CALCIUM MONTMORILLONITE SYSTEMS

A. BANIN (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA; Jerusalem, Hebrew University, Rehovot, Israel), J. G. LAWLESS, J. MAZZURCO, F. M. CHURCH (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA), L. MARGULIES (Jerusalem, Hebrew University, Rehovot, Israel), and J. B. ORENBERG (San Francisco State University, San Francisco, CA) *Origins of Life* (ISSN 0302-1688), vol. 15, no. 2, 1985, p. 89-101. refs (Contract NAGW-094)

The interaction of 5-prime-AMP with montmorillonite saturated with various ratios of two metals found ubiquitously on the surface of earth, that is, iron and calcium, is investigated. Adsorption and desorption of the nucleotide were studied in the pH range of 2-12 at three levels of addition: 0.080, 0.268 and 0.803 mmole 5-prime-AMP per gram of clay. Two desorption stages were employed - H₂O wash and NaOH extraction (pH = 12.0). 5-prime-AMP was preferentially adsorbed on the Fe-containing clays relative to the Ca clay. The nucleotide was fully recovered by the two desorption stages, mostly by the NaOH extraction. The evidence at hand indicates that 5-prime-AMP reaction with clay is affected by electrostatic interactions involving both attraction and repulsion forces. Some specific adsorption, possibly the result of covalent bonding and complex formation with the adsorbed ion, cannot be ruled out for iron but does not appear to operate for calcium. Changes in pH cause varying degrees of attraction and repulsion of 5-prime-AMP and may have been operating on the primitive earth, leading to sequences of adsorption and release of this biomolecule. Author

A85-36096* Stanford Univ., Calif.

THE RADIOLYSIS AND RADIORACEMIZATION OF AMINO ACIDS ON CLAYS

W. A. BONNER, H. HALL, G. CHOW, L. YI (Stanford University, Stanford, CA), and R. M. LEMMON (California, University, Lawrence Berkeley Laboratory, Berkeley, CA) *Origins of Life* (ISSN 0302-1688), vol. 15, no. 2, 1985, p. 103-114. Research supported by the U.S. Department of Energy. refs (Contract NGL-05-020-582)

The effects of the surfaces of kaolinite and bentonite clays on the radiolysis and radioracemization of L-leucine and its hydrochloride salt have been investigated experimentally. L-leucine and its hydrochloride salt were deposited on the clays and the amino acid/clay preparations were irradiated by a Co-60 gamma-ray source which induced 2-89 percent radiolysis. The efficiency of radiolysis and radioracemization were measured using gas chromatography. Results were obtained for leucine in 0.1 M aqueous solution for comparison with the clay-deposited leucine and leucine hydrochloride. It is found that radiolysis and radioracemization in the samples occurred according to a pseudo-first-order rate law. Comparison of the specific rate constants showed that leucine and its hydrochloride salt were the most resistant to both radiolysis and radioracemization, followed by leucine and its hydrochloride salt on kaolin. Leucine and its HCl salt on bentonite, and leucine in aqueous solution were found to be the least resistant to radiolysis and radioracemization. The experimental results are interpreted with respect to the Vester-Ulbricht mechanism for the origin of optical activity. I.H.

A85-36097

ABIOTIC FORMATION OF OLIGONUCLEOTIDES ON BASALT SURFACES

V. A. OTROSHCHENKO, N. V. VASILEVA, and A. M. KOPILOV (Akademii Nauk SSSR, Institut Biokhimii, Moscow, USSR) *Origins of Life* (ISSN 0302-1688), vol. 15, no. 2, 1985, p. 115-120. refs

The complication and further evolution of abiotic syntheses products occurred under environmental influences at the prebiological stage. From this point of view, the influence of some types of irradiation on the organic molecules adsorbed on the surfaces of volcanic rocks, appeared to be of great importance. In this connection, the effect of gamma rays on the AMP molecules adsorbed on mineral surfaces such as cinders and ashes has been studied. It has been shown that they can polymerize with the formation of oligonucleotides. The treatment of oligomers obtained by venom phosphodiesterase has shown that a polymeric product has mainly 3-prime - 5-prime and 2-prime - 5-prime bonds between nucleotides. The results obtained have been discussed from the evolutionary aspect. Author

A85-36098* San Francisco State Univ., Calif.

SOLUBLE MINERALS IN CHEMICAL EVOLUTION. I - ADSORPTION OF 5-PRIME-AMP ON CaSO₄ - A MODEL SYSTEM

J. B. ORENBERG, S. CHAN (San Francisco State University, San Francisco, CA), J. CALDERON (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, CA), and N. LAHAV (Jerusalem, Hebrew University, Rehovot, Israel) *Origins of Life* (ISSN 0302-1688), vol. 15, no. 2, 1985, p. 121-129. refs (Contract NAGW-324)

The adsorption of 5-prime-AMP onto solid CaSO₄·2H₂O was studied in a saturated suspension as a function of pH and electrolyte concentration. The adsorption is pH-dependent and is directly correlated with the charge on the 5-prime-AMP molecule which is determined by the state of protonation of the N-1 nitrogen of the purine ring and the phosphate oxygens. It is proposed that the binding that occurs between the nucleotide and the salt is electrostatic in nature. The adsorption decreases with increasing ionic strength of the solution which means that in a fluctuating environment of wetting and drying cycles, a biomolecule similar to 5-prime-AMP could be expected to desorb during the drying phase. The results indicate that CaSO₄·2H₂O can serve as a concentrating surface for biomolecules. The significance of this is discussed with regard to the possible role of soluble minerals and their

surfaces in a geochemical model consistent with the evolution of the earth and the origin of life. Author

A85-36099

NEW EVIDENCE FOR A TUBULAR STRUCTURE OF BETA-IRON (III) OXIDE HYDROXIDE AKAGANEITE

N. G. HOLM (Stockholm, Universitet, Stockholm, Sweden) *Origins of Life* (ISSN 0302-1688), vol. 15, no. 2, 1985, p. 131-139. Sponsorship: Naturvetenskapliga Forskningsradet. refs (Contract NFR-G-GU-3865-102; NFR-G-GU-3865-107)

A biological method for the preparation of ultrathin transmission electron microscopy (TEM) sections has been used successfully to examine the fragile mineral akaganeite. TEM exposures reveal a tubular structure for akaganeite. The existence of such a structure has been debated for over a decade. The tubular structure may have been active in prebiotic polymerization reactions on the young earth. Author

A85-36100

PHOSPHORYLATION MECHANISMS IN CHEMICAL EVOLUTION

A. M. SCHOFFSTALL and E. M. LAING (Colorado, University, Colorado Springs, CO) *Origins of Life* (ISSN 0302-1688), vol. 15, no. 2, 1985, p. 141-150. refs

The mechanisms of nucleoside and nucleotide phosphorylation in amide solvents and urea have been investigated experimentally. The specific nucleosides and nucleotides studied were: formamide; N-methylformamide; urea; and methyl acetamide. Reaction of adenosine with $\text{NH}_4\text{H}_2\text{PO}_4$ was observed in simple and monosubstituted amides at temperatures of 100 C. Dephosphorylated nucleoside phosphomonoesters were found in the amide solvents and urea at 100 C after one day. It is shown that the formation of oligonucleotides in the solvents could not have occurred without condensing agents since the formation of monomeric metaphosphate (MMP) from inorganic phosphate caused reversible phosphorylation and dephosphorylation. The use of peptides as media for oligonucleotide formation was found to counteract the detrimental effects of phosphorylation and dephosphorylation. The rate of phosphorylation and of 5 prime-ATP was found to be rapid in both urea and formamide. On the basis of the experimental results, it is concluded that oligonucleotides may be synthesized under prebiotic conditions, despite the detrimental effects of nucleotide dephosphorylation. I.H.

A85-36116

THE CASE FOR INTERSTELLAR MICRO-ORGANISMS

F. HOYLE, N. C. WICKRAMASINGHE, and S. AL-MUFTI (University College, Cardiff, Wales) *Astrophysics and Space Science* (ISSN 0004-640X), vol. 110, no. 2, March 1985, p. 401-403. refs

A response is made to the attempt by Davies et al. (1984) to disprove the Wickramasinghe et al. (1977) life-from-space theory. It is noted that the relevant data, in its present form, cannot be used to infer either the presence or the absence of the weak absorption band in the 2600-2800 A wavelength interval which might be expected from biological proteins and nucleic acids. O.C.

A85-36117

THE INFRARED AND ULTRAVIOLET ABSORPTIONS OF MICRO-ORGANISMS AND THEIR RELATION TO THE HOYLE-WICKRAMASINGHE HYPOTHESIS

S. YABUSHITA and K. WADA (Kyoto University, Kyoto, Japan) *Astrophysics and Space Science* (ISSN 0004-640X), vol. 110, no. 2, March 1985, p. 405-411. refs

The Hoyle and Wickramasinghe (1979) hypothesis of an interstellar grain composition that is largely microorganic is presently considered in view of electron microscope photographs of aggregates of *E. coli*, IR UV absorptions of yeast and *E. coli*, and the IR absorption of diatomaceous soil. The results of Hoyle et al. (1983) with respect to the absorption of microorganisms in the UV region were not reproduced; it is noted that it appears difficult to explain all absorption features from the UV to IR regions in terms of a single substance. O.C.

A85-36677

THE ULTRAVIOLET ABSORBANCE OF PRESUMABLY INTERSTELLAR BACTERIA AND RELATED MATTERS

F. HOYLE, N. C. WICKRAMASINGHE, and S. AL-MUFTI (University College, Cardiff, Wales) *Astrophysics and Space Science* (ISSN 0004-640X), vol. 111, no. 1, April 1985, p. 65-78. refs

The extinction properties of desiccated microorganisms at ultraviolet wavelengths was determined using 2-methylbutane as a solvent. The peak absorption was measured to be about 35,000 sq cm/g, in addition to a scattering component of the extinction which has an estimated value for dry microorganisms of about 50,000 sq cm/g. The calculated scattering for a size distribution of nonabsorbing hollow bacteria with irregularities on the scale of 300 A produces agreement with both the visual extinction law and the observed inverse wavelength type of extinction at the far ultraviolet. The contribution to the extinction from a pure scattering bacterial model combined with absorption precisely accounts for the observed total extinction at the peak of 5.7 mag per kpc. The attribution of the 2200 A absorption to small graphite particles is also discussed. C.D.

N85-26566*# Arizona Univ., Tucson. Lunar and Planetary Lab. THE IMPACT EJECTION OF LIVING ORGANISMS INTO SPACE Abstract Only

H. J. MELOSH *In Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf.* p 59-62 1985

Avail: NTIS HC A05/MF A01 CSCL 06B

The possibility of natural processes to blast living organisms into space was examined. It is suggested that rocks ejected from the Earth by a giant meteorite or comet impact can carry microorganisms into space. Such microscopic Earth life would have an opportunity to colonize the other planets if it can survive the rigors of space until it falls into the atmosphere of a hospitable planet. E.A.K.

N85-26567*# Los Alamos Scientific Lab., N. Mex. Isotope and Nuclear Chemistry Div.

A SEARCH FOR EVIDENCE OF LARGE BODY EARTH IMPACTS ASSOCIATED WITH BIOLOGICAL CRISIS ZONES IN THE FOSSIL RECORD Abstract Only

C. J. ORTH, J. S. GILMORE, and J. D. KNIGHT *In Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf.* p 63-67 1985

Avail: NTIS HC A05/MF A01 CSCL 06B

The natural history of the Earth, how the present plant and animal species developed, how others completely died out, etc., was studied. The rock strata sampled and studied were at the time of deposition at sea bottom. It was found that, exactly at the stratigraphic level corresponding to the extinction, a thin clay layer was greatly enriched in the rare element iridium. It was hypothesized that the excess iridium at the boundary came from a large steroid like object that hit the earth, and that the impact of this object threw up a dust cloud dense enough and long lasting enough to bring about the extinction of a wide variety of plants and animals, producing the unique break in the fossil record, the cretaceous-tertiary boundary. The same iridium and platinum metals enrichment are found in a thin clay layer that corresponds with the boundary as defined by sudden radical changes in plant populations. The iridium enrichment is confirmed at other fresh water origin sites in the Raton Basin. E.A.K.

N85-26609*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

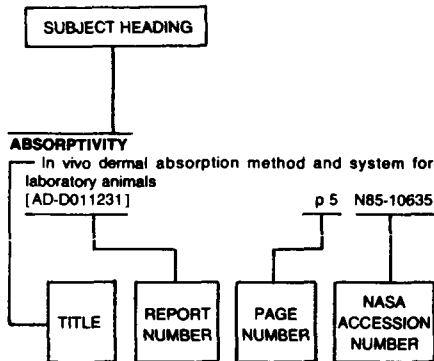
THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE

A. TUCHER *In its NASA Ames Summer High School Apprenticeship Res. Program* p 109-110 Apr. 1985 refs

Avail: NTIS HC A06/MF A01 CSCL 03C

The development of NASA's SETI project and strategies for searching radio signals are reviewed. A computer program was written in FORTRAN to set up data from observations taken at Jodrell Bank. These data are to be used with a larger program to find the average radio signal strength at each of the approximately 63,000 channels. A.R.H.

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document content, the title extension is added, separated from the title by three hyphens. The (NASA or AIAA) accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

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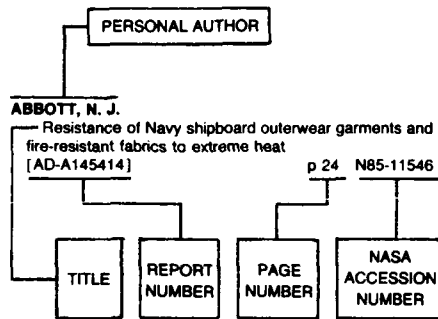
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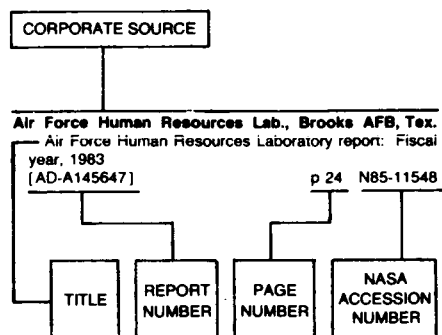
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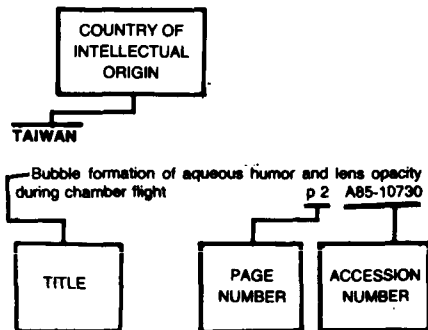
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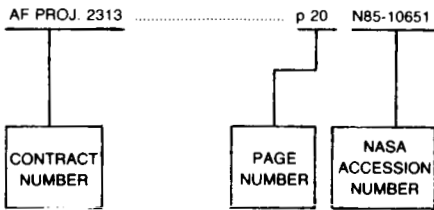
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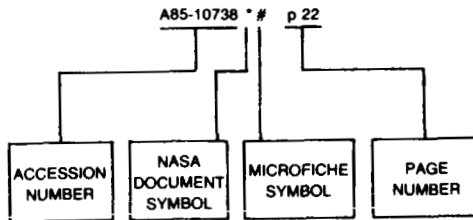


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